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Nortel Networks Symposium Call Center Server

Planning and Engineering Guide

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Standard 3.0 of the *Symposium Call Center Server Planning and Engineering Guide* is released. This version contains information about Symposium Voice Services on CallPilot and pcAnywhere version 10.5.

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Chapter 1

Getting started

In this chapter

Overview

Welcome

Nortel Networks presents Symposium Call Center Server. The server is designed to provide a call center solution for varied and changing business requirements by offering a suite of applications that includes call processing and agent handling, management and reporting, networking, and third-party application interfaces.

Some advantages of Symposium Call Center Server are

- complete call control and reporting
- application flexibility
- state-of-the art user interface
- industry standard, client-server architecture
- open interfaces: database, real time, host routing, and Meridian Link Services (MLS)
- comprehensive networking through public and private networks
- leveraged PBX switching reliability and client-server processing power

Introduction

The *Symposium Call Center Server Planning and Engineering Guide* provides information on how to determine the requirements of your Symposium Call Center Server.

For information on using or administering other tools and features of Symposium Call Center Server, refer to the appropriate document. To find out which document you need, see “Related documents” on page 37.

This chapter describes the major components of the Symposium Call Center Server architecture for each system type. For Meridian 1 or Succession Communication Server for Enterprise (CSE) 1000 systems with the optional Network Skill-Based Routing (NSBR) feature, the major components in a Network Control Center (NCC) setup are illustrated.

Note: Unless otherwise specified, references in this guide to the Meridian 1 switch are also applicable to the Meridian 1 Internet Enabled switch.

Who should read this guide

This guide is for Symposium Call Center Server system designers and technical support staff members. It is also intended to be used by administrators who are responsible for day-to-day management of the Symposium Call Center Server configuration.

Network information

This guide contains references to the Symposium Call Center Server Network Skill-Based Routing (NSBR) feature. However, this feature is not available for all switch types. For more information on networking, refer to the *Symposium Call Center Server Network Control Center Administrator's Guide*.

Symposium Call Center Server components

Introduction

Symposium Call Center Server consists of three key components: telephony equipment, server, and client.

Telephony component

The telephony component is made up of the phonesets and the switch.

Server component

The server component consists of these main elements:

- a PC-based server operating under Windows 2000 Server or Windows 2000 Advanced Server
- an Embedded LAN (ELAN), which connects Nortel Networks equipment: the switch, the server in Symposium Call Center Server, and an optional Client PC running the System Management Interface (SMI) Workbench. To preserve the bandwidth required for Nortel Networks equipment, no client PCs are allowed on the ELAN.
- Symposium Call Center Server base software to provide operations, administration, and management (OA&M) functions for the server
- the Symposium Call Center Server application, which runs on the server, and is accessed and controlled by the Symposium Call Center Server client PCs
- pcAnywhere on the server for remote support access

Client component

Symposium Call Center Server Client application Release 4.0 (the Fat client) is installed on the customer-supplied supervisor workstations, and accesses the Release 4.2 server over the Customer LAN (CLAN). Client workstations can operate under Windows 98, Windows NT Workstation, Windows 2000 Professional, or Windows XP.

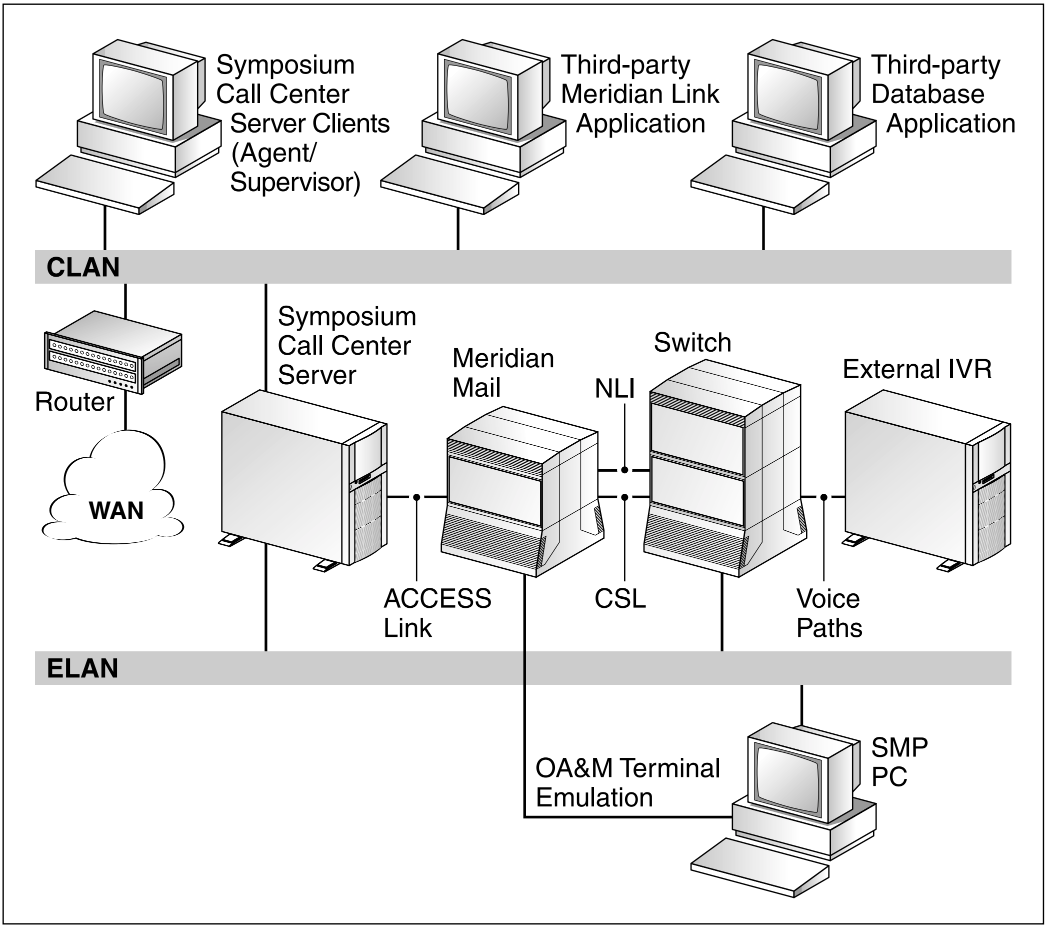
Notes:

- Windows XP is supported on Revision 5 and higher of the Client CD.
- Windows 95 is no longer supported on Revision 5 and higher of the Client CD.
- Symposium Web Client 4.0 is a new browser-based thin client. For more information about Symposium Web Client, see the Symposium Web Client documentation.

Meridian 1/CSE 1000 server architecture

The following illustrations show the major components of the Symposium Call Center Server nodal architecture when connected to a Meridian 1 or CSE 1000 switch.

A server using Meridian Mail as its voice processing system



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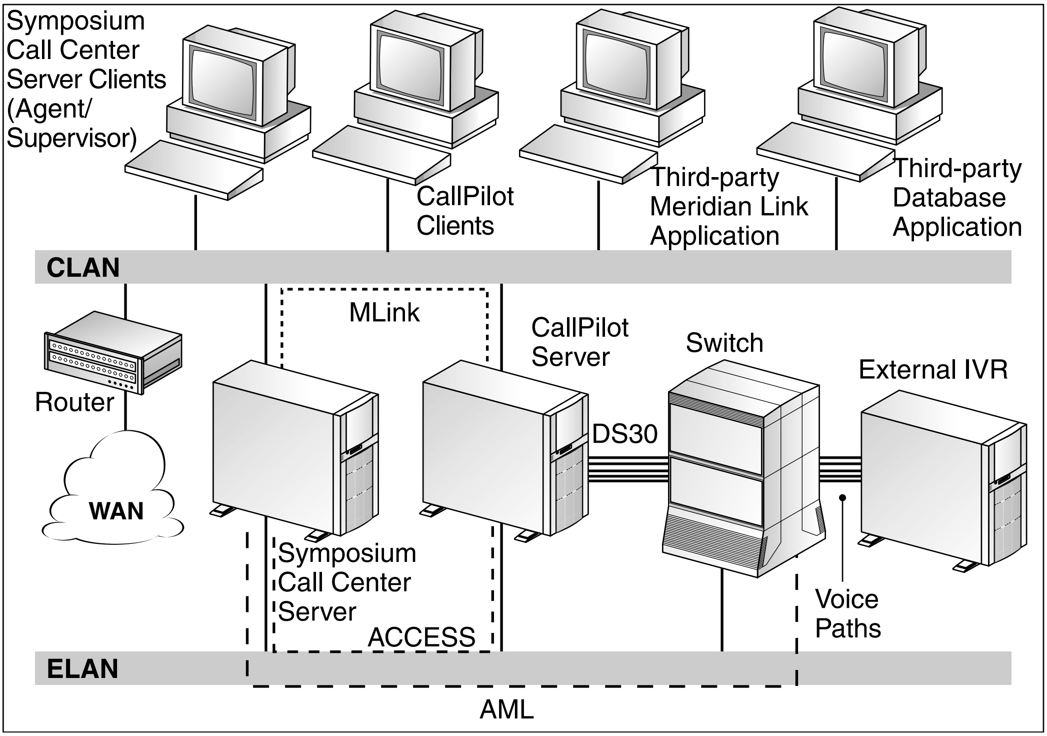
Note: Alternatively, instead of using a router, you can use another type of IP filter with routing capabilities.

A server using CallPilot as its voice processing system



These components comprise processor-based and network-based components:

Processor-based components

- server in Symposium Call Center Server
- client PCs
- switch
- CallPilot Server and client PCs
- Meridian Mail, System Management Platform (SMP) PC, and Operations Administration and Maintenance (OA&M) terminals
- third-party application platforms on the Customer LAN (CLAN)

Network-based components

- Embedded LAN (ELAN)
- Customer LAN (CLAN)
- Wide Area Network (WAN)
- for Meridian Mail:
  - serial ACCESS Link
  - Command and Status Link (CSL)
  - Network Loop Interface (NLI)
  - voice and signaling channels for Meridian Mail ports
- trunks and lines associated with Symposium Call Center Server

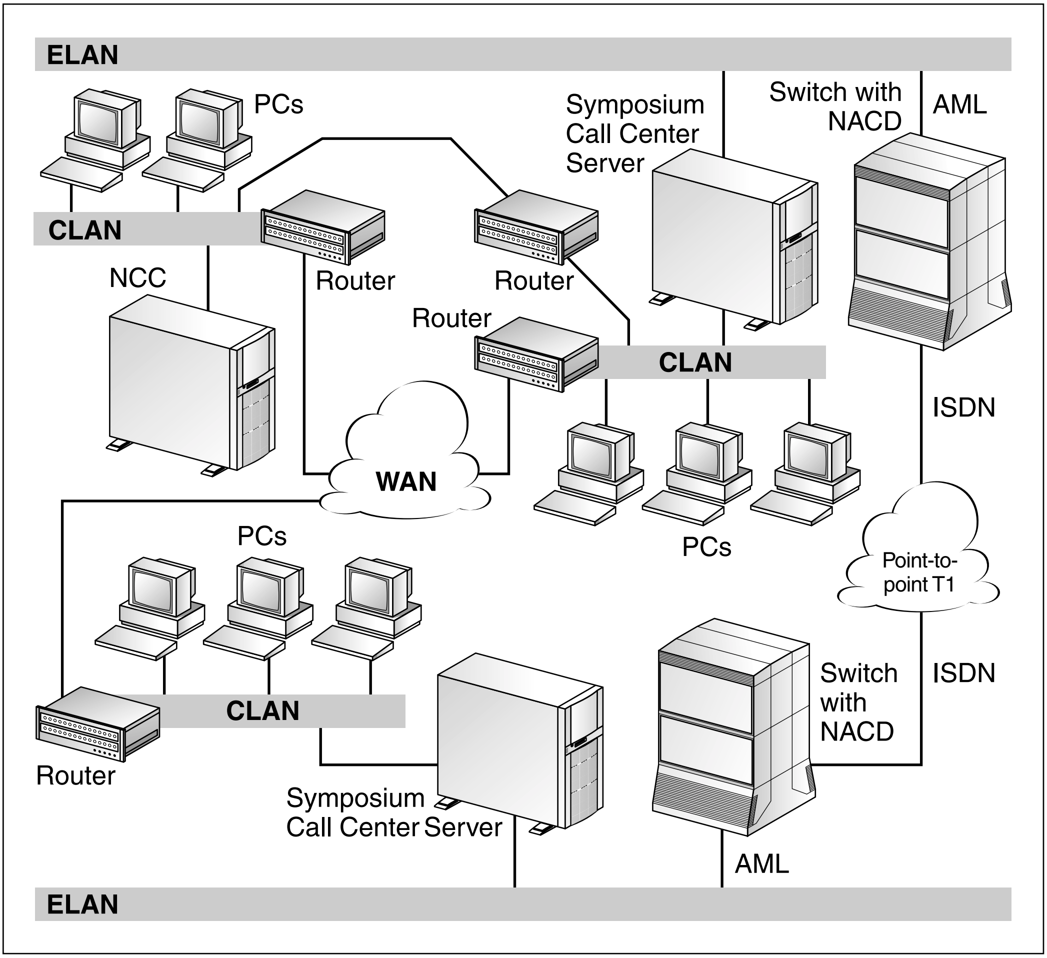
Symposium Call Center Server NCC architecture

Sites connected together in a Wide Area Network (WAN) require a central, non-call-processing computer to control the network. This computer is known as the Network Control Center (NCC). All servers in Symposium Call Center Server are connected to the NCC server. The NCC server can be located at the same site as one of the servers in the network. The NCC is described in detail in Chapter 6, “Engineering the NCC server.”

Notes:

- The networking of calls is supported for the Meridian 1 or CSE 1000 switches only. CSE 1000 Release 1.1 only supports networking over ISDN trunks.
- If the NCC is located at the same site as a server in Symposium Call Center Server, Nortel Networks recommends that you use an IP router. The router, as shown in the diagram, separates local traffic from networking traffic.

The major components of the Symposium Call Center Server Network Control Center (NCC) are shown in the following illustration:



Notes:

- Alternatively, instead of using a router, you can use another type of IP filter with routing capabilities.
- Symposium Call Center Server supports both point-to-point (illustrated) and tandem connections between switches. To route calls through tandem nodes, ensure that you have provisioned your CLAN/WAN to allow the transmission of messages from one server in Symposium Call Center Server to another.

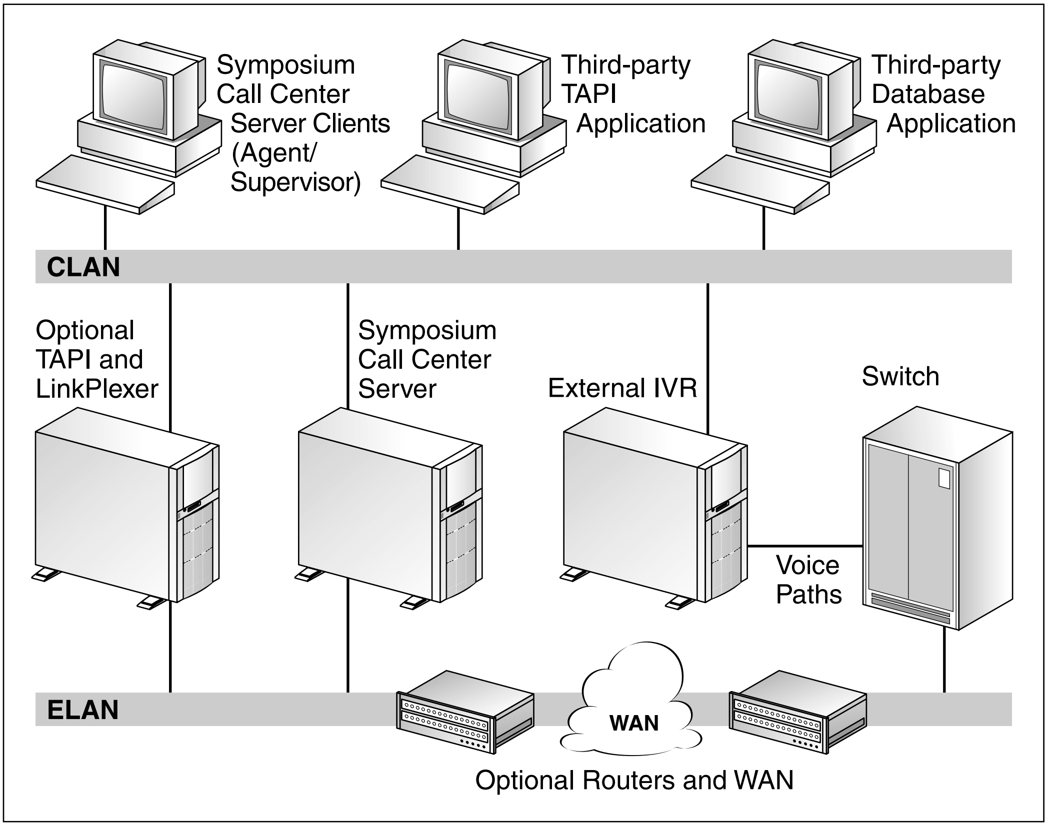
These components comprise processor-based and network-based components:

- Processor-based components
  - server in Symposium Call Center Server
  - client PCs
  - Meridian 1 or CSE 1000 switch with networked automatic call distribution (NACD) support
- Network-based components
  - ELAN
  - CLAN
  - WAN
  - trunks and lines associated with Symposium Call Center Server

DMS/MSL-100 server architecture

Note: DMS/MSL-100 is not currently supported in Release 4.2.

The major components of the Symposium Call Center Server architecture when connected to a DMS/MSL-100 switch are shown in the following illustration:



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Note: Alternatively, instead of using a router, you can use another type of IP filter with routing capabilities.

These components comprise both processor-based and network-based components:

- Processor-based components
  - server in Symposium Call Center Server
  - client PCs
  - TAPI and LinkPlexer server
  - third-party application platforms on the Customer LAN (CLAN)
  - the DMS/MSL-100 switch
  - external IVR system
- Network-based components
  - ELAN
  - CLAN
  - WAN
  - trunks and lines associated with Symposium Call Center Server on the DMS/MSL-100 side

The TAPI and LinkPlexer server, external IVR system, and ELAN WAN connection are optional components. You can have the external IVR system communicate with the MLS feature of Symposium Call Center Server rather than the LinkPlexer server.

LinkPlexer

Optionally, you can use the LinkPlexer with the DMS or MSL-100 switch. LinkPlexer allows Symposium Call Center Server and the External IVR system to control the same DN associations on the DMS or MSL-100.

DMS/MSL-100 External IVR fast transfer impact

If the IVR system uses the MLS capability of the Symposium Call Center Server system to transfer the call from the IVR voice port to the Symposium Call Center Server CDN, then this additional traffic should be included in any MLS traffic calculations.

If the IVR system uses the TAPI/LinkPlexer server to transfer the call from the IVR voice port to the Symposium Call Center Server CDN, then this additional traffic should be included in any CLAN and ELAN traffic calculations. The characterization of this traffic is outside the scope of this document.

Engineering methods

Introduction

You can use the following methods for estimating the requirements for a Symposium Call Center Server system:

- the CapTool method
- the formula method

Note: Whenever you change the capacity of your system (especially if you are adding agents, or increasing call volume), you must recalculate the requirements for your Symposium Call Center Server system. Changes to system capacity may necessitate an upgrade to your hardware platform.

CapTool method

The CapTool method provides an easy-to-use interface for inputting the parameters used to calculate system requirements. When all parameters are entered, CapTool can automatically identify the system requirements, including hardware platform, bandwidth, and disk space.

To use the CapTool method, see one of the following chapters:

- **Meridian 1 or CSE 1000 switch**—Chapter 3, "Meridian 1/CSE 1000 Symposium Call Center Server and NCC requirements"
- **DMS/MSL-100 switch**—Chapter 4, "DMS/MSL-100 Symposium Call Center Server requirements"

Formula method

The formula method is similar to the CapTool method, but it is a manual calculation method. To use the formula method, see Chapter 5, "Using the formula method."

Note: Nortel Networks recommends that you use the CapTool method to verify all calculations obtained with the formula method.

Hardware platforms

Platform Vendor Independence

Platform Vendor Independence (PVI) is a software-only call center solution, which allows Symposium Call Center Server to operate on hardware that is not supplied by Nortel Networks. The software is designed to run on any system that meets the minimum hardware requirements for Windows 2000 Server or Advanced Server, using Microsoft-certified drivers for all components.

Note: Other versions of Windows 2000, such as Windows 2000 Professional and Windows 2000 Datacenter Server, are not supported.

The minimum requirements are as follows:

Component	Minimum requirement
CPU	Intel Pentium II
CPU clock speed	300 MHz
RAM memory	See “Memory” on page 28
hard drive capacity	See “Disk space” on page 30
hard drive/speed	SCSI/7200 RPM

Note: If you are upgrading from an earlier release, use the Capacity Tool to determine whether the platform meets your call center’s capacity requirements in Release 4.2.

High Availability Platforms

Symposium Call Center Server is also supported on any High Availability Platform that has undergone compatibility testing with Symposium Call Center Server as part of Nortel Networks’ Compatibility Test Program. (For more details on this compatibility test program, see www.nortelnetworks.com/prd/dpp/).

Currently, Symposium Call Center Server Release 4.2 supports the Stratus ftServer 3220. This platform is available as

- a strictly hardware high availability solution known as hardware RAID
- a hybrid software/hardware solution known as Hardware Assisted Software Mirroring (HASM) or Hardware Assisted Software RAID

In this guide, the hardware RAID option is referred to as ftServer 3220 H/W and the software RAID option as ftServer 3220 HASM.

For more information on Stratus, go to www.stratus.com.

Other platforms

In addition, you can use the following hardware platforms as long as they are Windows 2000-compatible and configured as PVI systems:

- 702t
- 1003t

Note: To determine whether a specific 702t platform can be used with Symposium Call Center Server Release 4.2, see Appendix B of the *Installation and Maintenance Guide*.

The following hardware platforms are no longer supported regardless of how they are configured:

- 701t
- 1000t
- 1001t

CPU capacity

CPU capacity is rated using the Intel CPU as a reference. The Symposium Call Center Server performance model has derived a CPU Power Index, which is based on the Intel iCOMP CPU processing scale as well as other industry standard benchmarks. This index has been validated in the past on selected MAS and PVI hardware platforms by direct measurement. It is expected that computers manufactured by different vendors using identical Intel CPUs will differ to some degree in their performance. However, this difference is expected to be small compared to differences between CPU models.

Symposium Call Center Server Release 4.2 processors employ the Intel Pentium suite. The minimum recommended processor is the Pentium II, with a clock speed of 300 MHz. For optimal performance, average CPU utilization should not exceed 50 percent over at least a 15-minute time period. (See Appendix F, “CPU utilization upper limits,” for the rationale for these values.) CPU utilization in excess of the 50 percent limit (up to 100 percent) is expected and normal for relatively short periods of time. As call center size and call loads increase, the speed of the processor required to maintain average CPU utilization below the 50 percent limit increases.

Dual processor configurations are supported. The dual configuration increases processing speed by a factor of 1.5.

Note: Quad processors are not supported.

The relative processing speeds of the Intel suite of Pentium processors is shown in the following table:

Processor	PII300 Relative Index	iComp 2.0
Single Processors		
Pentium II, 300 MHz (PII300)	1.00	332
Pentium II, 333 MHz (PII333)	0.91	366
Pentium II, 350 MHz (PII350)	0.86	386
Pentium II, 400 MHz (PII400)	0.75	440

Processor	PII300 Relative Index	iComp 2.0
Pentium II, 450 MHz (PII450)	0.69	483
Pentium III, 450 MHz (PIII450)	0.57	586
Pentium III, 500 MHz (PIII500)	0.51	645
Pentium III, 550 MHz (PIII550)	0.48	696
Pentium III, 600 MHz (PIII600)	0.44	754
Pentium III, 600 MHz (PIII600E)	0.40	825
Pentium III, 650 MHz (PIII650)	0.37	888
Pentium III, 667 MHz (PIII667)	0.37	908
Pentium III, 700 MHz (PIII700)	0.35	947
Pentium III, 733 MHz (PIII733)	0.34	982
Pentium III, 750 MHz (PIII750)	0.33	994
Pentium III, 800 MHz (PIII800)	0.32	1053
Pentium III, 866 MHz (PIII866)	0.29	1132
Pentium III, 933 MHz (PIII933)	0.27	1218
Pentium III, 1 GHz (PIII1.0B)	0.26	1285
Pentium III, 1.13 GHz (PIII1.13G)	0.23	1451
Pentium IV, 1.3 GHz (PIV1.3G)	0.21	1610
Intel Xeon/Pentium IV 1.4 GHz (PIV1.4G)	0.20	1691
Intel Xeon/Pentium IV 1.5 GHz (PIV1.5G)	0.18	1871
Intel Xeon 1.6 GHz	0.17	1990

Processor	PII300 Relative Index	iComp 2.0
Intel Xeon/Pentium IV 1.7 GHz (PIV1.7G)	0.16	2116
Pentium IV, 1.8 GHz PIV1.8G)	0.15	2227
Pentium IV, 1.9 GHz (PIV1.9G)	0.14	2312
Pentium IV, 2.0 GHz (PIV2.0G)	0.14	2443
Dual Processors (iCOMP = 1.5 * iCOMP [Single Processor])		

Notes:

- Dual CPU iCOMP values are 1.5 times the single-CPU value. This value has been confirmed by measurement for the 2PIII500.
- You obtain the base relative value by dividing PII300 iCOMP by the desired platform iCOMP. The base relative value for dual processor PIII1.13G = 332 / 2176.5 = 0.15, where 2176.5 is the iCOMP for the dual processor PIII1.13G (1451 * 1.5).

Memory

As a rule of thumb, 256 Mbytes of RAM is adequate for call centers employing less than 600 active agents. Larger call centers require at least 512 Mbytes of RAM.

The following table shows how RAM is allocated between Windows, Sybase, and Symposium Call Center Server:

Component	Memory (Mbytes)
Operating system	48
Sybase	42
Memory available for server (256 Mbytes of RAM)	166
Memory available for server (512 Mbytes of RAM)	422

Note: The following section describes the virtual memory requirements for the server. If excessive paging occurs, and the paging file size is set to the maximum, you must install additional RAM.

Paging file

Microsoft defaults

During installation of Windows 2000 Server or Advanced Server, the minimum paging file (swapfile) size is set to 1.5 * RAM Mbytes. This results in a swapfile of 384 Mbytes for systems with 256 Mbytes of RAM and 768 Mbytes for systems with 512 Mbytes.

The maximum paging file size is set to 2 * RAM. This sets the maximum swapfile size to 512 Mbytes for systems with 256 Mbytes of RAM and 1 Gbyte for systems with 512 Mbytes of RAM.

Notes:

- The maximum swapfile size per volume is 4 Gbytes. If you require more swapfile space, you can distribute it across several volumes. Alternatively, you can create swapfiles in separate folders on the same volume. For more information, see Article number Q237740 in the Microsoft Knowledge Base.
- If physical RAM exceeds 2 Gbytes, the swapfile size is set to 2 Gbytes by default.

To optimize performance, Microsoft recommends setting the minimum and maximum paging file size to be the same.

Symposium Call Center Server requirements

Nortel Networks recommends that the minimum and maximum paging file for the server be set to 1.5 * RAM.

Monitor the pages per second counter in the memory object in the Performance Monitor. If page per second rates exceed 5 for 20 to 30 minutes of normal steady state operation, set the minimum and maximum swapfile to 2 * RAM. If excessive paging still occurs, increase RAM.

Disk space

Symposium Call Center Server requires a SCSI hard drive with a minimum of 8 Gbytes of disk space. (At least 18 Gbytes are required for a system with the Call Detail Reporting or Networking features.) The Windows 2000 operating system uses 150 Mbytes of disk space on the first partition, and Sybase ASE 12 requires 74 Mbytes of disk space on the second partition.

Minimum disk speed is 7200 RPM.

Notes:

- IDE hard drives are not supported for Symposium Call Center Server.
- Maximum size for database partitions is 16 Gbytes. Total database size cannot exceed 64 Gbytes.

The PVI platforms have the following partitioning requirements:

First partition

- Disk partition letter: C:
- Minimum partition size: 2 Gbytes
- Recommended partition size: 4 Gbytes
- File system type: NTFS

Second partition

- Disk partition letter: D:
- Minimum partition size: 2 Gbytes
- Recommended partition size: 4 Gbytes
- File system type: NTFS

First database partition

- Disk partition letter: F:
- Minimum partition size: 4 Gbytes
- Larger partitions are allowed in increments of 1 Gbyte from the minimum.
- File system type: NTFS

Additional database partitions

- Disk partition letters: G:–Z:
- Minimum partition size: 4 Gbytes
- All additional DB partition sizes should be in increments of 1 Gbyte.
- File system type: NTFS

Summary of partition requirements

Drive letter	Minimum size	Recommended size	Maximum size	Notes
A	1.44 Mbytes	1.44 Mbytes	N/A	Floppy drive A
C	2 Gbytes	4 Gbytes	N/A	NTFS partition on disk 0. This must be partitioned as the Primary partition. The Windows 2000 operating system and pcAnywhere are installed here.
D	2 Gbytes	4 Gbytes	N/A	Additional NTFS partition on disk 0 or an NTFS partition on a different disk. This must be partitioned as a Logical drive within an Extended partition, since this partition is not used for booting. Symposium Call Center Server is installed here.
E	N/A	N/A	N/A	CD-ROM drive
F–U	4 Gbytes	Dependent upon capacity requirements	16 Gbytes (16 384 Mbytes)	Drive F and any additional drives are used to store the database. Nortel Networks recommends that they be located on a different physical drive from partitions C and D. At a minimum, there must be an F drive where database information is stored.

Reliability

It is not possible to give specific Mean Time Between Failures (MTBF) for generic hardware platform. Obtain these values from your hardware supplier or manufacturer.

Additional information

For additional information, refer to the *Symposium Call Center Server Platform Vendor Independence Base Configuration Guide*.

What's new

Introduction

The following sections list enhancements to the Symposium Call Center Server Release 4.2.

Windows 2000 Server operating system

Symposium Call Center Server runs on the Windows 2000 Server and Windows 2000 Advanced Server operating systems. The operating system must now be provided by the customer.

Notes:

- Other versions of Windows 2000, such as Windows 2000 Professional and Windows 2000 Datacenter Server, are not supported.
- Symposium Call Center Server requires that Windows 2000 Service Pack 2 be installed on the server.

  Nortel Networks normally supports the currently available service pack. To find out which service packs have been verified for use with Symposium Call Center Server, contact your Nortel Networks customer service representative.

Support for additional platforms

Symposium Call Center Server runs on a Pentium IV platform. It also runs on any High Availability platform that has undergone compatibility testing with Symposium Call Center Server as part of Nortel Networks' Compatibility Test Program. Nortel Networks has completed testing of the Stratus ftServer 3220.

Support for additional switches

- Meridian 1 Internet Enabled
- Succession Communication Server for Enterprise 1000
- Meridian 1 Option 11 Mini

Capacity enhancements

Note: The following limits are contingent upon switch capacity.

- The number of active agents supported increases to 1500 from 1000.

  Note: In a system with more than 600 active agents, 512 Mbytes of RAM is required on the server.
- The number of active supervisors supported increases to 150 from 100 (for the Web Client only).
- The number of IVR ports supported increases to 500 from 96.
- For the M1/CSE 1000, the number of CDNs supported increases to 750 from 240.
- The peak call rate supported increases to 35 000 from 25 000.
- The number of network skillsets supported increases to 100 from 50. (However, total number of skillsets—including network skillsets—is still limited to 350.)

Note: Due to the additional features of Symposium Call Center Server Release 4.x, CPU utilization may be higher in Release 4.2 than it was in Release 3.0.

Symposium Voice Services on CallPilot

Release 4.2 of Symposium Call Center Server includes the optional Symposium Voice Services on CallPilot feature, which allows you to use CallPilot 2.0 as a voice processing system. Symposium Voice Services on CallPilot supports the following script commands:

- Give IVR
- Give Controlled Broadcast Announcement
- Open/End Voice Session
- Play Prompt
- Collect Digits

New version of Sybase

Sybase ASE 12 replaces 11.03.

New version of pcAnywhere

pcAnywhere 10.5 replaces pcAnywhere 9.2.

Support for Crystal Reports 8.5 on the client PC

Reports created in Crystal Reports version 8.5 can be imported into the Symposium Call Center Server Release 4.0 client application, as long as they do not use any Crystal Reports 8.5-specific features.

Support for Windows XP on the client PC

You can install and run the Symposium Call Center Server Client application Release 4.0 on a PC running Windows XP.

Note: Windows XP is supported on Revision 5 and higher of the Client CD.

Skills you need

Introduction

This section describes the skills and knowledge you need to use this guide effectively.

Nortel Networks product knowledge

Knowledge of, or experience with, the following Nortel Networks products is helpful in engineering Symposium Call Center Server:

- Symposium Call Center Server
- Meridian 1 or CSE 1000 switch and associated software
- DMS family of switches or the MSL-100 switch and associated software
- Meridian Mail or CallPilot

PC experience or knowledge

Knowledge of, or experience with, the following PC products and concepts is helpful when administering Symposium Call Center Server:

- client/server architecture
- Microsoft Windows 2000 Server or Windows 2000 Advanced Server
- Microsoft Windows 95, Windows 98, Windows NT Workstation 4.0, Windows 2000 Professional, or Windows XP
- Microsoft TCP/IP

Other experience or knowledge

Other types of experience or knowledge that might be useful include

- networking
- troubleshooting
- queuing theory (voice port calculations)

Related documents

Introduction

This section lists the documents in which you can find additional information related to Symposium Call Center Server.

Symposium Call Center Server installation

The following documents contain procedures for installing the Symposium Call Center Server hardware and software:

If you need information about	Refer to
■ performing the initial hardware installation	*Nortel Networks Symposium Call Center Server Installation and Maintenance Guide* and documentation provided with your hardware platform.
■ installing your server software	*Nortel Networks Symposium Call Center Server Installation and Maintenance Guide*
■ planning the network configuration between the DMS/MSL-100 switch and the WAN	*Nortel Networks Symposium Call Center Server DMS-100 ICM Router Guide* (NTP 297-2233-903) *Nortel Networks Symposium Call Center Server and DMS Switch Guide* or *Nortel Networks Symposium Call Center Server and MSL-100 Switch Guide*
■ installing the Network Control Center	*Nortel Networks Symposium Call Center Server Network Control Center Administrator's Guide*

Symposium Call Center Server setup

The following documents pertain to the setup and configuration of Symposium Call Center Server and the Meridian 1/CSE 1000 or DMS/MSL-100 family of switches:

If you need information about	Refer to
■ configuring the server	*Nortel Networks Symposium Call Center Server Setup Guide* and the *Symposium Call Center Server Administrator's Guide*
■ Meridian 1 or CSE 1000 switch configuration	*Nortel Networks Symposium Call Center Server Symposium, M1/CSE 1000, and Voice Processing Guide*
■ DMS/MSL-100 switch configuration	*Nortel Networks Symposium Call Center Server and DMS Switch Guide* or the *Nortel Networks Symposium Call Center Server and MSL-100 Switch Guide*

DMS/MSL-100 switch documents

The following documents pertain to the administration of the DMS/MSL-100 switch:

If you need information about	Refer to
■ utilities used to manage and monitor the switch	*DMS Utilities Guide*
■ Ethernet Interface Unit (EIU) installation and configuration	*EIU Installation and Configuration Guide*

Symposium Call Center Server administration

The following documents pertain to the administration of Symposium Call Center Server:

If you need information about	Refer to
■ the support and administration of the call center application that runs on client PCs connected to the server	*Nortel Networks Symposium Call Center Server Administrator's Guide*
■ setting up real-time displays ■ managing reports	*Nortel Networks Symposium Call Center Server Supervisor's Guide*
■ accessing the database ■ entity relationship diagram (ERD)	*Nortel Networks Symposium Call Center Server Historical Reporting and Data Dictionary*
■ creating and administering call center scripts	*Nortel Networks Symposium Call Center Server Scripting Guide*
■ support and administration of the network control center	*Nortel Networks Symposium Call Center Server Network Control Center Administrator's Guide*

Chapter 2

Using the CapTool method

In this chapter

Overview

Introduction

This chapter describes how to install the Capacity Assessment Tool (CapTool) application. It also describes how you can use CapTool to engineer a system.

Note: CapTool is available from the Partner Information Center web site.

For detailed information about the property pages, see one of the following chapters:

For	see
Meridian 1 or CSE 1000 systems	Chapter 3, "Meridian 1/CSE 1000 Symposium Call Center Server and NCC requirements."
DMS/MSL-100 systems	Chapter 4, "DMS/MSL-100 Symposium Call Center Server requirements."

Installing CapTool

Before you begin

Requirements

The following table shows the minimum hardware and software that you must have on your computer to install CapTool:

Minimum configuration	Recommended configuration
an Intel-compatible 80486 DX processor	Pentium processor
Microsoft Windows	
16 Mbytes of RAM	32 Mbytes of RAM
25 Mbytes of free disk space	35 Mbytes of free disk space
3.5-inch floppy drive	
a monitor capable of 640 x 480 display	

To obtain the CapTool application

The CapTool application is available from the Nortel Networks and Partner Information Center web sites. Download the application from the Web, and extract it into a temporary folder.

To uninstall previous versions of CapTool

Before installing a new version of CapTool, follow these steps to uninstall the previous version.

1. From the Windows Start menu, choose Settings → Control Panel.
2. Double-click Add/Remove Programs.
3. Select Capacity Tool, and then click Add/Remove.

   Result: The program prompts you to confirm that you want to remove the selected application.

4 Click OK.

Result: The InstallShield Wizard deletes CapTool, and then displays the Maintenance Complete page.

5 Click Finish.

6 Click Cancel to exit from the Add/Remove Programs property sheet.

To install CapTool

Obtain the CapTool application from the Partner Information Center web site. (The application is distributed as a zip file.) Extract the contents into a temporary folder on your PC. Then continue with this procedure:

1 From the Windows Start menu, choose Run.

2 Click Browse and navigate to the Disk 1 folder in the location where you extracted the CapTool application files.

3 Select Setup.exe, and then click Open.

4 Click OK to start the Setup Wizard.

5 Click Next.

6 If you want to change the installation directory, click Browse and select a different directory.

7 Click Next.

8 If desired, type a new name in the Program Folder box.

9 Click Next to complete the installation.

Result: The installation program installs the files and adds a folder for the CapTool application to the Programs folder on your Start menu. When the installation is complete, it displays the message `Setup is complete.`

10 Click OK.

11 Click Finish to close the Setup Wizard.

Understanding the CapTool application

Purpose of CapTool

The Capacity Assessment Tool (CapTool) helps you to plan for a new Symposium Call Center Server system, or to determine how proposed changes will affect an existing system. You can use CapTool to determine

- the hardware requirements of the server
- the data bandwidth requirements of the server
- the number of voice ports required by the server

CapTool can determine capacity requirements for either a Release 4.0 or Release 4.2 system.

Note: CapTool does not specify capacity requirements for the switch. For such information, refer to the documentation that accompanies your switch.

Hardware requirements

CapTool selects the required hardware configuration (a combination of CPU, memory, and disk space) from a list of available hardware configurations.

Bandwidth

The data communication bandwidth consists of the average required bandwidth for a CLAN, ELAN, and WAN.

The results of the CapTool analysis describe the requirements of Symposium Call Center Server *only*. You must adjust your configuration to accommodate anything else that your CLAN is used for beyond Symposium Call Center Server.

Voice ports

The voice ports used by Symposium Call Center Server must be dedicated to the Symposium Call Center Server application. Symposium Call Center Server cannot share resources with other applications such as Meridian MAX.

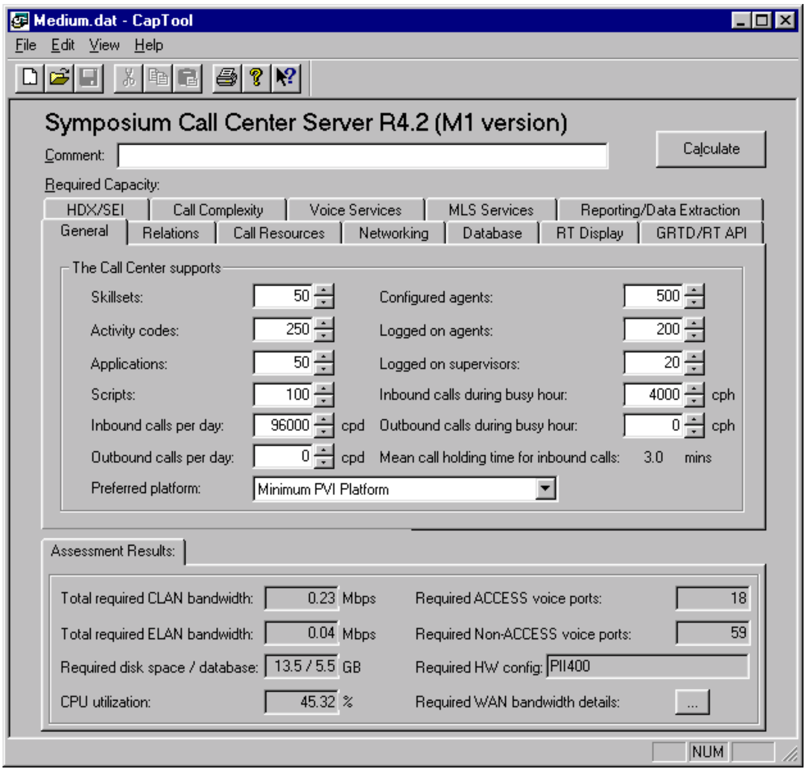
You can use CapTool to determine the number of voice ports required for Give IVR, Collect Digits, and Give Controlled Broadcast sessions.

Viewing CapTool windows

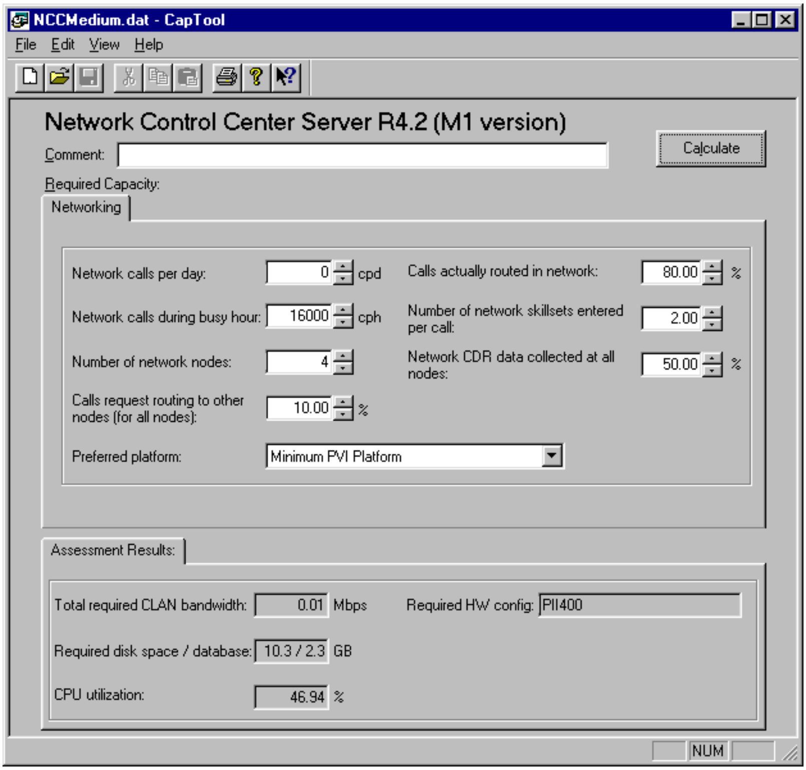
Introduction

This section describes the three sections of the main window of CapTool—the Comment area, the Property Pages area, and the Assessment Results area. The following illustrations show the CapTool main screens:

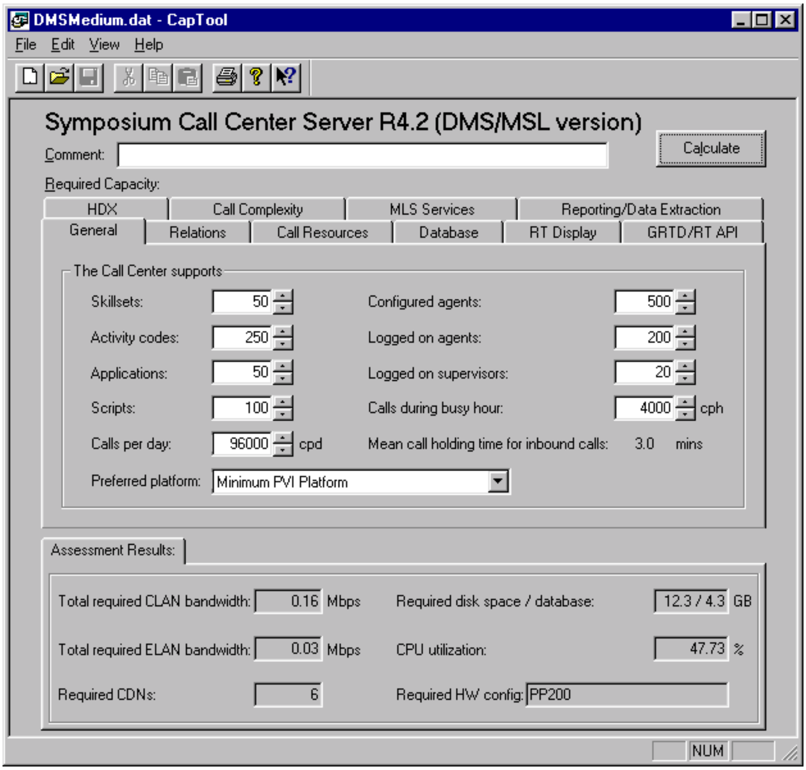
CapTool main window for the Meridian 1/CSE 1000 switch



CapTool main window for the NCC

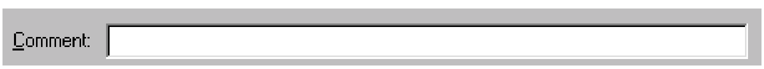


CapTool main window for a DMS/MSL-100 switch



Previewing CapTool's comment area

The top section of the CapTool window—the Comment area—contains a single-line text entry field in which you can enter a brief description (up to 60 characters) of the currently open file.



Previewing CapTool's property pages area

The middle section of the CapTool window is the property pages area. Each tab represents a property page. On each of the following property pages, you enter values into the fields:

- General
- Relations
- Call Resources
- Networking (Meridian 1/CSE 1000 only)
- Database
- RT (Real-time) Display
- GRTD/RT (Real-time) API
- HDX/SEI (Symposium Event Interface)
- Call Complexity
- Voice Services (Meridian 1/CSE 1000 only)
- MLS Services
- Reporting/Data Extraction

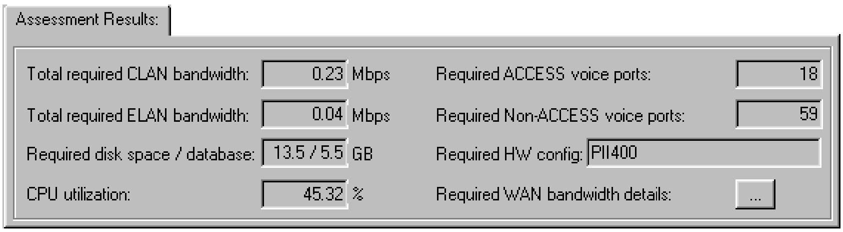
For a detailed description of these pages and the fields that they contain, see one of the following chapters:

For	see
Meridian 1 or CSE 1000 systems	Chapter 3, "Meridian 1/CSE 1000 Symposium Call Center Server and NCC requirements."
DMS/MSL-100 systems	Chapter 4, "DMS/MSL-100 Symposium Call Center Server requirements."

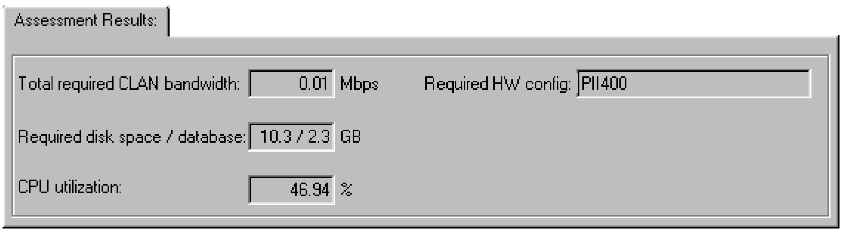
Previewing CapTool's Assessment Results area

The bottom section of the CapTool window is the Assessment Results area. This area contains the results of the Capacity Assessment. For a detailed description of the fields contained in this area, see "Viewing assessment results" on page 56.

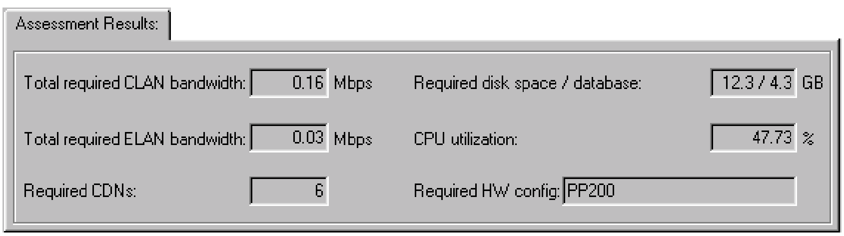
Meridian 1/CSE 1000 Assessment Results



Network Control Center Assessment Results



DMS/MSL-100 Assessment Results



Working with CapTool files

Introduction

You can open an existing Capacity Assessment file, create a new Capacity Assessment file, save your changes to a Capacity Assessment file, or print a Capacity Assessment file.

To open a file

When you open CapTool for the first time, the default Capacity Assessment file opens. You can work with this file, or you can open an existing one.

To open an existing Capacity Assessment file, choose File → Open.

To create a new file

1. From the View menu, choose the type of system you want to engineer (M1 server, DMS/MSL-100 server, or NCC).
2. From the View menu, choose the release of the server that you are engineering (Release 4.0 or Release 4.2).
3. From the File menu, select New.
4. From the submenu, select a workload scenario (Entry, Small, Medium, Large, or UpperEnd).

   Note: For a detailed description of workload scenario properties, see “Workload types” on page 333.
5. If prompted, click Yes to save changes to the file that is currently open, or No to close the file without saving changes.

   Result: A new file opens using the default settings for the workload selected in step 4.
6. Choose File → Save As.
7. Type a file name in the File Name box.
8. Click Save.

To save a file

To save the Capacity Assessment file that you are currently working on, choose File → Save.

To preview a file

To preview the page layout of the report before you print it, choose File → Print Preview.

To print a file

To print the Capacity Assessment file that you are currently working on, choose File → Print.

Performing a capacity assessment

Introduction

Follow this procedure for each server in Symposium Call Center Server and Network Control Center server that you want to engineer.

To perform a capacity assessment

1 Start the application from the Start menu by choosing Programs → Capacity Tool → Capacity Tool.

Result: The most recently used Capacity Assessment file opens.

2 If you want to use a different Capacity Assessment file, open or create it now (see “To open a file” on page 52, or “To create a new file” on page 52).

3 Enter values in the fields in the property pages. (For more information, see “Entering values in property pages,” below.)

4 Click Calculate.

Result: The program updates the Assessment Results area.

5 Save or print the results of the Capacity Assessment (see “To save a file” on page 53, or “To print a file” on page 53).

6 Choose File → Exit.

Entering values in property pages

Remember these points when entering field values:

- To display a property page, click the tab.
- Click the small triangle arrows (“thumb wheels”) beside fields to increase or decrease the values by one. Alternatively, highlight the existing value and enter a new value.
- When you click Calculate, CapTool analyzes the properties and then displays the results in the Assessment Results area at the bottom of the window.

- If you enter a value that exceeds the limit for a field, a system message appears and tells you the range of values you can enter.
- You can toggle quickly between different scenarios by selecting a recently used file from the File menu.
- The default values for the property pages are determined by the workload that you selected in step 4 on page 52. For a list of these values, see “Workload types” on page 333.

Viewing assessment results

Introduction

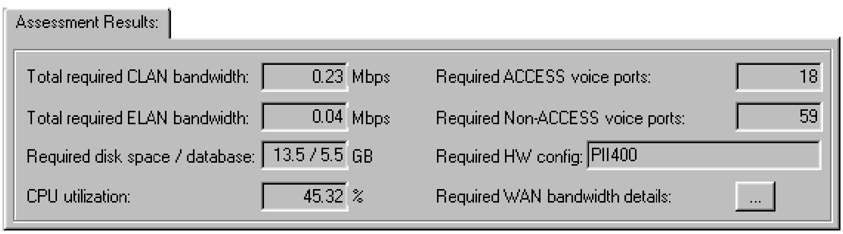
The Assessment Results area of the CapTool main screen displays the results of the capacity analysis, based on all of the values you entered into property pages. This analysis assesses values entered against LAN bandwidth, performance requirements, and computer resources.

If any parameter value exceeds limits so that an analysis cannot be completed, then a system message appears. This message shows the parameter that must be adjusted so that the analysis can be completed. Whenever this message appears, you must reenter the new value for the parameter and click Calculate again.

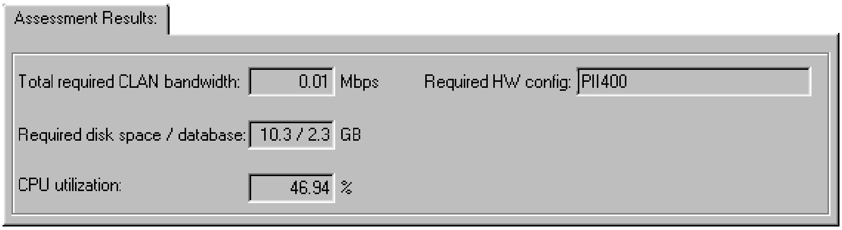
Assessment Results for a medium workload

The following illustration shows the Assessment Results area based on an analysis from a medium-sized call center. For information on each field, see “Description of Assessment Results fields” on page 57.

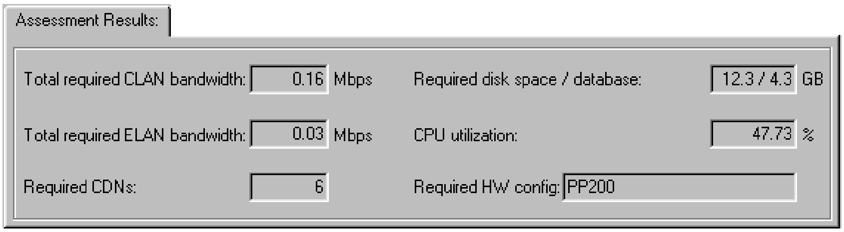
Assessment Results fields for Meridian 1/CSE 1000 analysis



Assessment Results area for NCC analysis



Assessment Results area for DMS/MSL-100 analysis



Description of Assessment Results fields

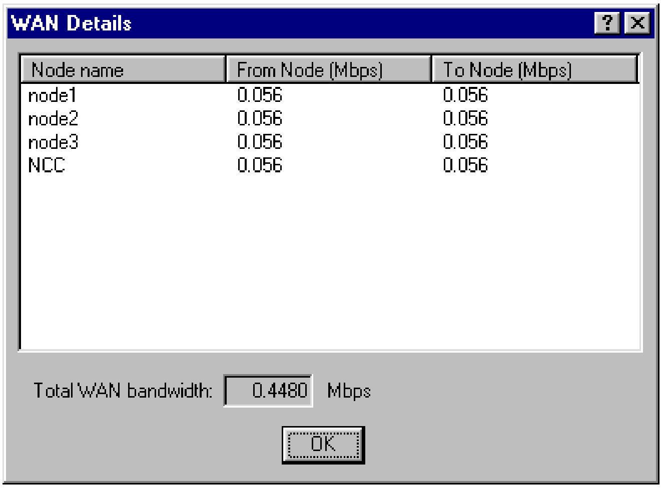
The following table provides descriptions for each field in the Assessment Results area. Values that appear in this area cannot be adjusted:

Field	Description
Total required CLAN bandwidth (Mbps)	The total required bandwidth (expressed in megabits per second) of the CLAN section connected to the server in Symposium Call Center Server. **Note**: The results of the Capacity Assessment Tool analysis describe the requirements of Symposium Call Center Server *only*. You must adjust your configuration to accommodate anything else that your CLAN is used for beyond Symposium Call Center Server.
Total required ELAN bandwidth (Mbps)	The total required bandwidth (expressed in megabits per second) of the Embedded LAN section connected to the server in Symposium Call Center Server.

Field	Description
Required disk space / database (Gbytes)	The disk space, expressed in Gbytes, required on the server to adequately handle all data communication requirements. The total disk space is followed by a forward slash (/) and the amount of disk space required by the database. **Note:** For PVI platforms, total disk space includes the recommended 4 Gbytes for drive C and 4 Gbytes for drive D.
CPU utilization (%)	The percentage of CPU usage required to process system data communication requirements. **Note:** This should be less than or equal to 50 percent.
Required ACCESS voice ports	(Meridian 1/CSE 1000 only) The number of Meridian Mail voice ports required to be handled directly by the server using the ACCESS link.
Required Non-ACCESS voice ports	(Meridian 1/CSE 1000 only) The number of Meridian Mail voice ports required to be handled by the server without using the ACCESS link.
Required CDNs	(DMS/MSL-100 only) The number of controlled directory numbers required by the system.
Required HW config	The minimum hardware configuration required to effectively process system data communication requirements.
Required WAN bandwidth details	(Meridian 1/CSE 1000 only) Click this button to open the WAN details window. See the following section for more information.

Calculating WAN bandwidth required (Meridian 1/CSE 1000)

To calculate the required WAN bandwidth, click Required WAN bandwidth details. The WAN details window opens. Since network call processing and NCC traffic are routed over the CLAN rather than the ELAN, only the CLAN to CLAN WAN details are shown.



The WAN Details dialog box displays CLAN capacities and total WAN bandwidth for the NCC server in Mbps. This is the NCC bandwidth requirement.

Chapter 3

Meridian 1/CSE 1000 Symposium Call Center Server and NCC requirements

In this chapter

Overview

Introduction

This chapter describes the fields displayed on the property pages for

- a server in Symposium Call Center Server connected to a Meridian 1 or CSE 1000 switch
- an NCC server

Parameter

The Parameter column in the tables starting on page 67 indicates the corresponding parameter used in the formula method (see Chapter 5, “Using the formula method”).

Example

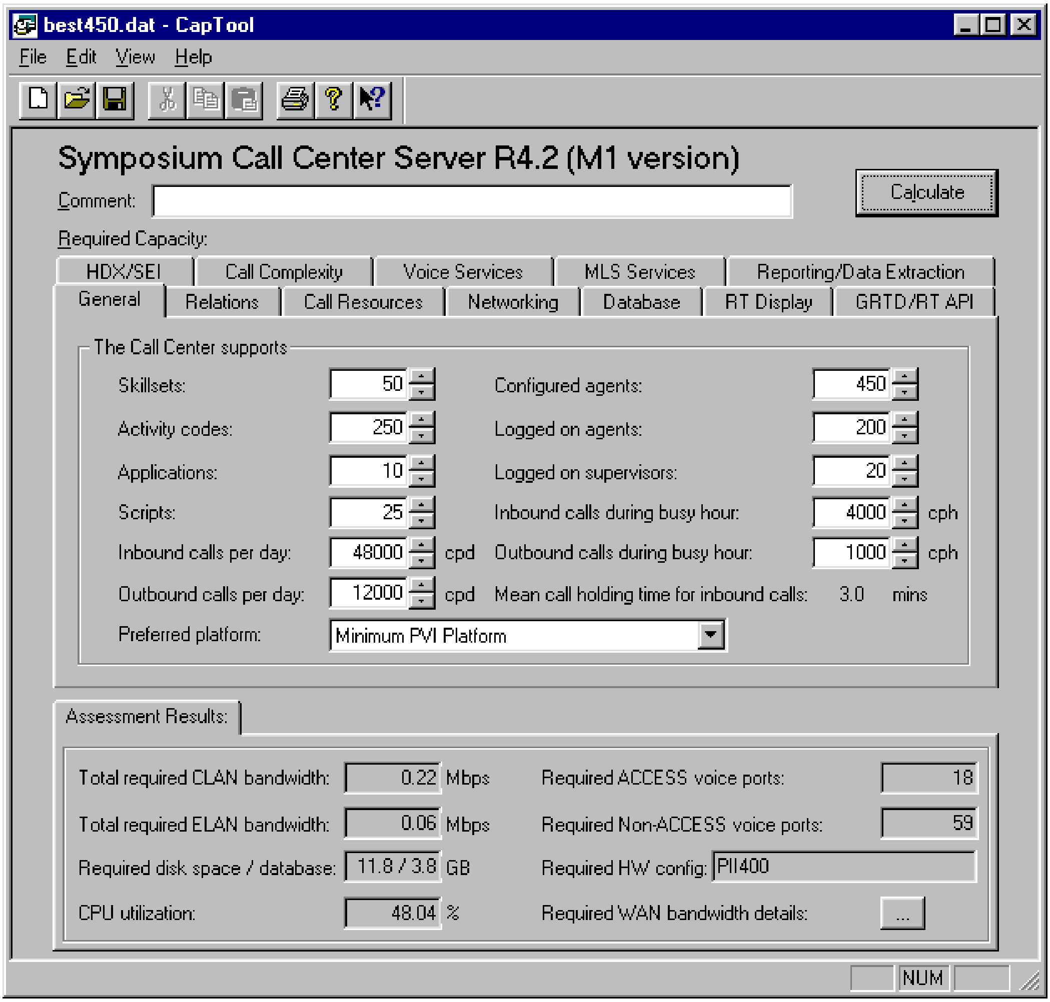
BestAir seat sale

Every July, BestAir Airline has a seat sale on certain flights. In the past, this event has dramatically increased the number of calls coming in to the call center. This year, the call rate is anticipated to increase from 4000 to 6000. To handle the increased call load, BestAir plans to hire an additional 100 agents—increasing the number of configured agents from 450 to 550.

The administrator of the call center can use the Capacity Assessment Tool to determine how these changes will affect the requirements of the call center system, and whether BestAir must upgrade its platform to handle the extra call traffic.

The following illustration shows the requirements of the BestAir call center with the original 450 agents:

Original call center configured for 450 agents



New call center configuration

The system administrator enters the proposed changes. This example increases

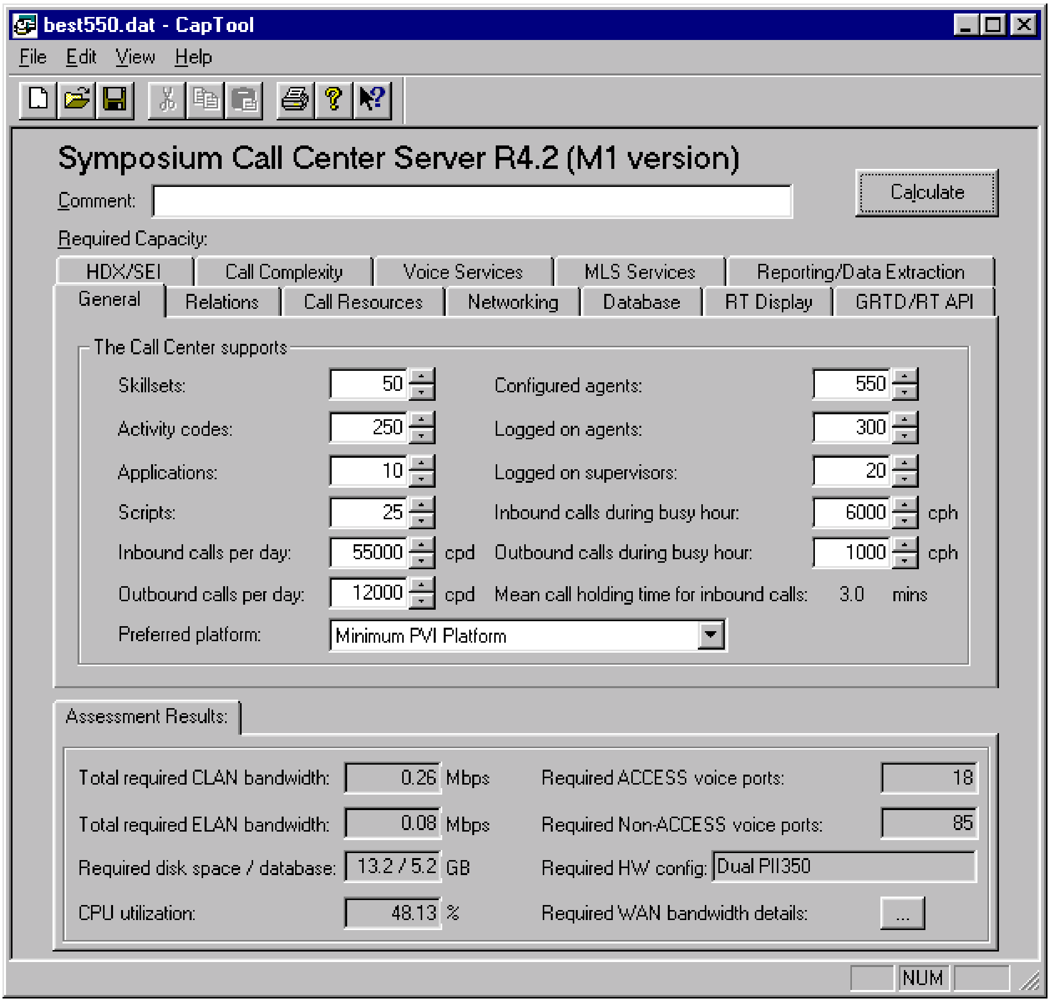
- the number of calls per hour and per day
- the total number of agents

- the number of agents logged on

  To keep mean call holding time unchanged at 3 minutes, an additional 100 agents must be logged on.
- the number of supervisors logged on

The following illustration shows the requirements of the BestAir call center after these changes are made:

New Call Center configured with an extra 100 agents



The Capacity Assessment Tool calculates the impact of the changes and shows them in the Assessment Results area in the lower part of each screen. Notice that the Assessment Results area shows an increase in

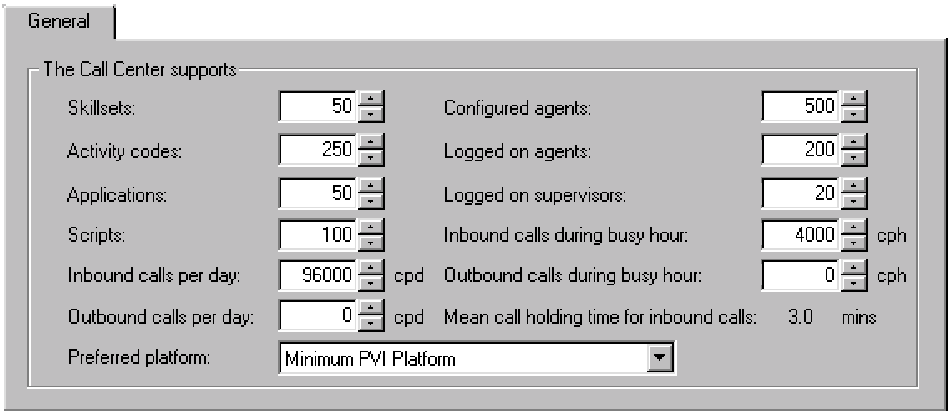
- ELAN and CLAN bandwidth requirements
- hard disk space requirements
- CPU utilization
- number of non-ACCESS voice ports required

To support the increased requirements, a hardware platform upgrade is required.

General

Introduction

The General property page allows you to enter information about your call center size and workload. The following illustration shows the General property page for the Meridian 1 or CSE 1000 switch:



General page field descriptions

Field	Valid range	Description	Parameter
Skillsets	1–350	The number of skillsets defined.	nSkillsets
Activity codes	0–5000	The number of activity codes defined.	nActCodes
Applications	5–500	The number of primary scripts (applications) defined.	nApplications
Scripts	1–1500	The number of scripts defined.	nScripts
Inbound calls per day (cpd)	0–840 000 (Rel. 4.2) 0–600 000 (Rel. 4.0)	The expected average number of inbound calls per day.	24 * DailyCallRate

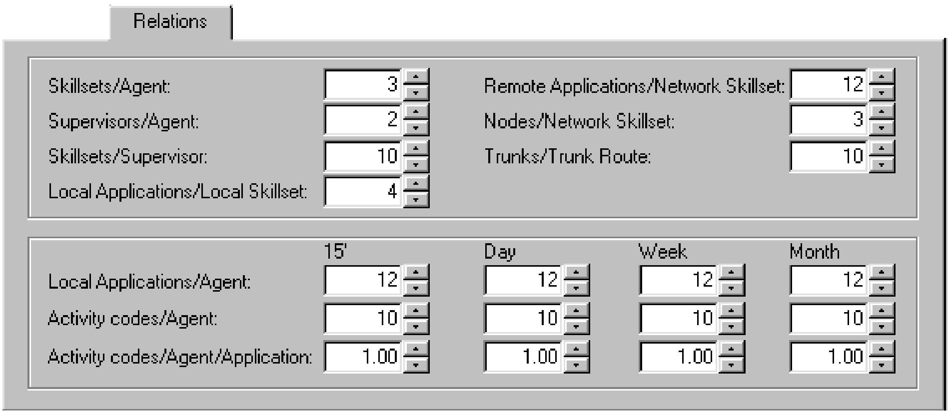
Field	Valid range	Description	Parameter
Outbound calls per day (cpd)	0–600 000	The expected average number of outbound calls per day.	24 * DailyOutCallRate
Configured agents	1–3000	The total number of agents defined.	nTAgents
Logged on agents	0–1500 (dual CPU) 1–600 (other platforms)	The maximum number of agents logged on at any one time.	nAgents
Logged on supervisors	0–150	The number of supervisors logged on using either the Symposium Call Center Server Client application (Fat client) or the Symposium Call Center Web client.	nSupervisors
Inbound calls during busy hour (cph)	0–35 000	The expected average number of inbound calls originating locally during a busy hour.	PeakCallRate
Outbound calls during busy hour (cph)	0–25 000	The expected average number of outbound calls during a busy hour.	PeakOutCallRate
Mean call holding time for inbound calls	Read-only	The average time in minutes taken to process a call.	60 * Average(nAgents)/ PeakCallRate

Field	Valid range	Description	Parameter
Preferred platform		The hardware platform to be used. The platforms available depend on the release of Symposium Call Center Server. If you select Minimum PVI platform, CapTool uses the minimum platform that provides the required capacity. If you select Platform Vendor Independence, a dialog box opens to allow you to identify the platform. If you select High Availability Platforms, you are prompted to select a hardware RAID configuration (ftServer 3220 H/W RAID) or a software RAID configuration (ftServer 3220 HASM).	

Relations

Introduction

The Relations property page allows you to input values relating to relationships, such as skillsets per agent and trunks per trunk route. The following illustration shows the Relations property page for the Meridian 1 or CSE 1000 switch:



Relations field descriptions

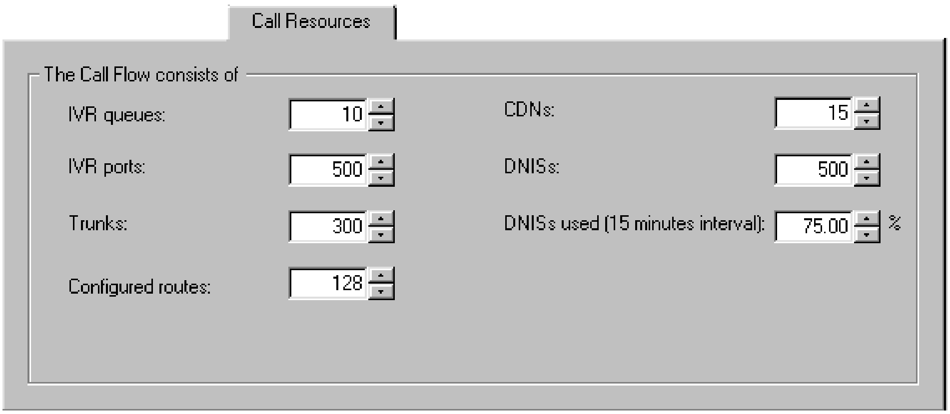
Field	Valid range	Description	Parameter
Skillsets/Agent	1–50 Default 3	The average number of skillsets served by an agent.	aSkill_Agent
Supervisors/ Agent	1–6	The average number of supervisors to which an agent reports.	aSup_Agent
Skillsets/ Supervisor	1–350	The average number of skillsets served by the supervisor’s agents.	aSkill_Supv
Local Applications/ Local Skillset	1–500	The average number of local applications per local skillset.	aAppl_Skill

Field	Valid range	Description	Parameter
Remote Applications/ Network Skillset	1–500	The average number of remote applications per network skillset per node.	aAppl_NetSkill
Nodes/Network Skillset	1–30	The average number of nodes per network skillset.	aNodes_NetSkill
Trunks/Trunk Route	1–60	The average number of trunks per trunk route.	aTrunk_Routes
Local Applications/ Agent in 15', Day, Week, Month	0–500	The average number of unique local applications handled by each agent for the specified period: interval (15 minutes), day, week, month.	aApplAgent Intv/ Day/Week/ Month
Activity codes/ Agent in 15', Day, Week, Month	0–5000	The average number of (non-unique) activity codes entered per agent for the specified period: interval (15 minutes), day, week, month.	aActCode_Agent Intv/Day/Week/ Month
Activity codes/ Agent/ Application in 15', Day, Week, Month	0–5000	The average number of unique activity codes entered per agent per local application for the specified period: interval (15 minutes), day, week, month.	aActCode_Agent _Appl Intv/Day/Week/ Month

Call Resources

Introduction

The Call Resources property page allows you to enter information about usage of switch resources. The following illustration shows the Call Resources property page for the Meridian 1 or CSE 1000 switch:



Call Resources field descriptions

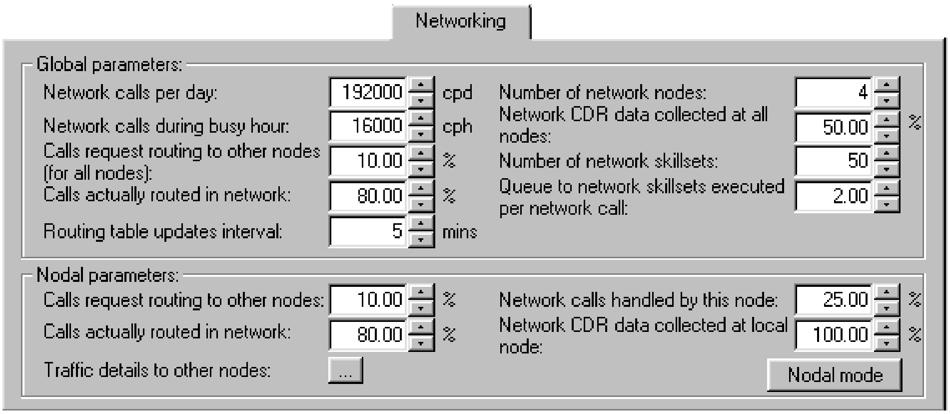
Field	Valid range	Description	Parameter
IVR queues	1–150	The number of Interactive Voice Response (IVR) queues configured.	nIVRQ
IVR ports	1–500	The number of IVR ports configured.	nIVRPorts
Trunks	1–3000	The number of trunks in the system.	nTrunks
Configured routes	1–513	The number of routes in the system.	nRoutes

Field	Valid range	Description	Parameter
CDNs	1–750 (Rel. 4.2) 1–240 (Rel. 4.0)	The number of Controlled Directory Numbers (CDNs) in the system.	nCDN
DNISs	1–10 000	The number of Dialed Number Identification Services (DNISs) defined in the system.	nDNIS
DNISs used	0–100	The percentage of Dialed Number Identification Services (DNISs) used during a single (15-minute) data collection interval.	nDNISInterval

Networking (Symposium Call Center Server)

Introduction

The Networking property page allows you to input values relating to global and nodal networking parameters. This page also contains a button that allows you to enter information about traffic to other nodes. The following illustration shows the Networking property page:



Networking field descriptions

Field	Valid range	Description	Parameters
Global parameters			
Network calls per day (cpd)	0–9 000 000	The average number of calls entering the network during a day.	24 * DailyNetwork CallRate
Network calls during busy hour (cph)	0–750 000	The average number of calls entering the network during a busy hour.	PeakNetwork CallRate

Field	Valid range	Description	Parameters
Calls request routing to other nodes (for all nodes)%	0–100 Default 10	The percentage of calls originating at all nodes in the network that are queued to a network skillset.	pNetOutNetw
Calls actually routed in network (%)	0–100 Default 80	The percentage of calls queued to network skillsets at all nodes that are actually routed to another node in the network.	pActual NetworkingNetw
Routing table updates interval (mins)	1–9999 Default 5	The frequency, in minutes, of routing table updates.	NCC_Period_ Min
Number of network nodes	1–30	The number of nodes in the Symposium Call Center Server network, including the local node.	nNetNodes
Network CDR data collected at all nodes (%)	0–100	The percentage of network Call Detail Reporting (CDR) data that is collected at all nodes in the network.	pCBCNetwork
Number of network skillsets	0–100	The number of network skillsets that route a call to another Symposium Call Center Server site.	nNetSkillsets
Queue to network skillsets executed per network call	0–10 Default 2	The average number of skillset queues entered by a network call over the entire network.	aQTNSPerNetw Call
Nodal parameters			
Calls request routing to other nodes (%)	0–100 Default 10	The percentage of calls originating at the local node that are queued to a network skillset.	pNetOut

Field	Valid range	Description	Parameters
Calls actually routed in network (%)	0–100 Default 80	The percentage of calls queued to network skillsets at the local node that are actually routed to another node in the network.	pActual Networking
Network calls handled by this node (%)	0–100	The percentage of incoming network calls that are presented to agents on the local node.	pNetIn
Network CDR data collected at local node (%)	0–100 Default 100	The percentage of network Call Detail Reporting (CDR) data that is collected at the local node.	pCBCNetwork Node
Traffic details to other nodes ...		Click this button to identify the traffic patterns in the network (see "Entering traffic details" on page 77).	
Nodal Mode/ Network Mode		Click this button to change from nodal to network mode and back (see the following section). **Note:** The button label displays either Nodal mode or Network mode, based on which statistics currently appear.	

Changing the networking mode

By default, capacity assessments are in nodal mode—that is, they assume a single-node network.

If you are engineering a multi-node network, you can change from nodal mode to network mode by clicking Network Mode. All fields take the default values for a networking configuration.

If you are engineering a single-node network, you can change to nodal mode by clicking Nodal Mode. All networking parameters are set to zero (0).

Entering traffic details

To calculate networking capacity requirements on the server, you must specify how much data travels between that server and the other nodes in the network. For each node in the network, you must specify

- the percentage of network traffic generated by the server that goes to that node

  For example, Bestair’s administrator is calculating performing a capacity assessment for the Toronto server. The administrator estimates that 25 percent of all traffic generated by the Toronto server goes to Chicago, 25 percent goes to Boston, and 50 percent goes to New York.

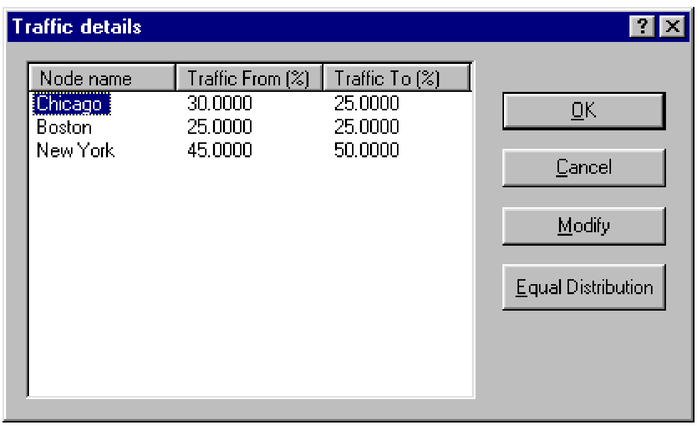
- the percentage of network traffic terminating at the server that is generated by that node

  In the example, 30 percent of all traffic terminating at the Toronto server originates in Chicago, 25 percent originates in Boston, and 45 percent originates in New York.

To change traffic details

1 Click Traffic details to other nodes.

Result: The Traffic details window appears.



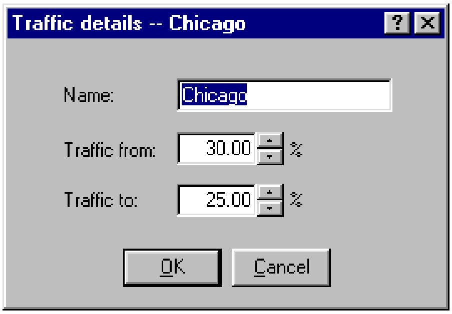
2 To distribute all traffic equally, click Equal Distribution. For example, if there are three other nodes in the network, click Equal Distribution to set the Traffic From and Traffic To for each node to 33.33 percent.

3 To specify traffic for an individual node, follow these steps:

a. Select the node you want to configure.

b. Click Modify to adjust traffic values for that node.

Result: The traffic details for that node appear.



c. Make the desired changes, and then click OK. (For a description of the field, see the following section.)

d. Repeat steps a to c to for each node you want to change.

Note: Both the “to” traffic and the “from” traffic must add up to 100 percent over all of the nodes. If they do not, a warning message appears when you click the Calculate button.

e. Click OK to exit from the Traffic details window.

Traffic details field descriptions

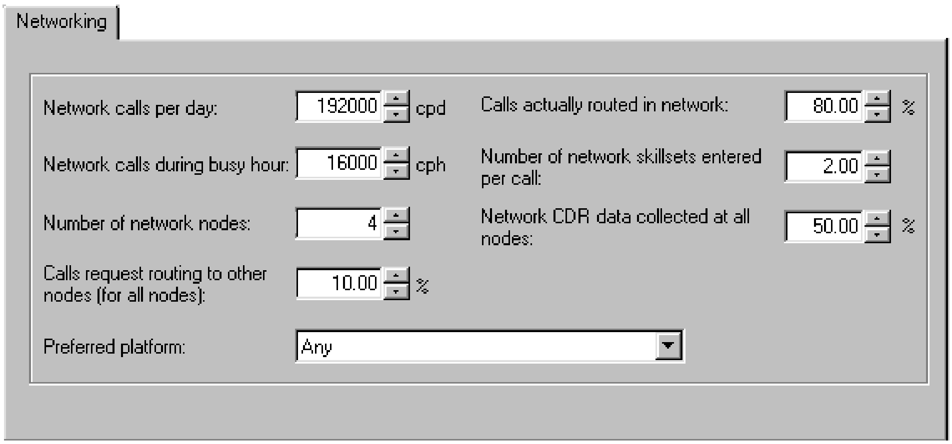
Field	Valid range	Description	Parameters
Name	Text	The name of the node.	
Traffic from (%)	0–100 Default 20	The percentage of networked calls originating at this node that are sent to the local node. **Note**: The total for all nodes must be approximately 100 percent.	pNetInOther Node

Field	Valid range	Description	Parameters
Traffic to (%)	0–100 Default 20	The percentage of networked calls originating at the local node that are sent to this node. **Note**: The total for all nodes must be approximately 100 percent.	pNetOutOther Node
Equal Distribution		Click this button to distribute traffic equally between all the nodes. (For example, if you have four nodes, each node will have 25 percent of the inbound and outbound traffic).	

Networking (NCC)

Introduction

The Networking property page for the NCC allows you to input networking parameters for all nodes on the network that the NCC server controls. The following illustration shows the Networking property page for the NCC server:



NCC Networking field descriptions

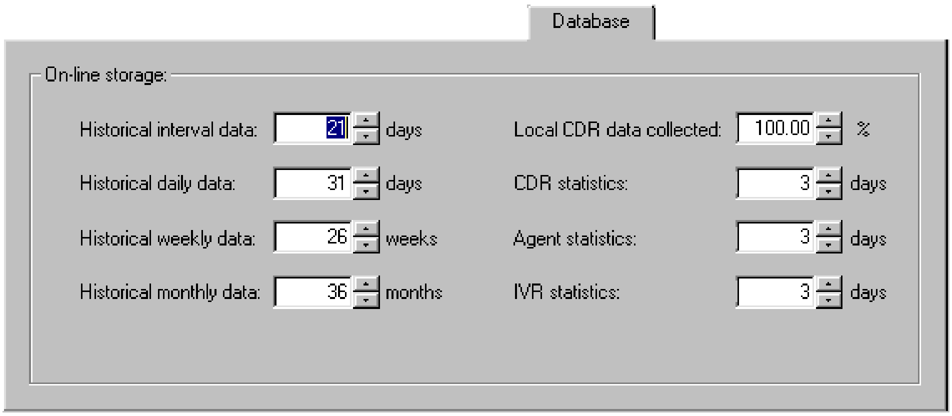
Field	Valid range	Description	Parameters
Network calls per day (cpd)	0–9 000 000 Default 24 000	The average number of calls entering the network during a day.	DailyNetwork CallRate
Network calls during busy hour (cph)	0–750 000 Default 24 000	The average number of calls entering the network during a busy hour.	PeakNetwork CallRate
Number of network nodes	1–30 Default 6	The number of network nodes including the local node in the Symposium Call Center Server network.	nNetNodes

Field	Valid range	Description	Parameters
Calls request routing to other nodes (for all nodes)%	0–100 Default 10	The percentage of calls originating at all nodes in the network that are queued to a network skillset.	pNetOutNetw
Calls actually routed in network (%)	0–100 Default 80	The percentage of calls queued to network skillsets within the network that are actually routed to another node in the network.	pActual NetworkingNetw
Number of network skillsets entered per call	0–100 (Rel. 4.2) 0–50 (Rel. 4.0) Default 50	The number of network skillsets that route a call to another Symposium Call Center Server site.	aQTNSPerNetw Call
Network CDR data collected at all nodes (%)	0–100 Default 100	The percentage of network Call Detail Reporting (CDR) data that is collected at all nodes in the network.	pCBCNetwork
Preferred platform	Default Any	The platform chosen by the user to be the NCC server.	

Database

Introduction

The Database property page allows you to input values used in calculating database storage requirements. The following illustration shows the Database property page for the Meridian 1 or CSE 1000 switch:



Database field descriptions

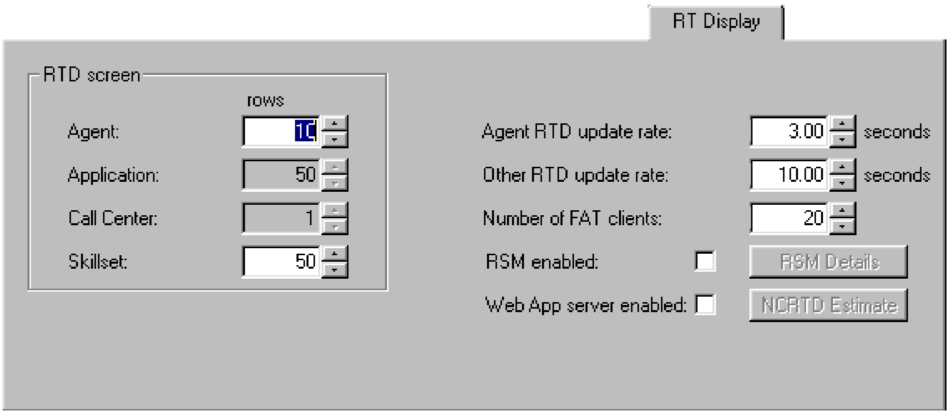
Field	Valid range	Description	Parameter
Historical interval data (days)	1–999 Default 21	The number of days that historical interval statistics are stored.	nDInterval
Historical daily data (days)	1–999 Default 31	The number of days that historical daily statistics are stored.	nDDay
Historical weekly data (weeks)	1–999 Default 26	The number of weeks that historical weekly statistics are stored.	nWWeek

Field	Valid range	Description	Parameter
Historical monthly data (months)	1–999 Default 36	The number of months that historical monthly statistics are stored.	nMMonth
Local CDR data collected (%)	0–100 Default 100	The percentage of Call Detail Reporting (CDR) data, also known as call-by-call data, that is collected at the local node.	pCBCNode
CDR statistics (days)	0–999 Default 3	The number of days that the call-by-call statistics are stored. A value of zero indicates that data is not collected.	nDCallByCall
Agent statistics (days)	1–999 Default 3	The number of days that agent event statistics are stored.	nDAgentStat
IVR statistics (days)	1–999 Default 3	The number of days that Interactive Voice Response (IVR) event statistics are stored.	nDIVRStat

RT Display

Introduction

The RT Display property page allows you to define resource requirements for real-time (RT) display screens. The following illustration shows the RT Display property page for the Meridian 1 or CSE 1000 switch:



Real-time Display field descriptions

Field	Valid range	Description	Parameter
Agent	0–3000	The number of rows displayed on each agent Real-time Display (RTD) screen. When you create a new capacity file, this field takes the value for Logged on agents for the selected workload.	nRTDAgRows
Application	View only	The number of rows displayed on each application Real-time Display (RTD) screen. This field contains the value specified in the Applications field on the General property page.	nRTDAppRows

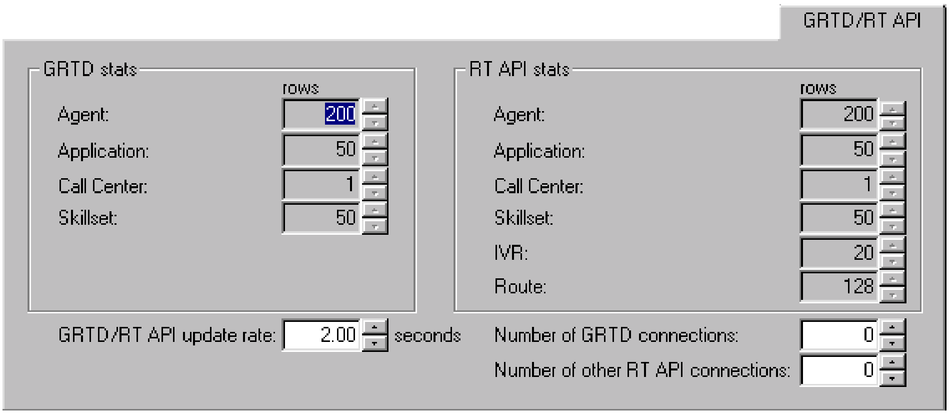
Field	Valid range	Description	Parameter
Call Center	View only	The number of rows displayed on the Call Center Summary RTD screen. This field is always set to 1.	nRTDCCRows
Skillset	0–350	The number of rows displayed on each skillset RTD screen. When you create a new capacity file, this field takes the value for Skillsets for the selected workload.	nRTDSkillRows
Agent RTD update rate (secs)	0.5–99 Default 3	The update rate of agent RTD screens.	AgScrUpdate Intvl
Other RTD update rate (secs)	2–99 Default 10	The update rate of other RTD screens (that is, other than agent).	RTDScrUpdate Intvl
Number of FAT clients	0–100	The average number of PCs running the Symposium Call Center Server Client application that are connected to the server.	nFATClients
RSM enabled	Default: Unchecked (No) (Rel. 4.2) Checked (Yes) (Rel. 4.0)	Check this box to generate real-time statistics. This option is checked by default.	
RSM Details	Button	Click this button to choose the real-time statistics on which you want to collect information.	

Field	Valid range	Description	Parameter
Web App Server Enabled	Default: Unchecked (No)	Check this box if the Application Server will be used to transmit real-time statistics to Web Clients on the system. **Note:** If you select this option, you must also select RSM enabled.	
NCRTD Estimate	Button	Click this button to specify the amount of network consolidated real-time display data that is transmitted across the WAN. **Note:** This option is applicable only if you are using the Web Client and are in networking mode.	

GRTD/RT API

Introduction

The GRTD/RT API property page allows you to define resource requirements for graphical real-time display (GRTD) and the real-time (RT) application program interface (API). The following illustration shows the GRTD/RT API property page for the Meridian 1 or CSE 1000 switch:



GRTD/Real-time API field descriptions

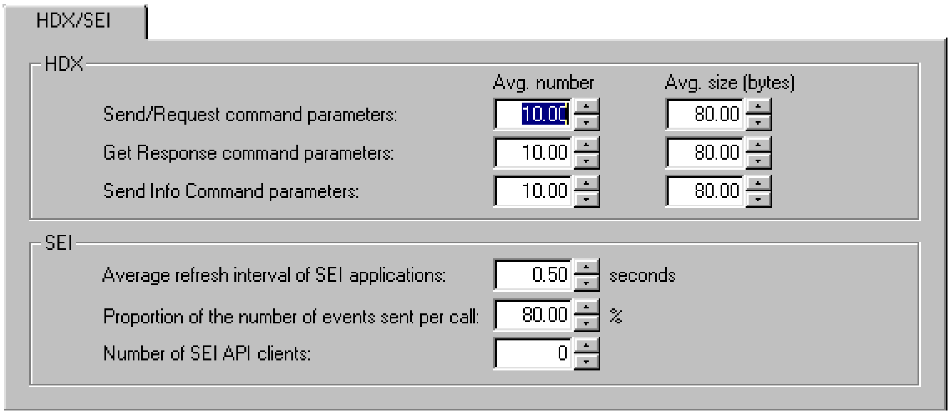
Field	Valid range	Description	Parameters
Agent (rows of GRTD/RT API stats)	View only	The number of rows in GRTD and RT API Agent statistics. This field contains the value specified in the Logged on agents field on the General property page.	nGRTDAgRows/ nRTIAgRows
Application (rows of GRTD/RT API stats)	View only	The number of rows in GRTD and RT API Application statistics. This field contains the value specified in the Applications field on the General property page.	nGRTDApp Rows/ nRTIAppRows

Field	Valid range	Description	Parameters
Call Center (rows of GRTD/RT API stats)	View only	The number of rows in GRTD and RT API Nodal statistics. This value is always set to 1.	nGRTDCCRows/ nRTICCRows
Skillset (rows of GRTD/RT API stats)	View only	The number of rows in GRTD and RT API Skillset statistics. This field contains the value specified in the Skillsets field on the General property page.	nGRTDSkill Rows/ nRTISkillRows
IVR (rows of RT API stats)	View only	The number of rows in RT API Interactive Voice Response (IVR) statistics. This field contains the value specified in the IVR queues field on the Call Resources property page.	nRTIIVRRows
Route (rows of RT API stats)	View only	The number of rows in RT API Route statistics. This field contains the value specified in the Configured routes field on the Call Resources property page.	nRTIRouteRows
GRTD/RT API update rate (secs)	2–99 Default 2	The average update (refresh) interval, in seconds, of RT API applications.	RTIUpdateIntvl
Number of GRTD connections	0–100 Default 0	The number of GRTD connections to the system.	nGRTDClients
Number of other RT API connections	0–100 Default 0	The number of RT API clients expected to be connected to the system.	nRTIClients

HDX/SEI

Introduction

The HDX/SEI property page allows you to define resource requirements for the Host Data Exchange (HDX) and Symposium Event Interface (SEI) interfaces. The following illustration shows the HDX/SEI property page for the Meridian 1 or CSE 1000 switch:



HDX/SEI field descriptions

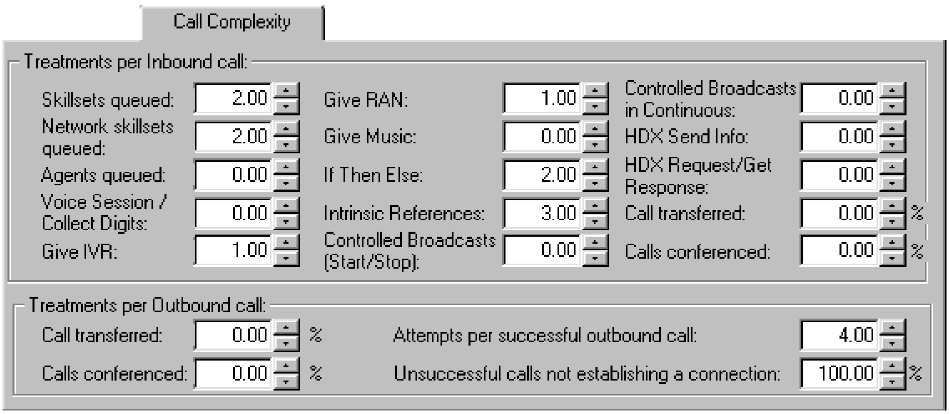
Field	Valid range	Description	Parameter
Average number of Send/Request command parameters	0–99 Default 10	The average number and average size of Send/Request instructions to be sent from the server PC to the client PC.	aDX_SndReq_ParNum
Average size of Send/Request command parameters	0–999 Default 80		aDX_SndReq_ParSize

Field	Valid range	Description	Parameter
Average number of Get Response command parameters	0–99 Default 10	The average number and average size of Get Response instructions to be sent from the server PC to the client PC.	aDX_GetResp_ ParNum
Average size of Get Response command parameters	0–999 Default 80		aDX_GetResp_ ParSize
Average number of Send Info Command parameters	0–99 Default 10	The average number and average size of Send Info instructions to be sent from the server PC to the client PC.	aDX_SndInfo_ ParNum
Average size of Send Info Command parameters	0–999 Default 80		aDX_SendInfo_ ParSize
Average refresh interval of SEI applications (secs)	0.5–5 Default 2	The average update interval of all Symposium Event Interface (SEI) applications.	aEIUpdateIntvl
Proportion of the number of events sent per call (%)	0–100 Default 10	The proportion, expressed as a percentage, of the total number of events available that are sent per call, as calculated with the formula Actual events per call/Total number of events available.	pEventsCall
Number of SEI API clients	0–3 Default 1	The number of clients using the Symposium Event Interface (SEI) Application Program Interface (API).	nSEIClients

Call Complexity

Introduction

The Call Complexity property page allows you to input values relating to the number of treatments given to inbound and outbound calls. The following illustration shows the Call Complexity property page for the Meridian 1 or CSE 1000 switch:



Call Complexity field descriptions

Field	Valid range	Description	Parameter
Treatments per inbound call			
Skillsets queued	0–99 Default 2	The average number of skillsets entered by an inbound call.	aQTSPerCall
Network skillsets queued	0–99 Default 2	The average number of network skillsets entered by an inbound call.	aQTNSPerNetwCall
Agents queued	0–99 Default 0	The average number of agent queues entered by an inbound call.	aQTAPerCall

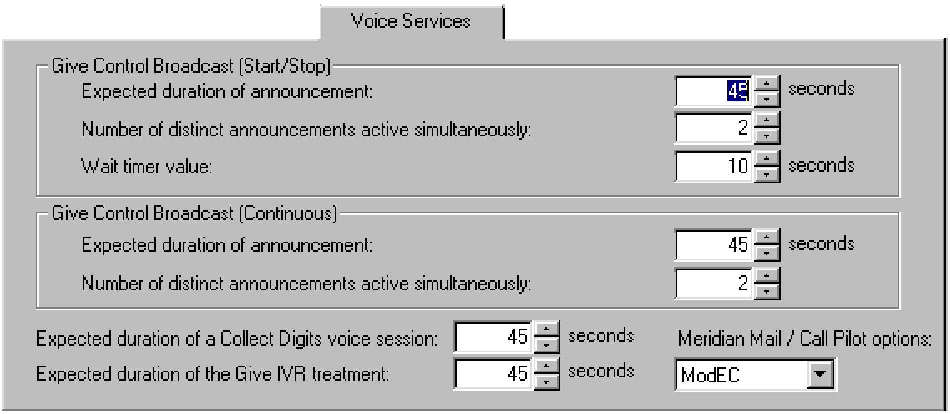
Field	Valid range	Description	Parameter
Voice Session/ Collect Digits	0–99 Default 0	The average number of collect digit requests per inbound call.	aVSCDGPerCall
Give IVR	0–99 Default 1	The average number of Give Interactive Voice Response (IVR) sessions per inbound call.	aGIVRPerCall
Give RAN	0–99 Default 2	The average number of Give Recorded ANnouncement (RAN) instances per inbound call.	aGRANPerCall
Give Music	0–99 Default 1	The average number of Give Music sessions per inbound call.	aGMUSPerCall
If Then Else	0–99 Default 5	The average number of “If Then Else” call treatments per inbound call.	aIFTHPerCall
Intrinsic References	0–99 Default 5	The average number of references to intrinsics per inbound call.	aINTRPerCall
Controlled Broadcasts (Start/Stop)	0–99 Default 1	The average number of controlled broadcast sessions in Start/Stop mode per inbound call.	aGCBPerCall
Controlled Broadcasts in Continuous	0–99 Default 0	The average number of controlled broadcast sessions in Continuous mode per inbound call.	aGCBCPerCall
HDX Send Info	0–99 Default 1	The average number of Host Data Exchange (HDX) Send Info treatments per inbound call.	aHDXSIPerCall
HDX Request/ Get Response	0–99 Default 1	The average number of HDX Request/ Get Response treatments per incoming call.	aHDXRGPerCall
Call transferred (%)	0–100 Default 5	The percentage of incoming calls that are transferred to another agent or CDN.	pTransferIn

Field	Valid range	Description	Parameter
Calls conferenced (%)	0–100 Default 5	The percentage of incoming calls that are conferenced with another agent or with a supervisor.	pConferencedIn
Treatments per Outbound call			
Call transferred (%)	0–100 Default 0	The percentage of outbound calls that are transferred to another agent or CDN.	pTransferOut
Call conferenced (%)	0–100 Default 0	The percentage of inbound calls that are conferenced with another agent or with a supervisor.	pConferenceOut
Attempts per successful outbound call	0–99 Default 4	The average number of call attempts per successful outbound call. **Note**: A successful call is defined as a call that reaches a live person.	aAttPerOutCall
Unsuccessful calls not establishing a connection	0–100 Default 100	The percentage of unsuccessful outbound calls that do not establish a Public Switch Telephone Network (PSTN) connection.	pUCallsNCon

Voice Services

Introduction

The Voice Services property page allows you to input values relating to the voice treatments given to calls. The following illustration shows the Voice Services property page for the Meridian 1 or CSE 1000 switch:



Voice Services field descriptions

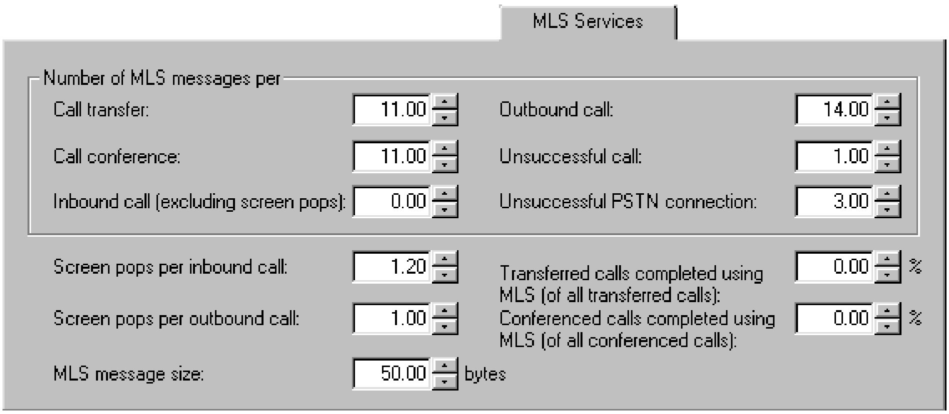
Field	Valid range	Description	Parameter
Give Control Broadcast (Start/Stop)			
Expected duration of announcement	1–999 Default 45	The expected duration in seconds of a Give Control Broadcast (GCB) announcement in Start/Stop mode.	nGCB_Duration
Number of distinct announcements active simultaneously	1–99 Default 2	The expected number of distinct GCB announcements played simultaneously in Start/Stop mode.	nGCB_ Simultaneous

Field	Valid range	Description	Parameter
Wait timer value	2–300 Default 10	The length in seconds of the Broadcast Port Wait Timer.	nGCB_WTimer
Give Control Broadcast (Continuous)			
Expected duration of announcement	1–999 Default 45	The expected duration in seconds of a GCB announcement in Continuous mode.	nGCBC_ Duration
Number of distinct announcements active simultaneously	1–99 Default 2	The expected number of distinct GCB announcements played simultaneously in Continuous mode.	nGCBC_ Simultaneous
Expected duration of a Collect Digits voice session	1–999 Default 45	The expected duration in seconds of a Collect Digits voice session.	nVSCDG_ Duration
Expected duration of the Give IVR treatment	1–999 Default 45	The expected duration in seconds of a Give IVR treatment.	nGIVR_ Duration
Meridian Mail / CallPilot options		If you are using Symposium Voice Services on CallPilot, choose CallPilot. If you are using Symposium Voice Services on Meridian Mail, choose your Meridian Mail platform. **Note:** When you set this field to CallPilot, the Number of MLS messages per Inbound call field on the MLS Services property page is set to 10. When you change this field from CallPilot to one of the Meridian Mail options, the Number of MLS messages per Inbound call field is set to 0.	

MLS Services

Introduction

The MLS Services property page allows you to define resource requirements for MLS. The following illustration shows the MLS Services page for the Meridian 1 or CSE 1000 switch:



MLS Services field descriptions

Field	Valid range	Description	Parameter
Number of MLS messages per			
Call transfer	1–99 Default 11	The average number of MLS messages per call transfer.	aMMSGPerTx
Call conference	1–99 Default 11	The average number of MLS messages per call conference.	aMMSGPerConf
Inbound call (excluding screen pops)	0–99 Default 0	The average number of MLS messages per inbound call, excluding screen pops.	aMMSGPerCall

Field	Valid range	Description	Parameter
Outbound call	0–99 Default 14	The average number of MLS messages per outbound call, including screen pops.	aMMSGPerOut Call
Unsuccessful call	0–99 Default 1	The average number of MLS messages per PSTN connection resulting in an unsuccessful call attempt.	aMMSGPerN Con
Unsuccessful PSTN connection	0–99 Default 3	The average number of MLS messages per unsuccessful PSTN connection.	aMMSGPerCon UCall
Screen pops per inbound call	0–99 Default 1.2	The number of screen pops per inbound call.	aMSPPerCall
Screen pops per outbound call	0–99 Default 1	The number of screen pops per outbound call.	aMSPPerOutCall
Trans. calls completed using MLS (of all transferred calls)	0–100	The proportion of transferred calls completed by an MLS application, such as Symposium Agent.	pTrnf_MLS
Conf. calls completed using MLS (of all conferenced calls)	0–100	The proportion of conferenced calls completed by an MLS application, such as Symposium Agent.	pConf_MLS
MLS message size	1–999 Default 50	The average size of MLS messages in bytes. This figure does not include overhead.	aMMSG_Size

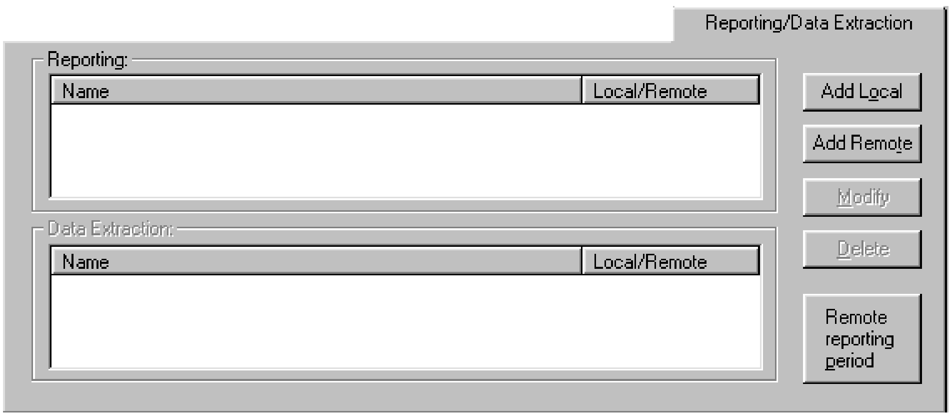
Reporting/Data Extraction

Introduction

The Reporting/Data Extraction property page allows you to specify the report generation and data extraction activities to be included in capacity calculations. Reports and data extractions are classified as

- local—if they are generated by local client PCs (that is, client PCs on the local segment of the CLAN) connected to the local server
- remote—if they are generated by local client PCs connected to a remote server or by remote client PCs (that is, client PCs on a remote segment of the CLAN) connected to the local server

The following illustration shows the Reporting/Data Extraction property page:



Reporting/Data Extraction field descriptions

Field	Valid range	Description
Reporting		
Name	Text	The name of the report. You can add a local or remote report based on hundreds of predefined reports.

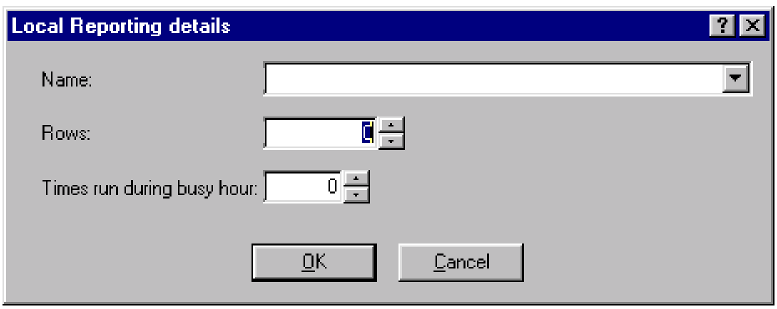
Field	Valid range	Description
Local/Remote	Local/ Remote	Shows whether the server on which the report is generated is a local or remote server.
Data Extraction		
Name	Text	The name of the view from which data is to be extracted.
Local/Remote	Local/ Remote	Shows whether the server from which the data is extracted is a local or remote server.

To add local reporting/data extraction activities

1 Click the Name bar or inside the list box for the activity type that you want to add (Reporting or Data Extraction).

2 Click Add Local.

Result: The Local Reporting details or Local View/Data Extraction details dialog box appears.



3 Select a report from the Name drop-down list.

4 Specify the number of rows (entries) in the report.

5 Specify the number of times per hour that the report is generated during the peak period.

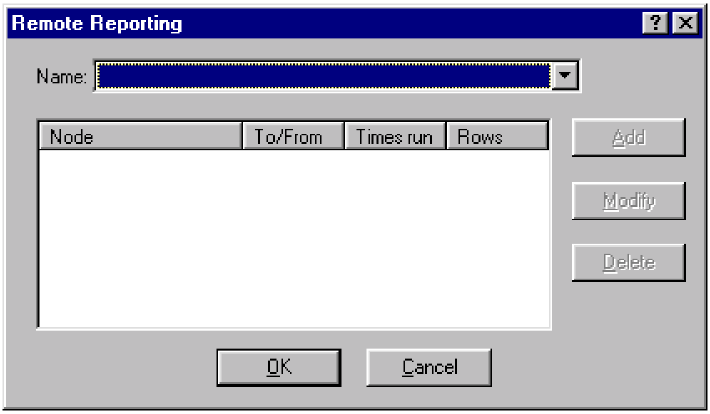
6 Click OK.

To add remote reporting/data extraction activities

1 Click the Name bar or inside the list box for the report type that you want to add (Reporting or Data Extraction).

2 Click Add Remote.

Result: The Remote Reporting or Remote View/Data Extraction window appears.

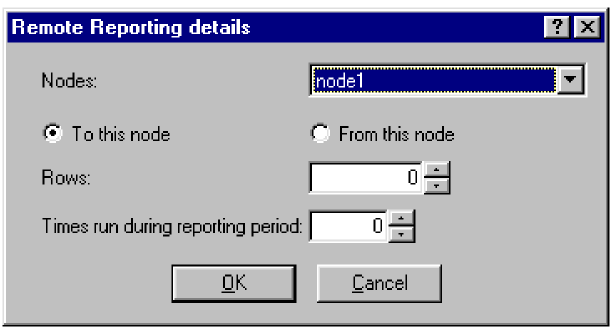


3 Select a view from the Name drop-down list.

4 Click the Node column label.

5 Click Add.

Result: The Remote Reporting details or Remote View/Data Extraction details dialog box appears.



6 In the Nodes box, select the server on which the report is to be generated or from which the data is to be extracted.

7 Select To this node if the report or data extraction activity runs on the remote node. Select From this node if the activity occurs on the local node.

8 In the Rows box, enter the number of rows to appear in the report. The number you enter appears in the Rows column.

9 In the Times run during reporting period box, enter the number of times the report should be run in a typical reporting period. (To define the reporting period, see “To change the reporting period for remote reporting and data extraction activities” on page 104.) The number you enter appears in the Times run column.

10 Click OK to exit.

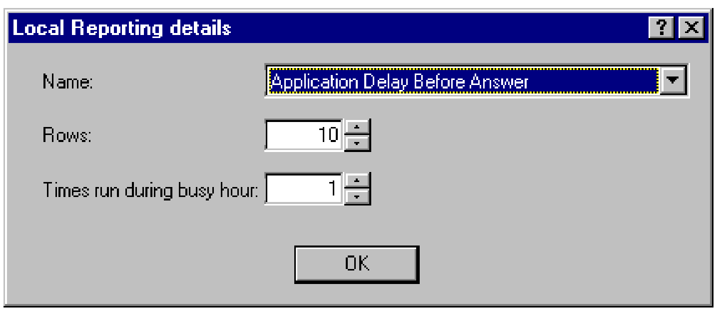
Result: The Remote Reporting window appears, showing all the nodes that you added.

To change local reporting/data extraction activities

1 Select the report or data extraction you want to change.

2 Click Modify.

Result: The Local Reporting details or Local View/Data Extraction details dialog box appears.



3 Make the desired changes.

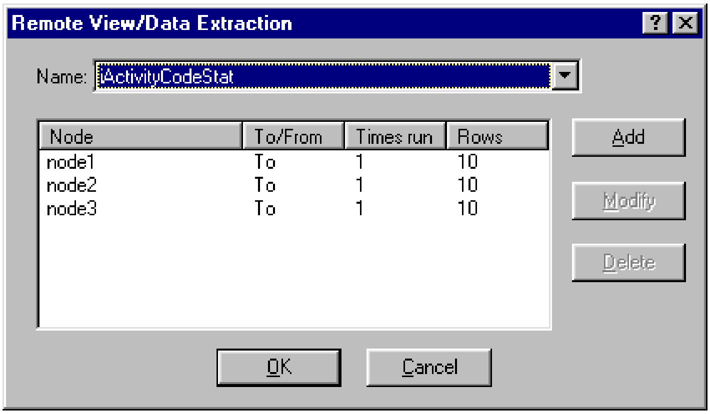
4 Click OK.

To change remote reporting/data extraction activities

1 Select the report or data extraction you want to change.

2 Click Modify.

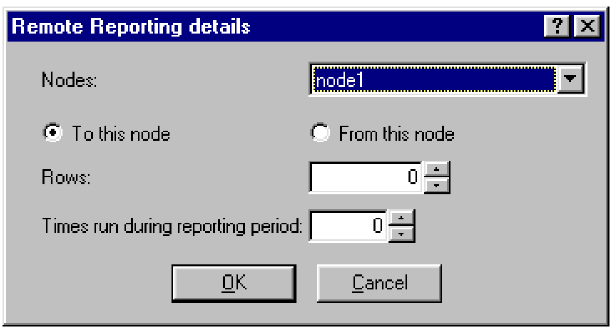
Result: The Remote Reporting or Remote View/Data Extraction dialog box appears.



3 To add a node, follow these steps:

a. Click Add.

Result: The Remote Reporting details or Remote View/Data Extraction details dialog box appears.



b. In the Nodes box, select the server on which the report is to be generated or from which the data is to be extracted.

c. Select To this node if the report or data extraction activity runs on the remote node. Select From this node if the activity occurs on the local node.

d. In the Rows box, enter the number of rows to appear in the report. The number you enter appears in the Rows column.

e. In the Times run during reporting period box, enter the number of times the report should be run in a typical reporting period. (To define the reporting period, see "To change the reporting period for remote reporting and data extraction activities" on page 104.) The number you enter appears in the Times run column.

f. Click OK to exit.

4 To change a node, follow these steps:

a. Select the node.

b. Click Modify.

Result: The Remote Reporting details or Remote View/Data Extraction details dialog box appears.

c. Make the desired changes.

d. Click OK.

5 To delete a node, follow these steps:

a. Select the node.

b. Click Delete.

6 Click OK.

To delete reporting/data extraction activities

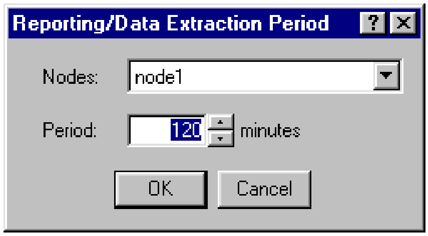
1 Select the report or data extraction you want to change.

2 Click Delete.

To change the reporting period for remote reporting and data extraction activities

1 Click Remote Reporting Period.

Result: The Reporting/Data Extraction Period dialog box appears.



2 In the Node box, select the node for which you want to define the data extraction period.

3 In the Period box, specify the period.

4 Click OK.

Chapter 4

DMS/MSL-100 Symposium Call Center Server requirements

In this chapter

Overview

Introduction

This chapter describes the fields displayed on the property pages for a DMS/MSL-100 switch.

Note: DMS/MSL-100 is not currently supported in Release 4.2.

Parameter

The Parameter column in the tables starting on page 111 indicates the corresponding parameter used in the formula method (see Chapter 5, “Using the formula method”).

Example

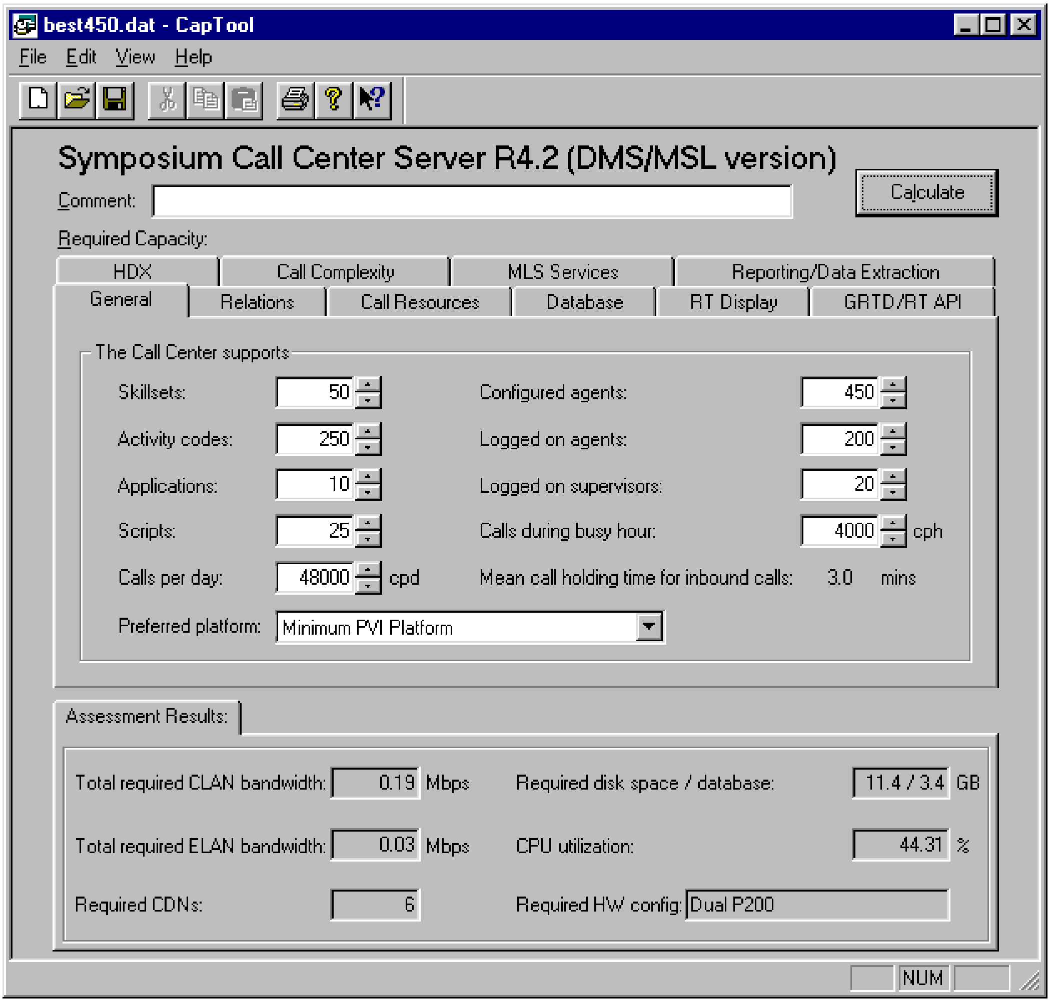
BestAir seat sale

Every July, BestAir Airline has a seat sale on certain flights. In the past, this event has dramatically increased the number of calls coming in to the call center. This year, the call rate is anticipated to increase from 4000 to 6000. To handle the increased call load, BestAir plans to hire an additional 100 agents—increasing the number of configured agents from 450 to 550.

The administrator of the call center can use the Capacity Assessment Tool to determine how these changes will affect the requirements of the call center system, and whether BestAir must upgrade its platform to handle the extra call traffic.

The following illustration shows the requirements of the BestAir call center with the original 450 agents:

Original call center configured for 450 agents



New call center configuration

The system administrator enters the proposed changes. This example increases

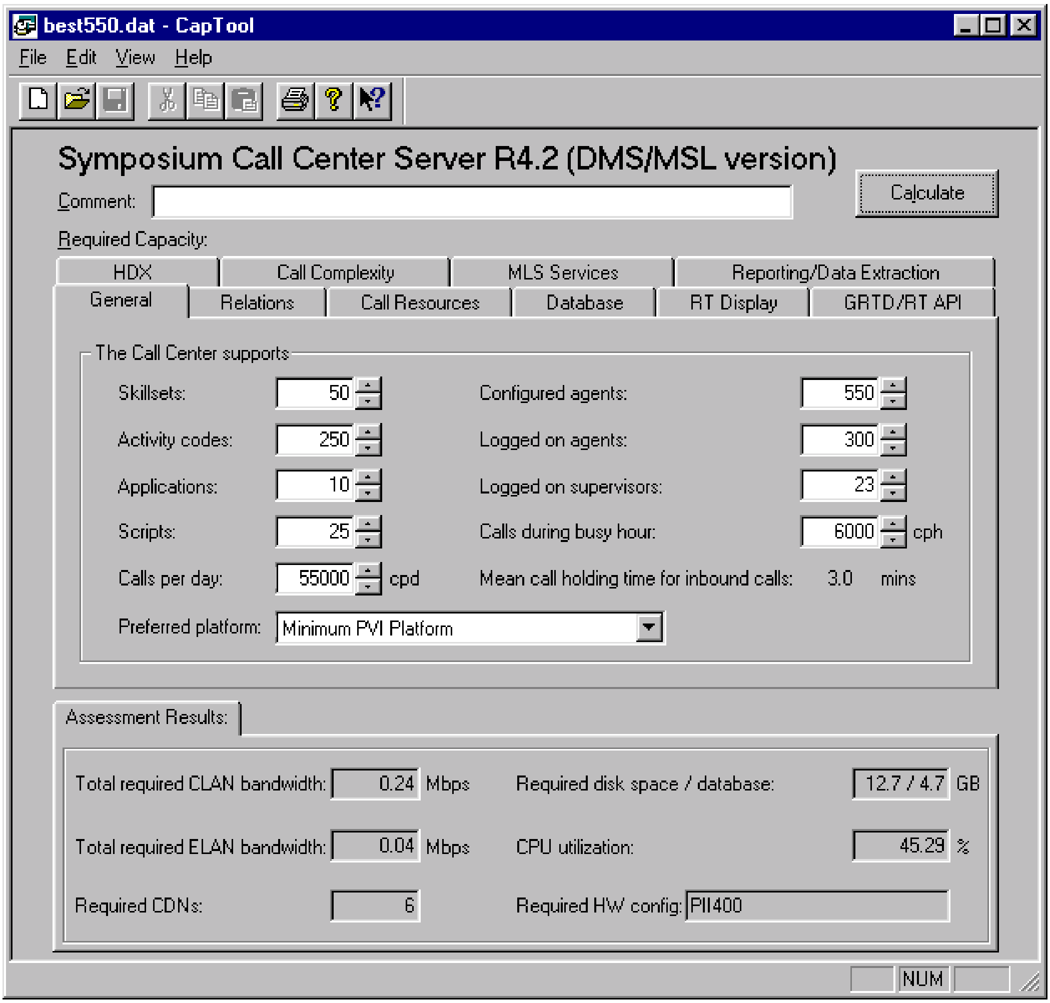
- the number of calls per hour and per day
- the total number of agents

- the number of agents logged on

  To keep mean call holding time unchanged at 3 minutes, an additional 100 agents must be logged on.
- the number of supervisors logged on

The following illustration shows the requirements of the BestAir call center after these changes are made:

New Call Center configured with an extra 100 agents



The Capacity Assessment Tool calculates the impact of the changes and shows them in the Assessment Results area in the lower part of each screen. Notice that the Assessment Results area shows an increase in

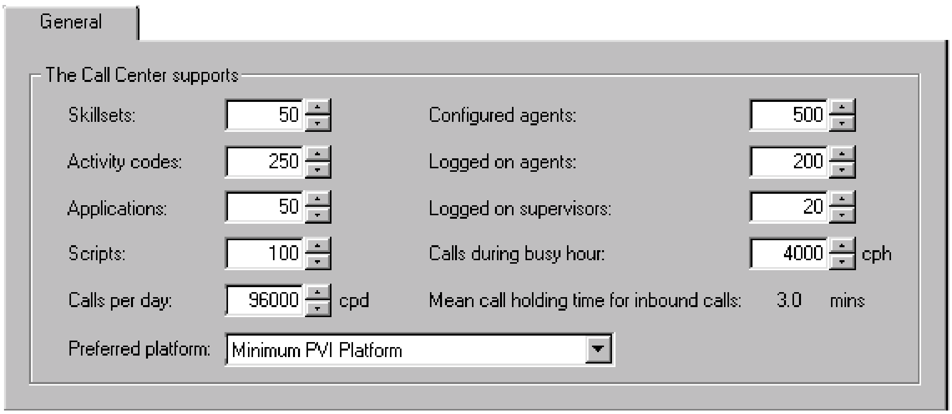
- ELAN and CLAN bandwidth requirements
- hard disk space requirements
- CPU utilization

To support the increased requirements, a hardware platform upgrade is required.

General

Introduction

The General property page allows you to enter information about your call center size and workload. The following illustration shows the General property page for the DMS/MSL-100 switch:



General page field descriptions

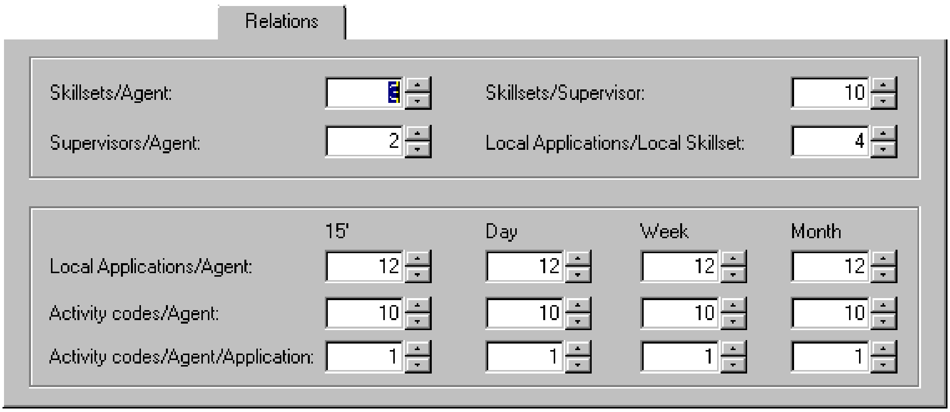
Field	Valid range	Description	Parameter
Skillsets	1–350	The number of skillsets defined.	nSkillsets
Activity codes	0–1000	The number of activity codes defined.	nActCodes
Applications	5–500	The number of primary scripts (applications) defined.	nApplications
Scripts	1–1500	The number of scripts defined.	nScripts
Calls per day (cpd)	0–600 000	The expected average number of inbound calls per day.	

Field	Valid range	Description	Parameter
Configured agents	1–3000	The total number of agents defined.	nTAgents
Logged on agents	0–1500 (dual CPU) 1–600 (other platforms)	The maximum number of agents logged on at any one time.	nAgents
Logged on supervisors	0–150	The number of supervisors logged on using either the Symposium Call Center Server Client application (Fat client) or the Symposium Call Center Web client.	nSupervisors
Calls during busy hour	0–25 000	The expected average number of inbound calls originating locally during a busy hour.	PeakCallRate
Mean call holding time for inbound calls	Read-only	The average time in minutes taken to process a call.	60 * Average(nAgents)/ PeakCallRate
Preferred platform		The hardware platform to be used. The platforms available depend on the release of Symposium Call Center Server. If you select Minimum PVI platform, CapTool uses the minimum platform that provides the required capacity. If you select Platform Vendor Independence, a dialog box opens to allow you to identify the platform. If you select High Availability Platforms, you are prompted to select a hardware RAID configuration (ftServer 3220 H/W RAID) or a software RAID configuration (ftServer 3220 HASM).	

Relations

Introduction

The Relations property page allows you to input values relating to relationships, such as skillsets per agent. The following illustration shows the Relations property page for the DMS/MSL-100 switch:



Relations field descriptions

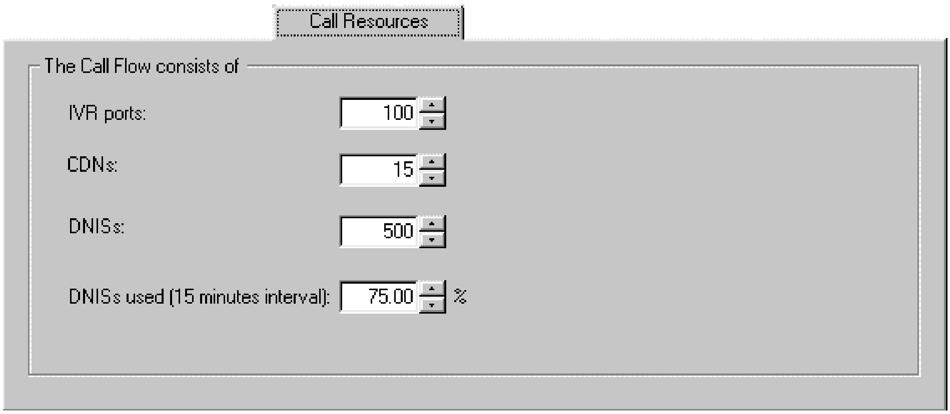
Field	Valid range	Description	Parameter
Skillsets/Agent	1–50 Default 3	The average number of skillsets served by an agent.	aSkill_Agent
Supervisors/ Agent	1–6	The average number of supervisors to which an agent reports.	aSup_Agent
Skillsets/ Supervisor	1–350	The average number of skillsets served by the supervisor’s agents.	aSkill_Supv
Local Applications/ Local Skillset	1–500	The average number of local applications per local skillset.	aAppl_Skill

Field	Valid range	Description	Parameter
Local Applications/ Agent in 15', Day, Week, Month	0–500	The average number of unique local applications handled by each agent for the specified period: interval (15 minutes), day, week, month.	aApplAgent Intv/ Day/Week/ Month
Activity codes/ Agent in 15', Day, Week, Month	0–1000	The average number of (non-unique) activity codes entered per agent for the specified period: interval (15 minutes), day, week, month.	aActCode_Agent Intv/Day/Week/ Month
Activity codes/ Agent/ Application in 15', Day, Week, Month	0–5000	The average number of unique activity codes entered per agent per local application for the specified period: interval (15 minutes), day, week, month.	aActCode_Agent _Appl Intv/Day/Week/ Month

Call Resources

Introduction

The Call Resources property page allows you to enter information about usage of switch resources. The following illustration shows the Call Resources property page for the DMS/MSL-100 switch:



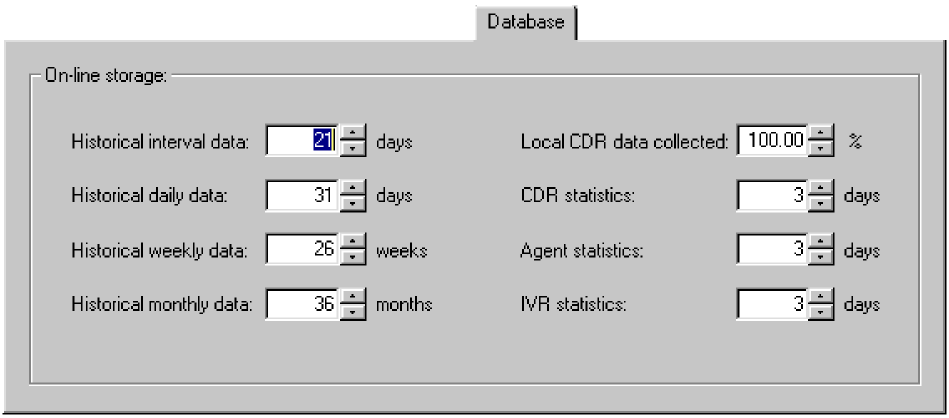
Call Resources field descriptions

Field	Valid range	Description	Parameter
IVR ports	1–500	The number of IVR ports configured.	nIVRPorts
CDNs	1–100	The number of Controlled Directory Numbers (CDNs) in the system.	nCDN
DNISs	1–10 000	The number of Dialed Number Identification Services (DNISs) defined in the system.	nDNIS
DNISs used	0–100	The percentage of Dialed Number Identification Services (DNISs) used during a single (15-minute) data collection interval.	nDNISInterval

Database

Introduction

The Database property page allows you to input values used in calculating database storage requirements. The following illustration shows the Database property page for the DMS/MSL-100 switch:



Database field descriptions

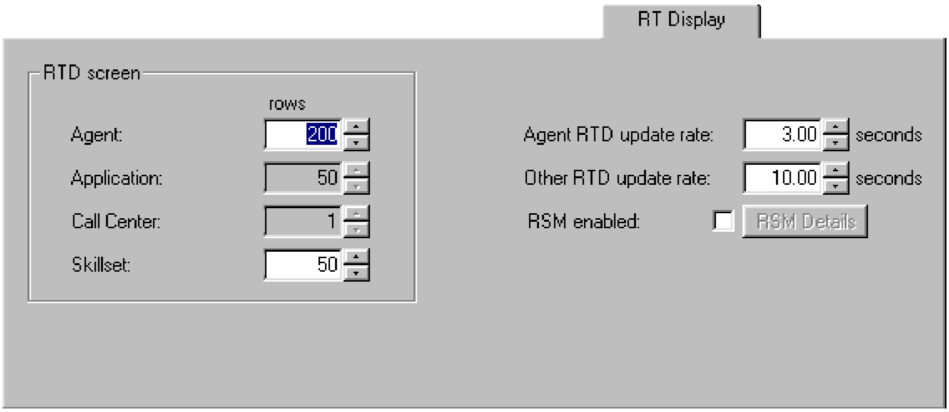
Field	Valid range	Description	Parameter
Historical interval data (days)	1–999 Default 21	The number of days that historical interval statistics are stored.	nDInterval
Historical daily data (days)	1–999 Default 31	The number of days that historical daily statistics are stored.	nDDay
Historical weekly data (weeks)	1–999 Default 26	The number of weeks that historical weekly statistics are stored.	nWWeek

Field	Valid range	Description	Parameter
Historical monthly data (months)	1–999 Default 36	The number of months that historical monthly statistics are stored.	nMMonth
Local CDR data collected (%)	0–100 Default 100	The percentage of Call Detail Reporting (CDR) data, also known as call-by-call data, that is collected at the local node.	pCBCNode
CDR statistics (days)	0–999 Default 3	The number of days that the call-by-call statistics are stored. A value of zero indicates that data is not collected.	nDCallByCall
Agent statistics (days)	1–999 Default 3	The number of days that agent event statistics are stored.	nDAgentStat
IVR statistics (days)	1–999 Default 3	The number of days that Interactive Voice Response (IVR) event statistics are stored.	nDIVRStat

RT Display

Introduction

The RT Display property page allows you to define resource requirements for real-time (RT) display screens. The following illustration shows the RT Display property page for the DMS/MSL-100 switch:



Real-time Display field descriptions

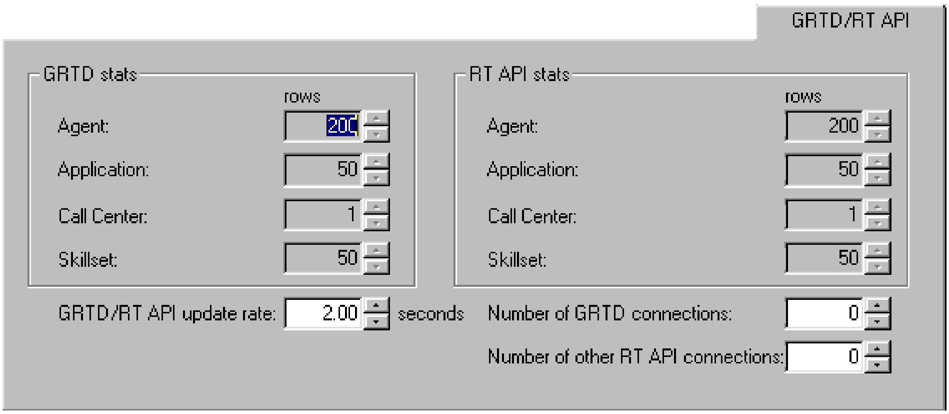
Field	Valid range	Description	Parameter
Agent	0–3000	The number of rows displayed on each agent Real-time Display (RTD) screen. When you create a new capacity file, this field takes the value for Logged on agents for the selected workload.	nRTDAgRows
Application	View only	The number of rows displayed on each application Real-time Display (RTD) screen. This field contains the value specified in the Applications field on the General property page.	nRTDAppRows

Field	Valid range	Description	Parameter
Call Center	View only	The number of rows displayed on the Call Center Summary RTD screen. This field is always set to 1.	nRTDCCRows
Skillset	0–350	The number of rows displayed on each skillset RTD screen. When you create a new capacity file, this field takes the value for Skillsets for the selected workload.	nRTDSkillRows
Agent RTD update rate (secs)	0.5–99 Default 3	The update rate of agent RTD screens.	AgScrUpdate Intvl
Other RTD update rate (secs)	2–99 Default 10	The update rate of other RTD screens (that is, other than agent).	RTDScrUpdate Intvl
RSM enabled	Default: Unchecked (No) (Rel. 4.2) Checked (Yes) (Rel. 4.0)	Check this box to generate real-time statistics. This option is checked by default.	
RSM Details	Button	Click this button to choose the real-time statistics on which you want to collect information.	

GRTD/RT API

Introduction

The GRTD/RT API property page allows you to define resource requirements for graphical real-time display (GRTD) and the real-time (RT) application program interface (API). The following illustration shows the GRTD/RT API property page for the DMS/MSL-100 switch:



GRTD/Real-time API field descriptions

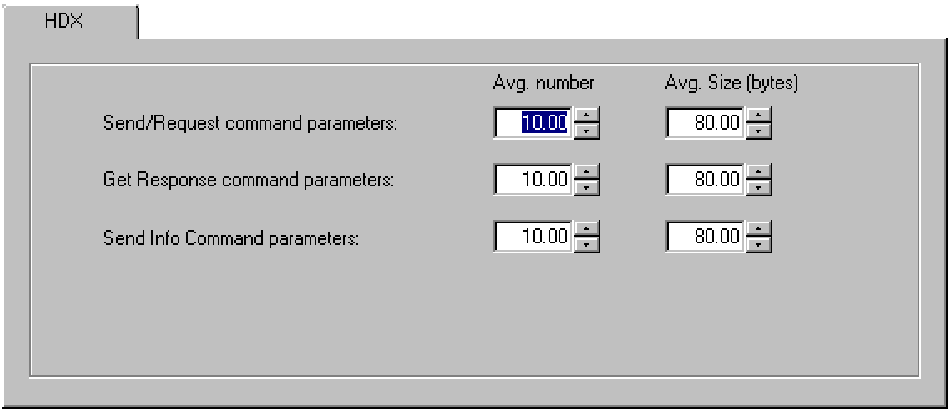
Field	Valid range	Description	Parameters
Agent (rows of GRTD/RT API stats)	View only	The number of rows in GRTD and RT API Agent statistics. This field contains the value specified in the Logged on agents field on the General property page.	nGRTDAgRows/ nRTIAgRows
Application (rows of GRTD/RT API stats)	View only	The number of rows in GRTD and RT API Application statistics. This field contains the value specified in the Applications field on the General property page.	nGRTDApp Rows/ nRTIAppRows

Field	Valid range	Description	Parameters
Call Center (rows of GRTD/RT API stats)	View only	The number of rows in GRTD and RT API Nodal statistics. This value is always set to 1.	nGRTDCCRows/ nRTICCRows
Skillset (rows of GRTD/RT API stats)	View only	The number of rows in GRTD and RT API Skillset statistics. This field contains the value specified in the Skillsets field on the General property page.	nGRTDSkill Rows/ nRTISkillRows
GRTD/RT API update rate (secs)	2–99 Default 2	The average update (refresh) interval, in seconds, of RT API applications.	RTIUpdateIntvl
Number of GRTD connections	0–100 Default 0	The number of GRTD connections to the system.	nGRTDClients
Number of other RT API connections	0–100 Default 0	The number of RT API clients expected to be connected to the system.	nRTIClients

HDX

Introduction

The HDX property page allows you to define resource requirements for the Host Data Exchange (HDX) interface. The following illustration shows the HDX property page for the DMS/MSL-100 switch:



HDX field descriptions

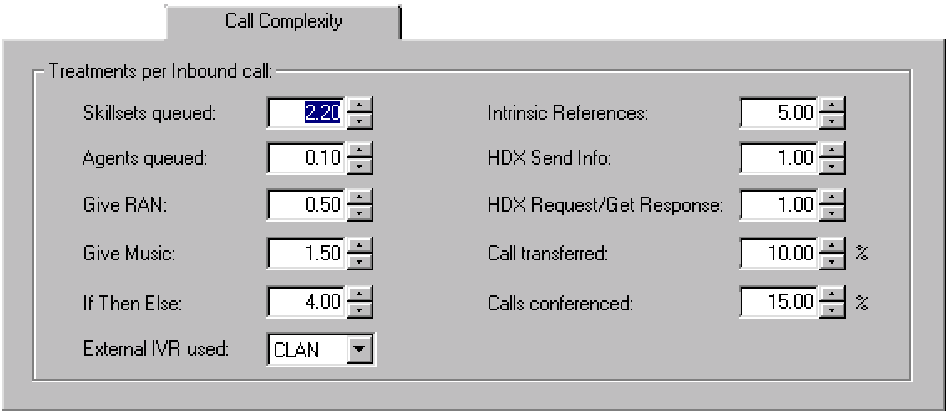
Field	Valid range	Description	Parameter
Average number of Send/Request command parameters	0–99 Default 10	The average number and average size of Send/Request instructions to be sent from the server PC to the client PC.	aDX_SndReq_ParNum
Average size of Send/Request command parameters	0–999 Default 80		aDX_SndReq_ParSize

Field	Valid range	Description	Parameter
Average number of Get Response command parameters	0–99 Default 10	The average number and average size of Get Response instructions to be sent from the server PC to the client PC.	aDX_GetResp_ ParNum
Average size of Get Response command parameters	0–999 Default 80		aDX_GetResp_ ParSize
Average number of Send Info Command parameters	0–99 Default 10	The average number and average size of Send Info instructions to be sent from the server PC to the client PC.	aDX_SndInfo_ ParNum
Average size of Send Info Command parameters	0–999 Default 80		aDX_SendInfo_ ParSize

Call Complexity

Introduction

The Call Complexity property page allows you to input values relating to the number of treatments given to inbound calls. The following illustration shows the Call Complexity property page for the DMS/MSL-100 switch:



Call Complexity field descriptions

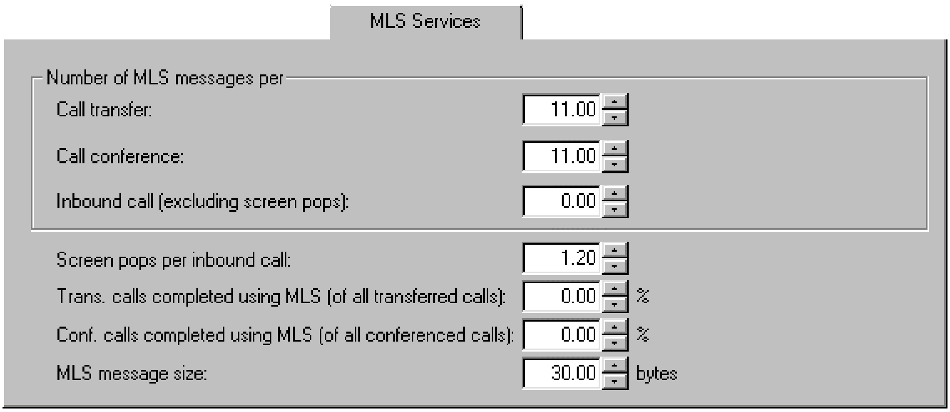
Field	Valid range	Description	Parameter
Skillsets queued	0–99 Default 2.2	The average number of skillsets entered by an inbound call.	aQTSPerCall
Agents queued	0–99 Default 0.10	The average number of agent queues entered by an inbound call.	aQTAPerCall
Give RAN	0–99 Default 0.5	The average number of Give Recorded ANnouncement (RAN) instances per inbound call.	aGRANPerCall
Give Music	0–99 Default 1.5	The average number of Give Music sessions per inbound call.	aGMUSPerCall

Field	Valid range	Description	Parameter
If Then Else	0–99 Default 4	The average number of “If Then Else” call treatments per inbound call.	aIFTHPerCall
External IVR used	None CLAN ELAN	A drop-down menu that indicates whether the external Interactive Voice Response (IVR) system (if present) is connected to the CLAN or the ELAN. “None” indicates that no IVR is present.	
Intrinsic References	0–99 Default 5	The average number of references to intrinsics per inbound call.	aINTRPerCall
HDX Send Info	0–99 Default 1	The average number of Host Data Exchange (HDX) Send Info treatments per inbound call.	aHDXSIPerCall
HDX Request/ Get Response	0–99 Default 1	The average number of HDX Request/ Get Response treatments per incoming call.	aHDXRGPerCall
Call transferred (%)	0–100 Default 10	The percentage of incoming calls that are transferred to another agent or CDN.	pTransferIn
Calls conferenced (%)	0–100 Default 15	The percentage of incoming calls that are conferenced with another agent or with a supervisor.	pConferencedIn

MLS Services

Introduction

The MLS Services property page allows you to define resource requirements for MLS. The following illustration shows the MLS Services page for the DMS/MSL-100 switch:



MLS Services field descriptions

Field	Valid range	Description	Parameter
Number of MLS messages per			
Call transfer	1–99 Default 11	The average number of MLS messages per call transfer.	aMMSGPerTx
Call conference	1–99 Default 11	The average number of MLS messages per call conference.	aMMSGPerConf
Inbound call (excluding screen pops)	0–99 Default 0	The average number of MLS messages per inbound call, excluding screen pops.	aMMSGPerCall

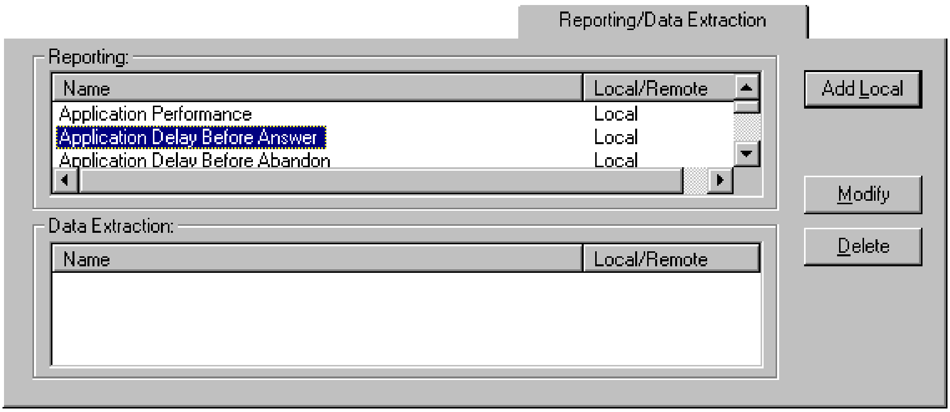
Field	Valid range	Description	Parameter
Screen pops per inbound call	0–99 Default 1.2	The number of screen pops per inbound call.	aMSPPerCall
Trans. calls completed using MLS (of all transferred calls)	0–100	The proportion of transferred calls completed by an MLS application, such as Symposium Agent.	pTrnf_MLS
Conf. calls completed using MLS (of all conferenced calls)	0–100	The proportion of conferenced calls completed by an MLS application, such as Symposium Agent.	pConf_MLS
MLS message size	1–999 Default 50	The average size of MLS messages in bytes. This figure does not include overhead.	aMMSG_Size

Reporting/Data Extraction

Introduction

The Reporting/Data Extraction property page allows you to specify the report generation and data extraction activities to be included in capacity calculations. For the DMS/MSL-100 switch, all reports are generated locally (that is, by PCs connected to the local server).

The following illustration shows the Reporting/Data Extraction property page:



Reporting/Data Extraction field descriptions

Field	Valid range	Description
Reporting		
Name	Text	The name of the report. You can add a local report based on hundreds of predefined reports.
Local/Remote	Local/ Remote	Shows whether the server on which the report is generated is a local or remote server. In this release, only local reporting is available.

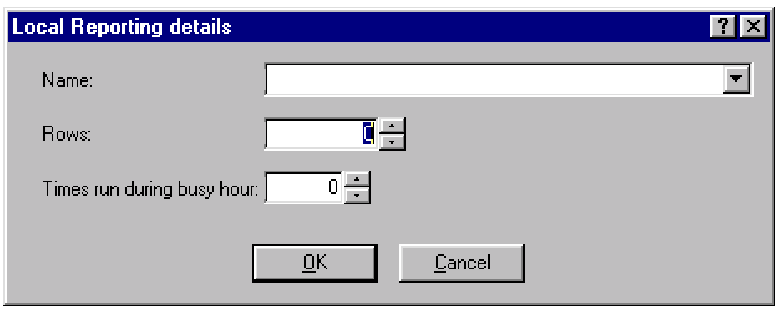
Field	Valid range	Description
Data Extraction		
Name	Text	The name of the view from which data is to be extracted.
Local/Remote	Local/ Remote	Shows whether the server from which the data is extracted is a local or remote server. In this release, only local data extraction is available.

To add local reporting/data extraction activities

1 Click the Name bar or inside the list box for the activity type that you want to add (Reporting or Data Extraction).

2 Click Add Local.

Result: The Local Reporting details or Local View/Data Extraction details dialog box appears.



3 Select a report from the Name drop-down list.

4 Specify the number of rows (entries) in the report.

5 Specify the number of times per hour that the report is generated during the peak period.

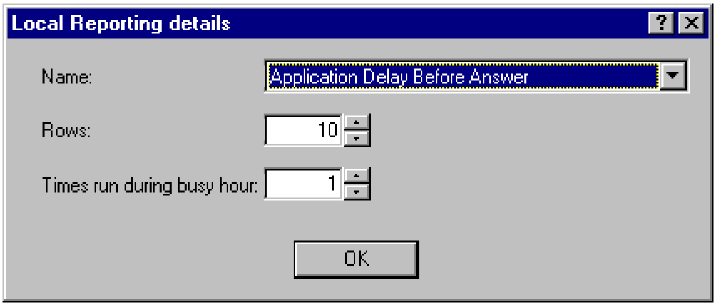
6 Click OK.

To change local reporting/data extraction activities

1 Select the report or data extraction you want to change.

2 Click Modify.

Result: The Local Reporting details or Local View/Data Extraction details dialog box appears.



3 Make the desired changes.

4 Click OK.

To delete reporting/data extraction activities

1 Select the report or data extraction you want to change.

2 Click Delete.

Chapter 5

Using the formula method

In this chapter

Checklist for using the formula method

Introduction

If you are using the formula method to calculate your requirements, use the checklist for your switch type.

Note: Be sure to verify your calculations with the Capacity Assessment Tool.

Meridian 1/CSE 1000 switch

Step	
Record your workload parameters. See page 134.	
Determine the expected call rate for networking. See page 156.	
Calculate server disk utilization. See page 163.	
Calculate server CPU utilization. See page 169.	
Calculate ELAN utilization. See page 192.	
Calculate CLAN utilization. See page 211.	
Calculate WAN requirements. See page 240.	
Calculate online database backup elapsed time. See page 256.	
If you have purchased the optional Network Skill-Based Routing feature, engineer the NCC. Refer to Chapter 6, “Engineering the NCC server.”	
If you are using a voice processing system, see Chapter 7, “Planning voice processing system requirements (Meridian 1/CSE 1000 only).”	

DMS/MSL-100 switch

Step	
Record your workload parameters. See page 134.	
Calculate server disk utilization. See page 163.	
Calculate server CPU utilization. See page 169.	
Calculate ELAN utilization. See page 200.	
Calculate CLAN utilization. See page 211.	
Calculate online database backup elapsed time. See page 256.	

Record your workload parameters

Introduction

Record the parameters for your system under the parameter name in the Parameter column in the following table. Use these values for the parameter variables in all subsequent computations.

Note: For assumptions underlying the workload calculations, see Appendix A, “Performance model assumptions.”

Naming conventions for parameters

The following conventions are used for parameter names:

- Names starting with the letter “n” define a number or a quantity of items; for example, nAgents defines the number of agents logged on to the system.
- Names starting with the letter “b” define a Boolean; for example, bCollectCBC specifies whether call-by-call (CBC) statistics are collected.
- Names starting with the letter “p” define a proportion. For example, pNetOut defines the proportion of calls arriving at all nodes in the network that request routing to other nodes.

  For example, if 5000 calls come into the network, and 1000 request routing to other nodes, pNetOut equals 0.2.
- Names starting with the letter “a” define an average relation between one quantity and another. This value is not always equal to a simple quotient between the quantities.

  For example, aSkill_Agent defines an average number of skillsets served by an agent. This number is not equal to nSkillsets/nAgents, but is based on the agent-skillset assignment pattern in a call center. If your call center has 100 agents and 100 skillsets, nSkillsets/nAgents is 1. If each agent serves an average of 10 skillsets, then aSkill_Agent equals 10.
- Names that do not start with either “n,” “p,” or “a” are the names relating to call rate (CallRate), or to the quantities derived by computations. For example, CallByCall_RecsDay defines the number of records added to the

CallbyCall table in a day. This number is derived by using a number of formulas from system parameters.

Workload parameters

In the following table, parameters are arranged by switch type. All parameters that apply to both switch types appear in the upper part of the table section. All parameters that apply only to the Meridian 1/CSE 1000 or DMS/MSL-100 switch type appear at the end of each table section, where applicable.

Parameter	Description	Switch	Resource impact
Call rate			
PeakCallRate	The expected number of inbound calls originating locally during a busy hour (used for CPU utilization calculations).	Both	CPU, LAN, WAN
DailyCallRate	The expected daily average number of inbound calls per hour (used for disk space calculations). Default = PeakCallRate / 2.	Both	Disk Space
PeakOutCallRate	The expected number of outbound calls originating locally during a busy hour (used for CPU utilization calculations).	M1/ CSE 1000	CPU, LAN, WAN
DailyOutCallRate	The expected daily average number of outbound calls per hour (used for disk space calculations). Default = PeakOutCallRate / 2.	M1/ CSE 1000	Disk Space
PeakNetworkCallRate	The expected number of calls originating in the network during a busy hour (used for CPU utilization calculations). Default = PeakCallRate * nNetNodes.	M1/ CSE 1000	CPU, LAN, WAN

Parameter	Description	Switch	Resource impact
DailyNetworkCall Rate	The expected daily average number of calls per hour in the network (used for disk space calculations). Default = DailyCallRate * nNetNodes.	M1/ CSE 1000	Disk Space
General parameters			
nAgents	Number of agents logged on simultaneously. Maximum = 1500 (dual CPU); maximum = 600 (other platforms).	Both	CPU, LAN, Disk Space
nTAgents	Total number of agents defined in the system. Maximum = 3000.	Both	LAN, Disk Space
nSupervisors	Number of logged-on supervisors. Maximum = 100. Default = 10 percent of the number of agents.	Both	CPU, LAN, Disk Space
nFATClients	Number of Fat (Thick) Clients using RTDs. If there are no Web Clients, this value is the same as nSupervisors.	Both	CPU, LAN
nAdministrators	Number of logged-on administrators.	Both	Disk Space
nScripts	Number of scripts defined in the system (previously called nTaskFlows). Typically, nScripts = nAgents / 8.	Both	Disk Space

Parameter	Description	Switch	Resource impact
nApplications	Number of applications—the number of “exit” points from the Master_Script (including the 5 system applications). The number of applications can range from 5 in small systems to 200 in large ones. Number of applications is always less than or equal to the number of scripts: nApplications <= nScripts. Maximum = 505.	Both	CPU, LAN, Disk Space, WAN
nSkillsets	Number of skillsets defined. Maximum = 354 (including network skillsets and 4 system skillsets that are hidden from the user). Typically, nSkillsets = nAgents / 4.	Both	CPU, LAN, Disk Space,
nActCodes	Number of activity codes in a typical configuration (including the 2 system activity codes). Typically, nActCodes = nSkillsets * 5. **M1/CSE 1000 switch:** Maximum = 5000. **DMS/MSL-100 switch:** Maximum = 1000.	Both	Disk Space
bCollectCBC	Specifies whether CBC statistics are collected.	Both	CPU, LAN, Disk Space,
bExternal_IVR	Specifies whether an external IVR system is connected to the DMS/MSL-100 system.	DMS/ MSL-100	CPU, LAN, Disk Space, WAN

Parameter	Description	Switch	Resource impact
Call resources			
nCDN	Number of CDNs in the system. **M1/CSE 1000 switch:** Typically, nCDN = nApplications * 1.5. Maximum = 750. Default = 15. **DMS/MSL-100 switch:** Maximum = 100. See “Number of CDNs required” on page 308.	Both	CPU, LAN, Disk Space
nRMRoutes	Number of RAN or music routes included in nRoutes.	Both	CPU, LAN, Disk Space
nDNIS	Number of DNISs defined in the system. Maximum = 10 000.	Both	CPU, LAN, Disk Space
pDNISInterval	Proportion of DNISs used during a single data collection interval. The value depends on the system use: it is typically 75 percent in small systems and 60 percent in larger systems.	Both	Disk Space
nIVRPorts	Number of IVR ports. Maximum = 500. Typical value = 48 in small systems and 500 in larger ones.	Both	CPU, LAN, Disk Space,
nIVRPortEvents	Number of IVR events per port per day (logon/logoff and so on). Typical value = 5 in smaller systems (less than 200 agents) and 20 in larger systems (greater than 500 agents).	Both	Disk Space
nIVRQ	Number of IVR queues configured. Default = 10. Maximum = 150.	M1/ CSE 1000	CPU, LAN, Disk Space,

Parameter	Description	Switch	Resource impact
nRoutes	Number of routes configured. Default = 128 for small systems (<200 agents) and 250 for larger ones (>500 agents). Maximum = 513.	M1/ CSE 1000	CPU, LAN, Disk Space
nTrunks	Number of trunks in the system. Usually, the number of trunks is 1.5 * nAgents. Maximum = 3000.	M1/ CSE 1000	CPU, LAN, Disk Space
Relations (Typical range for relations is 1–15, workload dependent)			
aSkill_Agent	Average number of skillsets served by an agent.	Both	Disk Space
aSup_Agent	Average number of supervisors to which an agent reports. Maximum = 10.	Both	Disk Space
aSkill_Supv	Average number of skillsets served by the supervisor's agents.	Both	CPU, LAN
aAppl_Skill	Average number of local applications per local skillset.	Both	Disk Space
aAppl_NetSkill	Average number of remote applications per network skillset per node.	M1/ CSE 1000	Disk Space
aNodes_NetSkill	Average number of nodes per network skillset.	M1/ CSE 1000	Disk Space
aTrunk_Routes	Average number of trunks per trunk route.	M1/ CSE 1000	Disk Space

Parameter	Description	Switch	Resource impact
Interval relations			
aActCode_Agent_Intv	Average number of activity codes (not necessarily unique) entered per agent per interval.	Both	Disk Space
aAppl_Agent_Intv	Average number of unique local applications per agent per interval.	Both	Disk Space
aAppl_Agent_Appl_Intv	Average number of unique activity codes entered per agent per local application per interval. Can be derived as aActCode_Agent_Intv / aAppl_Agent_Intv.	Both	Disk Space
Daily relations			
aActCode_Agent_Day	Average number of activity codes entered per agent per day (not necessarily unique).	Both	Disk Space
aAppl_Agent_Day	Average number of unique local applications per agent per day.	Both	Disk Space
aActCode_Agent_Appl_Day	Average number of unique activity codes entered per agent per local application per day.	Both	Disk Space
Weekly relations			
aActCode_Agent_Week	Average number of activity codes (not necessarily unique) entered per agent per week.	Both	Disk Space
aAppl_Agent_Week	Average number of unique local applications per agent per week.	Both	Disk Space

Parameter	Description	Switch	Resource impact
aActCode_Agent_ Appl_Week	Average number of unique activity codes entered per agent per local application per week.	Both	Disk Space
Monthly relations			
aActCode_Agent_ Month	Average number of activity codes (not necessarily unique) entered per agent per month.	Both	Disk Space
aAppl_Agent_Month	Average number of unique local applications per agent per month.	Both	Disk Space
aActCode_Agent_ Appl_Month	Average number of unique activity codes entered per agent per local application per month.	Both	Disk Space
Agent operations			
nShifts	Number of agent shifts per day. Default = 3.	Both	Disk Space, CPU
nShiftsHrs	Number of hours per agent shift. Default = 8.	Both	Disk Space, CPU
nIntPerShift	Number of agent interruptions per shift. The number of agent-related events depends on the number of interruptions (logon/logoff, walkaway, and so on). Default = 10.	Both	Disk Space, CPU
pAgDailyReassign	Proportion of agent-supervisor and agent-skillset assignments that are changed daily. Default = 2 percent.	Both	Disk Space

Parameter	Description	Switch	Resource impact
pAgWeeklyReassign	Proportion of agent-supervisor and agent-skillset assignments that are changed weekly. Default = 15 percent.	Both	Disk Space
pAgMonthlyReassign	Proportion of agent-supervisor and agent-skillset assignments that are changed monthly. Default = 25 percent.	Both	Disk Space
Networking (M1/CSE 1000 only)			
Global networking parameters			
nNetNodes	Number of call processing nodes in the multinode Symposium Call Center Server network including the local node. Maximum = 30. **Note:** This does not include the NCC because the NCC does no call processing.	M1/ CSE 1000	CPU, LAN, Disk Space, WAN
pCBCNetwork	Proportion of network CBC data that is collected at all nodes in the network. Default = 100 percent.	M1/ CSE 1000	CPU, LAN, WAN
pNetOutNetw	Proportion of calls arriving at all nodes in the network that request routing to another node. Default = 10 percent.	M1/ CSE 1000	CPU, LAN, WAN
pActualNetworking Netw	Proportion of all calls actually routed in the network (out of all calls that request routing) for all nodes in the network. Default = 80 percent.	M1/ CSE 1000	CPU, LAN, WAN

Parameter	Description	Switch	Resource impact
aQTNSPerNetwCall	Average number of network skillset queues entered per call. Default = 2. Maximum = 30 / nNetwBestNodes.	M1/ CSE 1000	CPU, LAN, Disk Space, WAN
nNetSkillsets	Number of network skillsets (that is, skillsets that route calls to another node). Maximum = 100.	M1/ CSE 1000	Disk Space
NCC_Period_Min	Routing table update interval. Default = 5 minutes.	M1/ CSE 1000	WAN
nNetwBestNodes	Average number of nodes to which calls are queued with a QTNS command, for all nodes in the network. (This is currently fixed at 3 and cannot be changed.)	M1/ CSE 1000	CPU, LAN, Disk Space, WAN
Nodal networking parameters			
pCBCNetworkNode	Proportion of network CBC data that is collected at the local node when it is a destination node. Default = pCBCNetwork.	M1/ CSE 1000	CPU, LAN, Disk Space, WAN
pNetOut	Proportion of calls arriving at the local node that request routing to another node. Default = 10 percent.	M1/ CSE 1000	CPU, LAN, Disk Space, WAN
pNetOutOtherNode	Proportion of networked calls originating at this node that request routing to a particular other node in the network. Default = 100 percent * 1 / (nNetNodes –1). **Note:** Calculate this parameter for each node in the network to which this node routes calls.	M1/ CSE 1000	WAN

Parameter	Description	Switch	Resource impact
pActualNetworking	Proportion of all calls actually routed in the network (out of all calls that request routing) for this node. Default = 80 percent.	M1/ CSE 1000	CPU, LAN, WAN
pNetIn	Proportion of all incoming network calls that are presented to agents on the local node. Default = 100 percent * 1 / nNetNodes since all network calls are assumed to be distributed equally.	M1/ CSE 1000	CPU, LAN, Disk Space, WAN
pNetInOtherNode	Proportion of incoming networked calls originating at a particular node in the network. Default = 100 percent * 1 / (nNetNodes –1). **Note:** Calculate this parameter for each node in the network that routes calls to this node.	M1/ CSE 1000	WAN
aQTNSPerCall	Average number of network skillset queues entered per network out call. Default = 2. Maximum = 30 / nBestNodes.	M1/ CSE 1000	CPU, LAN, Disk Space, WAN
nBestNodes	Average number of nodes queued for a QTNS command executed at the local node. Default = 3. Maximum = min (20, nNetNnodes – 1).	M1/ CSE 1000	CPU, LAN, Disk Space, WAN

Parameter	Description	Switch	Resource impact
Database			
nDInterval	Number of days that the historical interval data is kept online.	Both	Disk Space
nDDay	Number of days that the historical daily data is kept online.	Both	Disk Space
nWWeek	Number of weeks that the historical weekly data is kept online.	Both	Disk Space
nMMonth	Number of months that the historical monthly data is kept online.	Both	Disk Space
nDCallbyCall	Number of days that the CBC event records are kept online (part of CBC database).	Both	Disk Space
pCBCNode	Proportion of local CBC data that is collected at the local node. Default=100 percent.	Both	Disk Space
nDAgentStat	Number of days that the agent event records are kept online.	Both	Disk Space
nDIVRStat	Number of days that IVR event records are kept online.	Both	Disk Space
nHrsBackup	Number of hours allowed for online backup.	Both	Disk Space
Data characteristics			
nRTFormulas	Number of real-time formulas defined.	Both	Disk Space
nRTColumns	Number of columns in real-time displays.	Both	Disk Space

Parameter	Description	Switch	Resource impact
nScriptVarsPerScripts	Number of script variables per script.	Both	Disk Space
aScriptTreeDepth	Average depth of script execution tree.	Both	Disk Space
pBatchAssignFactor	Proportion of elements (for example, agent skillsets or agent supervisors) assigned in agent to skillset or agent to supervisor assignments.	Both	Disk Space
nTelsetFields	Number of fields on the agent's phoneset display. **M1/CSE 1000:** Default = 11 fields x 4 types (44); **DMS/MSL-100:** Default = 0.	Both	Disk Space
Real-time displays			
AgScrUpdateIntvl	Weighted average of the update rate of all agent RTD screens. Minimum = 0.5 second. Typical value = 3 seconds.	Both	CPU, LAN
RTDScrUpdateIntvl	Weighted average of the update rate of other RTD screens (other than agent RTDs). Minimum = 2 seconds. Typical value = 3 seconds.	Both	CPU, LAN
nRTDAgRows	Number of rows per agent RTD screen (nAgents/nSupervisors).	Both	CPU, LAN
nRTDAppRows	Number of rows per application RTD screen. (This number is always nApplications.)	Both	CPU, LAN

Parameter	Description	Switch	Resource impact
nRTDCCRows	Number of rows per nodal RTD screen. This is fixed at 1.	Both	CPU, LAN
nRTDSkillRows	Average number of rows per skillset RTD screen, average number of skillsets per supervisor (aSkill_Supv).	Both	CPU, LAN
nRTDIVRRows	Average number of rows per IVR RTD screen.	M1/ CSE 1000	CPU, LAN
nRTDRouteRows	Average number of rows per route RTD screen.	M1/ CSE 1000	CPU, LAN
aAgStatesCall	Average number of agent states per call.	Both	CPU, LAN
Real-time API			
RTIUpdateIntvl	Weighted average of the update (refresh) interval of all real-time API applications. Minimum and typical values = 2 seconds.	Both	CPU, LAN
nRTIAgRows	Number of rows per RT API agent statistics (nAgents).	Both	CPU, LAN
nRTIAppRows	Number of rows per RT API application stats (nApplications).	Both	CPU, LAN
nRTICCRows	Number of rows per RT API nodal statistics. This is fixed at 1.	Both	CPU, LAN
nRTISkillRows	Number of rows per RT API skillset statistics (nSkillsets).	Both	CPU, LAN
nRTIClients	Number of RTD API clients.	Both	CPU, LAN

Parameter	Description	Switch	Resource impact
nRTIIVRRows	Number of rows per RT API IVR statistics (nIVRQ).	M1/ CSE 1000	CPU, LAN
nRTIRouteRows	Number of rows per RT API route statistics (nRoutes).	M1/ CSE 1000	CPU, LAN
Graphical Real-Time Display			
GRTDUpdateIntvl	Weighted average of the update (refresh) interval of all GRTD applications. Minimum and typical values=2 seconds.	Both	CPU, LAN
nGRTDAgRows	Number of rows of agent statistics (nAgents).	Both	CPU, LAN
nGRTDAppRows	Number of rows of application statistics (nApplications).	Both	CPU, LAN
nGRTDCCRows	Number of rows of nodal statistics. This is fixed at 1.	Both	CPU, LAN
nGRTDSkillRows	Number of rows of skillset statistics (nSkillsets).	Both	CPU, LAN
nGRTDClients	Number of GRTD clients.	Both	CPU, LAN
RSM parameters			
RDTUpdateIntvl	Update (refresh) interval for the RSM Data Transmission component.	Both	CPU, LAN
nRSMAgRows	Number of rows of agent statistics (nAgents).	Both	CPU, LAN
nRSMAppRows	Number of rows of application statistics (nApplication).	Both	CPU, LAN

Parameter	Description	Switch	Resource impact
nRSMCCRows	Number of rows of nodal statistics. This is fixed at 1.	Both	CPU, LAN
nRSMSkillRows	Number of rows of skillset statistics (nSkillsets).	Both	CPU, LAN
nRSMIVRRows	Number of rows per RT API IVR statistics (nIVRQ).	M1/ CSE 1000	CPU, LAN
nRSMRouteRows	Number of rows per RT API route statistics (nRoutes).	M1/ CSE 1000	CPU, LAN
Host Data Exchange (if present)			
aDX_SndReq_ParNum	Average number of Send Request command parameters.	Both	CPU, LAN
aDX_SndReq_ParSize	Average size of Send Request parameters.	Both	CPU, LAN
aDX_GetResp_ParNum	Average number of Get Response command parameters.	Both	CPU, LAN
aDX_GetResp_ParSize	Average size of Get Response parameters.	Both	CPU, LAN
aDX_SndInfo_ParNum	Average number of Send Info command parameters.	Both	CPU, LAN
aDX_SndInfo_ParSize	Average size of Send Info parameters.	Both	CPU, LAN
External IVR (if present)			
aExternal_IVR_Size	Average number of bytes in the external IVR caller-entered-data (CED) message sent to Symposium Call Center Server.	DMS/ MSL-100	CPU, LAN

Parameter	Description	Switch	Resource impact
Event interface (M1/CSE 1000 only, if present)			
aEIUpdateIntvl	Average update (refresh) interval of all Event Interface applications. Range = 0.5 seconds – 5 seconds. Default = 0.5 seconds.	M1/ CSE 1000	CPU, LAN
pEventsCall	Proportion of the number of events available that are sent to client applications per call. Default = 80 percent. **Note:** The number of events sent to a client is application-dependent.	M1/ CSE 1000	CPU, LAN
nSEIClients	Number of Event Interface API clients. Maximum = 3.	M1/ CSE 1000	CPU, LAN
Voice Services (M1/CSE 1000 only)			
nGCB_Duration	Duration (in seconds) of a Give Controlled Broadcast in Start/Stop mode.	M1/ CSE 1000	Voice Ports
nGCBC_Duration	Duration (in seconds) of a Give Controlled Broadcast in Continuous mode.	M1/ CSE 1000	Voice Ports
nVSCDG_Duration	Duration (in seconds) of a Collect Digits voice session.	M1/ CSE 1000	Voice Ports
nGIVR_Duration	Duration of the Give IVR treatment.	M1/ CSE 1000	Voice Ports
nGCB_Simultaneous	Number of distinct Give Controlled Broadcast sessions played simultaneously in Start/Stop mode.	M1/ CSE 1000	Voice Ports

Parameter	Description	Switch	Resource impact
nGCBC_ Simultaneous	Number of distinct Give Controlled Broadcast played simultaneously in Continuous mode.	M1/ CSE 1000	Voice Ports
nGCB_WTimer	The length (in seconds) of the Broadcast Port Wait Timer.	M1/ CSE 1000	Voice Ports
Inbound call complexity parameters			
aQTSPerCall	Average number of skillset queues entered per inbound call.	Both	Disk Space, CPU
aQTAPerCall	Average number of agent queues entered per inbound call.	Both	Disk Space, CPU
aGRANPerCall	Average number of Give RAN treatments per inbound call (never with GCB).	Both	CPU, LAN, Disk Space
aGMUSPerCall	Average number of Give Music treatments per inbound call.	Both	CPU, LAN, Disk Space
aIFTHPerCall	Average number of If Then Else treatments per inbound call.	Both	CPU
aINTRPerCall	Average number of Intrinsic References per inbound call (Expected Wait Time, Longest Idle Agent, Oldest Call, Position in Queue).	Both	CPU
aHDXSIPerCall	Average number of Host Data Exchange Send Info treatments per inbound call (only if Host Data Exchange is present). For example, `SEND INFO Provider_ID XXXX YYYY`	Both	CPU, LAN, Disk Space

Parameter	Description	Switch	Resource impact

aHDXRGPerCall	Average number of Host Data Exchange Send Request/Get Response treatments per inbound call (only if Host Data Exchange is present). For example,
	`SEND REQUEST Provider_ID XXXX YYYY`
	`GET RESPONSE Provider_ID XXXX YYYY`
		Both	CPU, LAN, Disk Space

aMSPPerCall	Average number of screen pops per inbound call.	Both	CPU, LAN
aMMSGPerCall	Average number of MLS messages per inbound call (excluding screen pops).	Both	CPU, LAN
pTransferIn	Proportion of inbound calls that are transferred to another agent or DN.	Both	CPU, LAN
pConferenceIn	Proportion of inbound calls that are conferenced with another agent or supervisor.	Both	CPU, LAN

aGCBPerCall	Average number of controlled broadcasts in Start/Stop mode per inbound call. Never with Give RAN. For example,
	`Give Controlled Broadcast Announcement YYYY`
	`Play Prompt Voice Segment X`
		M1/ CSE 1000	CPU, LAN, Disk Space, Voice Ports

Parameter	Description	Switch	Resource impact

aGCBCPerCall	Average number of controlled broadcasts in Continuous mode per inbound call. For example,
	`Give Controlled Broadcast Announcement YYYY`
	`Play Prompt Voice Segment X continuous`
		M1/ CSE 1000	CPU, LAN, Disk Space, Voice Ports

aVSCDGPerCall	Average number of collect digit services per inbound call. 2 digits each time (including voice session and play prompt). For example,
	`Open Voice Session VVVV`
	`Play Prompt Voice Segment SSSS`
	`COLLECT 2  DIGITS INTO ZZZZ`
	`End Voice Session`
		M1/ CSE 1000	CPU, LAN, Disk Space, Voice Ports

aGIVRPerCall	Average number of Give IVR treatments per inbound call:
	`GIVE IVR NNNN`
	`With Treatment TTTT`
		M1/ CSE 1000	CPU, LAN, Disk Space, Voice Ports

Outbound call complexity parameters			
aAttPerOutCall	Average number of unsuccessful call attempts per successful outbound call. A successful outbound call is one that reaches a live person.	M1/ CSE 1000	CPU, LAN

Parameter	Description	Switch	Resource impact
pUCallsNCon	Proportion of unsuccessful calls not establishing a PSTN connection. **Note:** An unsuccessful call can result in either a PSTN connection that does not reach a live party (for example, one connecting to an answering machine), or in an unsuccessful PSTN connection (for example, one resulting in a busy tone). See "Outbound call models (Meridian 1/CSE 1000 only)" on page 349 for more details.	M1/ CSE 1000	CPU, LAN
aMSPPerOutCall	Average number of screen pops per outbound call.	M1/ CSE 1000	CPU, LAN
aMMSGPerOutCall	Average number of MLS messages per outbound call (excluding screen pops).	M1/ CSE 1000	CPU, LAN
aMMSGPerConUCall	Average number of MLS messages per unsuccessful call that results in a successful PSTN connection.	M1/ CSE 1000	CPU, LAN
aMMSGPerNCon	Average number of MLS messages per unsuccessful call that results in an unsuccessful PSTN connection.	M1/ CSE 1000	CPU, LAN
pTransferOut	Proportion of outbound calls that are transferred to another agent or DN.	Both	CPU, LAN
pConferenceOut	Proportion of outbound calls that are conferenced with another agent or supervisor.	Both	CPU, LAN

Parameter	Description	Switch	Resource impact
Meridian Link Services, transfers, and conferencing			
aMMSG_Size	Average MLS message size, in bytes, not including standard overhead of 88 bytes (78 for TCP/IP plus 10 for collisions due to the CSMA/CD Ethernet protocol). **Note:** Only a limited set of commands are supported for the DMS/MSL-100.	Both	LAN
pConf_MLS	Proportion of conferenced calls completed by an MLS application (for example, Symposium Agent).	M1/ CSE 1000	CPU, LAN
pTrnf_MLS	Proportion of transferred calls completed by an MLS application (for example, Symposium Agent).	M1/ CSE 1000	CPU, LAN
aMMSGPerTx	Average number of MLS messages per call transfer.	M1/ CSE 1000	CPU, LAN
aMMSGPerConf	Average number of MLS messages per call conference. **Note:** This does not include the standard overhead of 88 bytes (78 for TCP/IP plus 10 for collisions due to the CSMA/CD Ethernet protocol).	M1/ CSE 1000	CPU, LAN

Note: Inbound call complexity parameters represent the number of executed statements, not the number of statements in the script.

Determine the expected call rate for network calls (M1/CSE 1000 only)

Types of calls

When networking is available, five types of calls are recognized on Symposium Call Center Server. These five types are shown in the following table. The call costs are an intuitive description of costs associated with the calls. The formal costs are described in the relevant sections on CPU, memory, and disk impact.

Call/request type	Description	Call cost assumptions
Call: Local—Local	Calls originating locally, handled by local agents.	Described by the complexity of the Symposium Call Center Server local call model.
Call: Local—Network	Calls originating locally, handled by agents on other nodes. Calls are given all treatments that are part of the local call model before being sent to an agent on a remote node.	Equal to the complexity of the Symposium Call Center Server local call model *minus* the final connect to agent *plus* the cost of an agent request to the network node.
Call: Network—Local	Calls originating on other nodes, handled by local agents.	The cost of these calls is the cost of processing the agent request and handing the call to an agent. It is assumed that all call treatments are provided on the originating node of the call.
Request: Local—Network	An unsuccessful request for the network agent sent whenever a `Queue To Network Skillset` is executed. (All successful requests are included in Call: Local–Network.)	The cost of this request is significantly smaller than the cost of a call; it includes only sending a request and then canceling it.

Call/request type	Description	Call cost assumptions
Request: Network—Local	An unsuccessful request for the local agent received from a network node. (All successful requests are included in Call: Network – Local.)	The cost of this request is significantly smaller than the cost of a call. It includes only processing and the cancellation of a request.

Call rate

CallRate is the average rate of call arrivals to and from the Symposium Call Center Server system. The call arrival rate is measured in Calls Per Hour and is based on steady arrival traffic. Throughout this document, CallRate refers to sustainable steady arrival traffic unless explicitly stated otherwise.

Service time

Call rate, number of agents, and the average service time are related: given the same call rate, the more agents there are, the longer the mean service time can be. For example, if the call rate is 60 calls per hour and there is only one agent, then the mean service time cannot be more than 1 minute. On the other hand, if there are 60 agents, then each can talk for up to an hour.

Note: Service time is the time that the agent is involved in serving a call. It is the sum of average talk time, time required for post call processing when the agent is not available to handle other calls, and the intercall interval (such as union break time, if any). Average Service Time is also known as Mean Time Between Calls (MTBC).

Call rate computations by call type

Each of the call types described above has a different call rate parameter. The following table shows the call rate computations for these call types. The rates for different call and request types are used throughout this document.

Call type	Parameter name	Call rate formula	Description
n/a	nwAccNetwPeakCall Rate	PeakNetworkCallRate * pNetOutNetw * pActualNetworkingNetw	# calls handled at a different node than the originator (network calls)
n/a	nwReqNetwPeakCall Rate	aQTNSPerNetwCall * nNetwRequestsSent * PeakNetworkCallRate * pNetOutNetw	# networking requests
n/a	nwRejNetwPeakCall Rate	nwReqNetwPeakCallRate – nwAccNetwPeakCallRate	# requests that are rejected/canceled
Call: Local—Network	nwOAccPeakCallRate	PeakCallRate * pNetOut * pActualNetworking	# local calls handled remotely (network out calls)
Call: Local—Local	LocalPeakCallRate	PeakCallRate – nwOAccPeakCallRate	# local calls handled locally
Call: Network—Local	nwIAccPeakCallRate	nwAccNetwPeakCallRate * pNetIn	# remote calls handled locally (network in calls)
n/a	nwOReqPeakCallRate	aQTNSPerCall * nRequestsSent * PeakCallRate * pNetOut	# Outgoing networking requests
n/a	nwIReqPeakCallRate	nwReqNetwPeakCallRate * pNetIn	# Incoming networking requests

Call type	Parameter name	Call rate formula	Description
Request: Local—Network	nwORejPeakCallRate	nwOReqPeakCallRate – nwOAccPeakCallRate	# outgoing requests that are rejected/ canceled
Request: Network—Local	nwIRejPeakCallRate	nwIReqPeakCallRate – nwIAccPeakCallRate	# incoming requests that are rejected/ canceled
n/a	AgentPeakCallRate	LocalPeakCallRate + nwIAccPeakCallRate	# calls handled by agents on the local node
n/a	nwAccNetwDailyCall Rate	DailyNetworkCallRate * pNetOutNetw * pActualNetworkingNetw	# calls handled at a different node then the originator (network calls)
n/a	nwReqNetwDailyCall Rate	aQTNSPerNetwCall * nNetwRequestsSent * DailyNetworkCallRate * pNetOutNetw	# networking requests
n/a	nwRejNetwDailyCall Rate	nwReqNetwDailyCallRate – nwAccNetwDailyCallRate	# requests that are rejected/canceled
Call: Local—Network	nwOAccDailyCallRate	DailyCallRate * pNetOut * pActualNetworking	# local calls handled remotely (network out calls)
Call: Local—Local	LocalDailyCallRate	DailyCallRate – nwOAccDailyCallRate	# local calls handled locally
Call: Network—Local	nwIAccDailyCallRate	nwAccNetwDailyCallRate * pNetIn	# remote calls handled locally (network in calls)

Call type	Parameter name	Call rate formula	Description
n/a	nwOReqDailyCallRate	aQTNSPerCall * nRequestsSent * DailyCallRate * pNetOut	# Outgoing networking requests
n/a	nwIReqDailyCallRate	nwReqNetwDailyCallRate * pNetIn	# Incoming networking requests
Request: Local—Network	nwORejDailyCallRate	nwOReqDailyCallRate – nwOAccDailyCallRate	# outgoing requests that are rejected/ canceled
Request: Network—Local	nwIRejDailyCallRate	nwIReqDailyCallRate – nwIAccDailyCallRate	# incoming requests that are rejected/ canceled
n/a	AgentDailyCallRate	LocalDailyCallRate + nwIAccDailyCallRate	# calls handled by agents on the local node

Some of these quantities are based on the number of requests that are sent whenever a call is queued to a network skillset. The number of requests is defined as

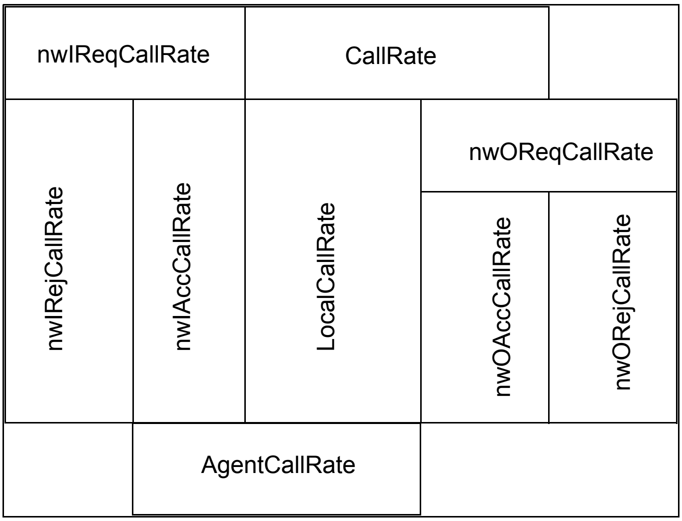
```
nRequestsSent = Min (nBestNodes, nNetNodes – 1)

nNetwRequestsSent = Min (nNetwBestNodes, nNetNodes – 1)
```

Note: nBestNodes and nNetwBestNodes are fixed at 3.

The value of the rank table size is fixed at 3 (a design decision), and cannot be controlled by the user.

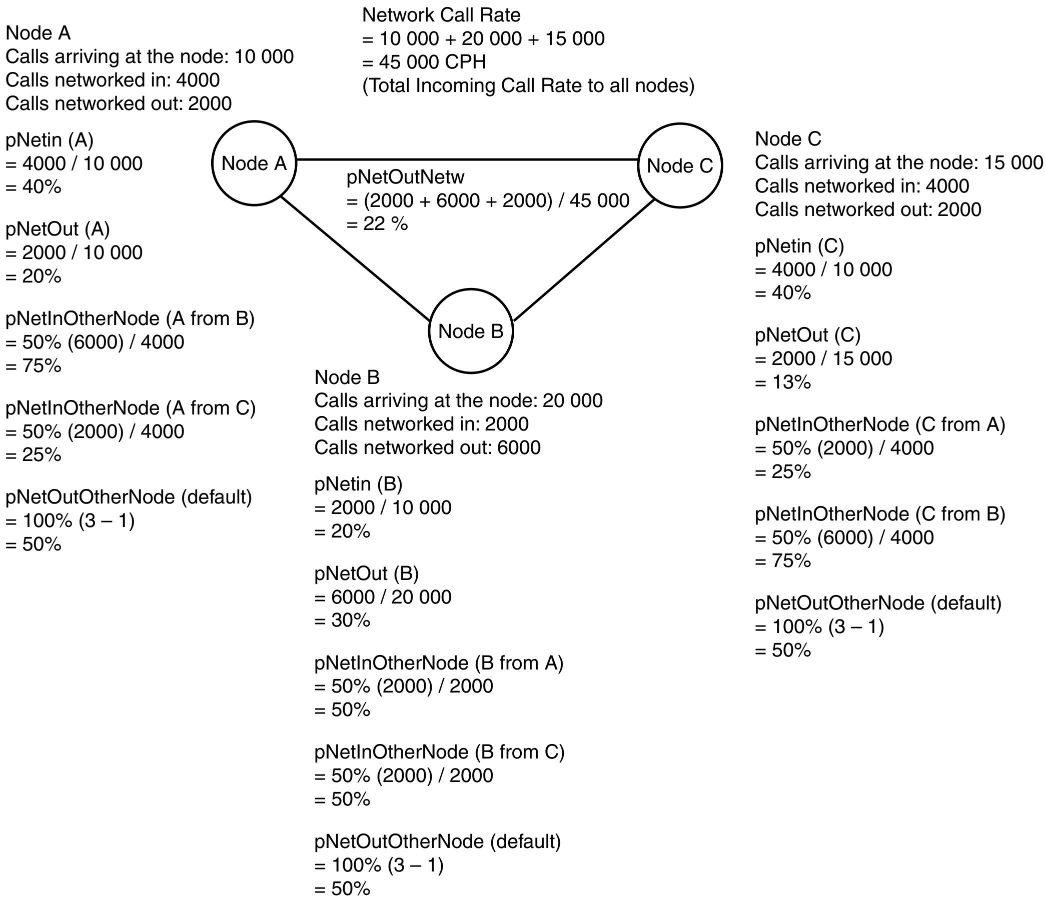
Relationship between call and request rates

The following illustration shows the relationship between different call and request rates defined above. These relationships apply to both peak and daily call rates:



Networking parameters

The following illustration shows the relationship of the networking parameters in a network consisting of three nodes (A, B, C):



Note: This example assumes that calls networked out from a particular node are evenly distributed to the other two nodes.

Calculate server disk utilization

Introduction

The total disk space requirements depend on

- partition size of the C and D drives
- the size of Symposium Call Center Server executable files and the Master and User databases
- the size of the largest table
- the size of database tables
- the disk space utilization factor

The database space (the largest portion of the disk space required) includes the space needed to store configuration tables, event tables, and interval tables. The formulas for computing the sizes of the individual Symposium Call Center Server tables, as well as the definition of the SizeOf() notation, are presented in Appendix C, "Database table sizes."

The following sections provide formulas for calculating disk space requirements.

C drive

The C drive contains the operating system files and the page file. The minimum size for the C drive is 2 Gbytes, and the recommended size is

C_Drive_SpaceKb = 4000000

The file space breaks down as follows:

WINNT_Kb = 850000 (minimum)

WINNT_Swap_files_Kb = 384000 (minimum)

For a system with more than 600 agents, the paging file is 1.5 * 512 Mbytes = 768 Mbytes.

WINNT_Swap_files_Kb = 768000

Despite the increase in the size of the paging file, the required space does not exceed the 2 Gbyte minimum specification; however, if more than 512 Mbytes of RAM is installed, the paging file size increases, and a larger C partition may become necessary.

D drive

The D drive contains the Symposium Call Center Server software, including Sybase. The minimum size for the D drive is 2 Gbytes, and the recommended size is

D_Drive_SpaceKb = 4000000

The approximate size of the files residing on the D drive is as follows:

SCCS_files_Kb = 700,000

MAS_files_Kb = 103,000

Sybase_DB_Kb = 74,000

MAS_DB_Kb = 230,000

Largest table size

As per Sybase recommendations, there must be additional space equivalent to the size of 120 percent of the largest table for the database system to function properly. The largest tables (excluding the CallByCall statistics) are the historical statistics tables (interval, daily, weekly, and monthly) and the event statistics tables. The largest table size is computed as follows:

```
LargestTableSizeKb = MAX(
    SizeOf(NIi***Stat) * nIntervalsPerDay * nDInterval
    SizeOf(NId***Stat) * nDDay
    SizeOf(NIw***Stat) * nWWeek
    SizeOf(NIm***Stat) * nMMonth
    AgentLoginStatSizeKb
    IVRPortStatSizeKb
  )
```

where *** represents the different historical statistics table names.

The largest table overhead is 120 percent. All other overheads, as recommended by Sybase, are log files and temporary disk space overheads. Log files and temporary disk space for the Blue Database are 20 percent and 30 percent respectively. For the CBC database, these values are both 5 percent. In addition, the disk space utilization factor is set to 90 percent:

DB_Log_Overhead = 0.2 (20%)

DB_Temp_Overhead = 0.3 (30%)

CBC_Log_Overhead = 0.05 (5%)

CBC_Temp_Overhead = 0.05 (5%)

LargestTab_Overhead = 1.2 (120%)

Max_Disk_Utilization = 0.9 (90%)

Configuration tables disk space

Configuration tables are "static" tables that contain the information related to the configuration. The information and the size of these tables do not change on a per call basis. The size of these tables depends on a number of global system parameters that are expected to be relatively constant after the initial system setup (such as the total number of agents and activity codes). Configuration table size computations use a number of additional parameters shown in the table in "Record your workload parameters" on page 134. The size of the configuration tables is computed as

ConfigTablesSizeKb = SizeOf(ConfigurationTables)

Event tables disk space

There are four event tables:

- CallByCall Statistics—The largest table. If CBC recording is turned on, this table is updated (that is, a record is added) several times per call, depending on the complexity of the call.
- Agent Login Statistics—Updated every time an agent logs on or logs off.
- IVR Port statistics—Updated every time the status of the IVR port changes.

- Skillset State Statistics—Not currently collected.

Note: CBC statistics are stored in the CBC database. All other tables are stored in the Blue database.

```
CallByCallSizeKb = SizeOf(NIeCallByCallStatYYYYMMDD)
```

The size of the Agent Login Statistics table per day depends in the number of agent events per shift. The size is computed as

```
AgentLoginStatSizeKb = SizeOf(NIeAgentLoginStat)
```

The daily size of the IVR Port Statistics table depends on the number of IVR port events per day (login/logout) and is computed as

```
IVRPortStatSizeKb = SizeOf(NIeIVRPortLoginStat)
```

Interval, Daily, Weekly, and Monthly tables disk space

There are four types of historical statistics tables: interval, daily, weekly, and monthly tables. These tables have similar structure but are updated based on different intervals and are kept online for different durations.

Interval tables

The interval-based records are generated every interval (every 15 minutes). The following formulas are used to estimate the total size of all interval records generated per day:

```
nIntervalsPerDay = nShifts * nShiftsHrs * 4

IntervalStatDailySizeKb =
  nIntervalsPerDay * SizeOf(IntervalStatTables)
```

In addition to the interval statistics tables, there are also temporary interval tables that are used to hold the interval statistics data while the data is being collected. The size of these temporary tables is as follows:

```
IntervalTempSizeKb = SizeOf(TempIntervalTables)
```

Daily tables

Daily records are generated every day. The following formulas are used to estimate the total size of all daily records generated per day:

```
DailyStatDailySizeKb = SizeOf(DailyStatTables)
```

Weekly tables

Weekly records are generated every week. The following formulas are used to estimate the total size of all weekly records generated per week:

```
WeeklyStatWeeklySizeKb = SizeOf(WeeklyStatTables)
```

Monthly tables

Monthly records are generated every month. The following formulas are used to estimate the total size of all monthly records generated per month:

```
MonthlyStatMonthlySizeKb = SizeOf(MonthlyStatTables)
```

Detailed computations

The total disk space required is computed as

```
Overhead_SpaceKb =
  SUMOF(
  C_Drive_SpaceKb (2,000,000 minimum, 4,000,000 recommended)
  D_Drive_SpaceKb (2,000,000 minimum, 4,000,000 recommended)
  )

CBC_DB_SpaceKb =
  CallByCallSizeKb * (nDCallByCall + 1.5) *
  (1 + CBC_Log_Overhead + CBC_Temp_Overhead)

Blue_DB_SpaceKb =
  SUMOF(
    LargestTableSizeKb * LargestTab_Overhead
    ConfigTableSizeKb
    AgentLoginStatSizeKb * nDAgentStat
    IVRPortStatSizeKb * nDIVRStat
```

```
    IntervalStatDailySizeKb * (nDInterval + 2)
    IntervalTempSizeKb
    DailyStatDailySizeKb * (nDDay + 2)
    WeeklyStatWeeklySizeKb * (nWWeek + 2)
    MonthlyStatMonthlySizeKb * (nMMonth + 2)
  ) * (1 + DB_Log_Overhead + DB_Temp_Overhead)

TotalDatabaseSpaceRequiredKb =
  2*max(CBC_DB_SpaceKb, Blue_DB_SpaceKb) /
  Max_Disk_Utilization

TotalDiskSpaceRequiredGb =
  (TotalDatabaseSpaceRequiredKb + Overhead_SpaceKb)/
  1 000 000
```

Backup size computations

In this section, the amount of data that is to be backed up for an online backup is estimated. This is required for estimating the impact of backups on the CPU utilization and for estimating the backup storage requirements.

```
CBCBackupSizeKb =
  CallByCallSizeKb * (nDCallByCall + 0.5)

BlueBackupSizeKb =
  SUMOF(
    ConfigTableSizeKb
    AgentLoginStatSizeKb * (nDAgentStat + 0.5)
    IVRPortStatSizeKb * (nDIVRStat + 0.5)
    IntervalStatDailySizeKb * (nDInterval + 0.5)
    IntervalTempSizeKb
    DailyStatDailySizeKb * nDDay
    WeeklyStatWeeklySizeKb * nWWeek
    MonthlyStatMonthlySizeKb * nMMonth
  )

TotalBackupSizeKb =
  SUMOF(
    CBCBackupSizeKb
    BlueBackupSizeKb
  )
```

Calculate server CPU utilization

Introduction

The total CPU utilization comprises the following primary components:

- base call processing
- inbound call services
- outbound call services (Meridian 1/CSE 1000 only)
- database access
- real-time displays
- real-time API
- GRTD
- RSM data collection and transmission
- event interface
- interval reporting
- networking impact
- Symposium Voice Services on CallPilot impact
- software RAID impact
- Application Server impact

Each of these components is described in the following sections.

Detailed CPU requirement computations

The metric used for CPU resource consumption is CPU utilization. This is defined as the fraction of time the CPU is busy. This value is usually presented as a percentage. Unless otherwise stated, the formulas given for CPU utilization yield fractional values. Values presented for tables and examples may be given in percent, which is 100 * fractional value.

The total CPU requirement is derived by summing all the contributions to CPU utilization. That is, the total CPU utilization is calculated as

$$U_{Total} = \Sigma U_i$$

where

- U_i is a utilization component
- *i* is an index for each component

so that ΣU_i represents the sum of the CPU utilizations over all of the components listed in the following table:

Description	Utilization component (U_i)
Basic Call Processing	U_{BaseCP}
Queue To Skillset	U_{QTS}
Queue To Network Skillset	U_{QTNS}
Queue To Agent	U_{QTA}
Transfer inbound call	U_{TRN_IN}
Conference inbound call	U_{CNF_IN}
Transfer outbound call	U_{TRN_OUT}
Conference outbound call	U_{CNF_OUT}
Give Controlled Broadcast	U_{GCB}
Give Controlled Broadcast Continuous	U_{GCBC}
Collect Digits	U_{VSCDG}
Give IVR	U_{GIVR}
IVR	U_{IVR}
MLS Screen Pops for inbound calls	$U_{MLINK\_SP\_IN}$
MLS Screen Pops for outbound calls	$U_{MLINK\_SP\_OUT}$

Description	Utilization component (U_i)
MLS Applications for inbound calls	U_{MLINK_IN}
MLS Applications for outbound calls	U_{MLINK_OUT}
MLS Conference for inbound calls	$U_{MLINK\_CONF\_IN}$
MLS Transfer for inbound calls	$U_{MLINK\_TX\_IN}$
MLS Conference for outbound calls	$U_{MLINK\_CONF\_OUT}$
MLS Transfer for outbound calls	$U_{MLINK\_TX\_OUT}$
Host Data Exchange Send Info	U_{HDXSI}
Host Data Exchange Request/Get Data	U_{HDXRG}
If-Then-Else	U_{IFTH}
Intrinsics	U_{INTR}
Give RAN	U_{GRAN}
Give Music	U_{GMUS}
Blue Sybase	U_{BS}
CBC Sybase	U_{CBC}
Remote CBC Sybase	U_{RCBC}
Real-time background	U_{BRT}
Real-time displays	U_{RTD}
Real-time API	U_{RTI}
Graphical Real-Time Data	U_{GRTD}
Real-time Statistical Multicast Data Collection (RSC)	U_{RSC}

Description	Utilization component (U_i)
Real-time Statistical Multicast Data Transmission (RST)	U_{RST}
Event Interface Background	U_{BEI}
Event Interface	U_{SEI}
Reporting	U_{REP}
Data Extraction	U_{DATA}
Networking Related	U_{NET}
Real-time Statistical Multicast Background	U_{BRM}
Real-time Statistical Multicast	U_{RSM}

CPU measurements

The following table shows the CPU utilization for each component, based on the Pentium II 300 MHz (PII300) CPU. To change to a different processor, multiply the value by the PII300 relative factor, as provided in the table “CPU capacity” on page 26.

Parameter	Value	Notes
U_{BG}	1.5%	Overall background cpu (%) on PII300
BCC_Cost	0.025 CpuSec	Basic call (on local node for local call)
BCC_Netw_Cost	0.025 CpuSec	Basic call (on local node for outcall)
U_{SW}[2]	14.273%	ftServer 3220 software RAID Impact
QTS_Cost	0.0039 CpuSec	Queue to Skillset
QTNS_Cost	0.0043 CpuSec	Queue to network skillset
QTA_Cost	0.00078 CpuSec	Queue to Agent
TRN_Cost	0.020 CpuSec	Transfer Call

Parameter	Value	Notes
CONF_Cost	0.020 CpuSec	Conference Call
GCB_Cost	0.046 CpuSec	Give Controlled Broadcast (Start/Stop)
GCBC_Cost	0.046 CpuSec	Give Controlled Broadcast (Continuous)
VSCDG_Cost	0.080 CpuSec	Voice Session with Play Prompt and Collect Digits
GIVR_Cost	0.021 CpuSec	Give IVR
IVR_Cost	0.029 CpuSec	Process External IVR messages
IFTHEN_Cost	0.00096 CpuSec	If-Then-Else (the cost is small, close to that of INTR_Cost)
INTR_Cost	0.00096 CpuSec	Intrinsic reference
GRAN_Cost	0.00042 CpuSec	Give RAN
GMUS_Cost	0.0016 CpuSec	Give Music
HDXSI_Cost	0.028 CpuSec	Host Data Exchange—Send Information
HDXRG_Cost	0.056 CpuSec	Host Data Exchange—Send Request / Get Response
MLINK_Msg_Cost	0.0052 CpuSec	MLS Message
MSP_Cost	0.0034 CpuSec	MLS screen pop cost
BCP_Insert_Cost	0.00032 CpuSec	Cost of a single bulk copy procedure (BCP) insert (Sybase)
Remote_BCP_Insert_Cost	0.00012 CpuSec	Cost of a single Remote BCP insert (Sybase)
Cons_Insert_Cost	0.0041 CpuSec	Cost of a single consolidation (Sybase)

Parameter	Value	Notes
Con_Dcon_Cost	0.0181 CpuSec	Cost of a direct Database connect plus disconnect. **Note:** Although this value does not appear in any of the engineering formulas, it was measured to determine the additional impact of directly accessing the database instead of using the standard API call to OA&M. It is the cost of a direct database connection and disconnection.
RTDCell_Cost	0.000054 CpuSec	Cell update cost on RTD
RTICell_Cost	0.000054 CpuSec	Cell update cost on RTI per client
RSCCell_Incr	0.00000000013 CpuSec	The slope of the RSCCell_Cost function
RSC_Const	0.00002 CpuSec	The constant of linearity for the RSCCell_Cost function
RSTCell_Cost	0.00000128 CpuSec	The CPU time, in seconds, required per RSM call sent
U_{BRT}	4.0%	Base RTD/RTI CPU (%) on PII300
BaseRow_Cost	0.066 ms	Base cost for a row selected
ColRow_Cost	0.008 ms	Cost per column per row selected
MultiRow_Cost	1.36 ms	Cost per row selected with >1 view
SEIEvent_Cost	0.0050 CpuSec	Event Monitoring cost on SEI
SEIMessage_Cost	0.00099 CpuSec	Notification Message cost on SEI
U_{BEI}	1.2%	Base Event Interface CPU (%) on PII300
DBBackupDAT_cost	732 CpuSec	Cost to perform an online database backup per Gbytes of data with a DAT drive

Parameter	Value	Notes
DBBackupMLR_cost	366 CpuSec	Cost to perform an online database backup per Gbyte of data with an MLR drive
IREJ_Cost	0.020 CpuSec	Network call rejected or canceled locally. The cost of request and cancellation only.
IACC_Cost	0.050 CpuSec	Network call accepted locally. The cost of the messaging as well as the basic call processing on the local node.
OREJ_Cost	0.0051 CpuSec	Local request canceled/rejected elsewhere. The cost of request and rejection only.
OACC_Cost	0.016 CpuSec	Local call accepted elsewhere. The cost of Basic Call (similar to BCC), as well as the cost of the accepted request.
U_{NCC_GB}	0.31%	NCC Background CPU
NCCRem_BCP_Ins_Cost	0.00028 CpuSec	Cost of a single NCC Remote BCP Insert (Sybase)
NCC_Retrieve_Cost	0.00026 CpuSec	Cost for a row selected
SCCS_CPU_CD	0.018106627 CpuSec	Cost of a connect plus disconnect when the Application Server directly accesses the database

Note: CpuSecs specified are PII300 CPU seconds.

The following sections contain the details of each utilization calculation. The total CPU utilization is summarized at the end. Examples are given in some of the subsections for clarification.

Background call processing

The background CPU is the amount of CPU resource that is used when no other utilization components are running. It is a measured quantity and has been measured to be U_{BG} = 1.5% on a PII300 platform.

Base call processing

The base call processing CPU requirement is the amount of CPU resource required for Symposium Call Center Server to answer untreated calls at the specified call rate. The base CPU resource requirements do not include

- disk access
- queueing to skillsets
- real-time display
- historical reporting

As such, these values bound from below Symposium Call Center Server performance (that is, server performance can never exceed these values).

The equation used for CPU contribution on the PII300 is

```
UBaseCP =
  UBG + (
  BCC_Cost * LocalPeakCallRate
    + BCC_Netw_Cost * nwOAccPeakCallRate
    + BCC_Cost * PeakOutCallRate
  ) / 3600
```

Inbound call services

Call treatment services are treatments given to calls dictated by the script. These include voice services, “Queue to Skillset,” as well as the Basic Call Cost described in the previous section.

Measurements are taken to quantify the CPU resources required for call treatment services. For example, the measurements are based on the CPU cost of executing a single treatment script operation whenever there are no agents available to service the call immediately.

The CPU requirement for these services all have the same calculation:

$$U_i = S_i * N_i * PeakCallRate / 3600$$

where S_i is the CPU cost which was measured in CPU seconds, and N_i is the average number of treatments per call. The following table provides S_i and N_i values used in the formula:

i (service)	S_i (Cost)	N_i (Frequency)
QTS	QTS_Cost	aQTSPerCall
QTNS	QTNS_Cost	aQTNSPerCall * pNetOut
QTA	QTA_Cost	aQTAPerCall
GCB	GCB_Cost	aGCBPerCall
GCBC	GCBC_Cost	aGCBCPerCall
VSCDG	VSCDG_Cost	aVSCDGPerCall
GIVR	GIVR_Cost	aGIVRPerCall
IVR	IVR_Cost	1 (if external IVR); 0 (otherwise)
IFTH	IFTHEN_Cost	aIFTHPerCall
INTR	INTR_Cost	aINTRPerCall
GRAN	GRAN_Cost	aGRANPerCall
GMUS	GMUS_Cost	aGMUSPerCall
HDXSI	HDXSI_Cost	aHDXSIPerCall
HDXRG	HDXRG_Cost	aHDXRGPerCall
TRN_IN	TRN_Cost	pTransferIn * (1 – pTrnf_MLS)
CNF_IN	CONF_Cost	pConferenceIn * (1 – pConf_MLS)
MLINK_SP_IN	MSP_Cost	aMSPPerCall
MLINK_IN	MLINK_Msg_ Cost	aMMSGPerCall **Note:** If you are using Symposium Voice Services on CallPilot, increase aMMSGPerCall by 10.

i (service)	S_i (Cost)	N_i (Frequency)
MLINK_CONF_IN	MLINK_Msg_Cost	aMMSGPerConf * pConferenceIn * pConf_MLS
MLINK_TX_IN	MLINK_Msg_Cost	aMMSGPerTx * pTransferIn * pTrnf_MLS

Example

What is the CPU cost of MLS screen pops for a call rate of 6000 calls per hour?

Solution

The general formula is $U_i = S_i * N_i * R / 3600$
From the preceding table, S_i is 0.0052. From "Call complexity" on page 345, average number of screen pops per call (N_i) is 1.2 for the Meridian 1/CSE 1000. Thus, U_{MSP} = 1.0%

Outbound call services (Meridian 1/CSE 1000 only)

The CPU contribution due to outbound MLS applications is made up of three components:

- MLS messages due to successful outbound calls
- MLS messages due to attempts resulting in unsuccessful PSTN connections
- MLS messages due to attempts resulting in calls not connected

A successful outbound call is defined as a call that reaches a live party. An unsuccessful call could be either a PSTN connection not reaching a live person or a call that is not connected. Each of these events corresponds to a term in the bracketed sum in the MLINK_OUT row in the following table.

As in the inbound case, the CPU requirement for these contributions all have the same calculation:

$$\mathbf{U_O} = S_O * N_O * PeakOutCallRate / 3600$$

where S_o is the CPU cost which was measured in CPU seconds and N_o is the average number of treatments per call. The following table provides S_o and N_o values used in the formula.

o (Service)	**S_o (Cost)**	**N_o (Frequency)**
TRN_OUT	TRN_Cost	pTransferOut * (1 – pTrnf_MLS)
CNF_OUT	CNF_Cost	pConferenceOut * (1 – pConf_MLS)
MLINK_OUT	MLINK_Msg_Cost	aMMSGPerOutCall + aAttPerOutCall * (1 – pUCallsNCon) * aMMSGPerConUCall + aAttPerOutCall * pUCallsNCon * aMMSGPerNCon
MLINK_SP_OUT	MSP_Cost	aMSPPerOutCall
MLINK_CONF_OUT	MLINK_Msg_Cost	aMMSGPerConf * pConferenceOut * pConf_MLS
MLINK_TX_OUT	MLINK_Msg_Cost	aMMSGPerTx * pTransferOut * pTrnf_MLS

Database operations

Database operational requirements describe the database access (insert) capabilities for Symposium Call Center Server. The requirements are based on the amount and the type of data to be written in the database per unit of time. The following sections describe the computations to determine the disk access requirements. The computations are based on measurements performed on a non-RAID configuration with all disk drives having similar characteristics.

Disk insert rate is based on the number of table rows to be written into the database per unit of time. The rows of the event and interval tables are written using the Bulk Copy Procedure (BCP) method. The interval tables are then consolidated by the database. Experimental measurements performed on a MAS server (Pentium 100) determined the values for BCP_Insert_Cost and Cons_Insert_Cost in units of CPU seconds incurred per insert for BCP and Consolidations scaled to the PII300. These values are given in the table in “Detailed CPU requirement computations” on page 169.

Note: Bulk Copy Procedure (BCP) is a Sybase utility.

The following formulas are used to compute the rate of inserts (rows per second) required based on the system parameters.The formulas for the number of rows for the individual tables and the definition of the NumberOfRecords() notation are presented in Appendix C, “Database table sizes.”

Number of records per day for event tables

To compute the number of records (rows) per day for the event tables, use this formula:

```
CallByCall_RecsDay =
  NumberOfRecords(NIeCallByCallStatYYYYMMDD)

AgentLoginStat_RecsDay =
  NumberOfRecords(NIeAgentLoginStat)

IVRPortStat_RecsDay =
  NumberOfRecords(NIeIVRPortLoginStat)
```

Number of records per day for interval tables

To compute the number of records (rows) per day for interval historical statistics tables, use this formula:

```
nIntervalsPerDay = nShifts * nShiftsHrs * 4

IntervalStat_RecsDay =
  nIntervalsPerDay * NumberOfRecords(IntervalStatTables)
```

Note: Daily, Weekly, and Monthly tables are generated during the Nightly database maintenance operations.

Number of records per second

To compute the total number of records (rows) to be written into the database every second for the Blue and CBC databases, use this formula:

```
Blue_BCP_DiskInsertRate_InsertsSec =
  (IntervalStat_RecsDay + AgentLoginStat_RecsDay +
  IVRPortStat_RecsDay) / (3600 * nShifts * nShiftsHrs)

CBC_BCP_DiskInsertRate_InsertsSec =
  CallByCall_RecsDay * (PeakCallRate / DailyCallRate) /
  (3600 * 24)
```

The resulting CBC_BCP_DiskInsertRate_InsertsSec represents the number of inserts per second required to support the given call rate and workload. These records are written into the database using Sybase's BCP operation.

Number of consolidations per second

After the records are written into the database, some of the records, including all interval tables, must be consolidated. This consolidation operation requires additional CPU resources. The following is the computation of the parameter Blue_Cons_DiskInsertRate_InsertsSec. This parameter refers to the number of consolidations per second required for the Blue database, as in the following formula:

```
Blue_Cons_DiskInsertRate_InsertsSec =
  IntervalStat_RecsDay / (3600 * nShifts * nShiftsHrs)
```

Data manipulation

The CPU requirements of the Sybase SQL Server to support the insert rate as computed previously, depend mainly on the number of disk inserts per second, and can be estimated as

U_{BS} **= Blue_SybaseTotalCPU%** =

```
  SUMOF (
    Blue_BCP_DiskInsertRate_InsertsSec * BCP_Insert_Cost
    Blue_Cons_DiskInsertRate_InsertsSec *
    Cons_Insert_Cost
  ) * 100%
```

U_{CBC} =

```
  CBC_BCP_DiskInsertRate_InsertsSec * BCP_Insert_Cost *
  100%
```

U_{RCBC} =

```
  CBC_RBCP_DiskInsertRate_InsertsSec *
  Remote_BCP_Insert_Cost * 100%
```

where

- `CBC_RBCP_DiskInsertRate_InsertsSec = NCBC_Records_PerNodePerHour / 3600`
- NCBC_Records_PerNodePerHour is defined in “Network call-by-call traffic per node (CLAN) (Meridian 1/CSE 1000 only)” on page 238.

Data extraction

Symposium Call Center Server is supplied with a number of views for periodic and on-demand extraction of data from the database. These views are described in Appendix H, “Symposium Call Center Server database views.” The CPU requirements for data extraction depend on

- the complexity of the query
- the number of rows selected from the views
- the number of columns selected

A single data extraction can select data from multiple views at one time that are joined based on the rules defined in the entity relationship diagram (ERD). For more information, refer to the *Nortel Networks Symposium Call Center Server Historical Reporting and Data Dictionary.*

Single-view data extraction

For single-view data extractions, the impact is approximately linear with respect to the number of columns.

The following formulas describe the estimation of the impact of single-view data extraction in terms of the number of milliseconds of PII300 CPU required to extract the data. Before applying these formulas, you must know the number of rows to be extracted (DataRows):

```
DataRowCPU_msec = ViewColumns * ColRow_Cost + BaseRow_Cost
```

Multiple-view data extraction

For multiple-view data extractions, the impact is dependent on the actual complexity of the data selection operation and on the state of the database at the time the report is generated. The DataRowCPU_msec is taken as MultiRow_Cost.

```
DataCPU_msec = DataRowCPU_msec * DataRows
```

To determine the impact of the data extraction, compute the DataCPU_msec for each data extraction run during the busy hour, and multiply it by the number of times that the data extraction is expected to be executed:

```
TotalExtractDataCPU_msec =
  SUMOF_ALL(
  DataCPU_msec * ExtractionsPerBusyHour...for all data extractions
  )
```

U_{DATA} =
  TotalExtractDataCPU_msec / (1000 * 3600)

The DataTotalCPU% value would be the percentage of CPU required for data extraction during the busy hour.

Real-time data

CPU resources are required for the following users of real-time data:

- real-time displays (RTD)—real-time displays on Fat (non-Web) Client PCs
- real-time APIs (RTI)—custom applications
- Graphical Real-Time Displays (GRTD)—an application that provides graphical views of the RTDs
- Real-time Statistical Multicast (RSM)—an application that uses multicast technology to send out the same information as RTD API (see "Real-time Statistics Multicast" on page 186)

Real-time background

If one or more of these features is in use, a background CPU cost is incurred. This cost has been derived from measurements and is given as U_{BRT} in "CPU measurements" on page 172. The governing equation is

$$\mathbf{U_{BRT}} = U_{BRT} \text{ if either RTD, RTI or GRTD, or RSM is operating}$$
$$= 0 \text{ otherwise}$$

Real-time displays

The real-time display (RTD) load on the CPU depends on the number of Fat (non-Web) Clients, the number of screens displayed on the clients, the size of the screens, and the refresh rate. The equations used for CPU contribution due to the RTDs are

$$\mathbf{U_{RTD}} = U_{Client} * nFATClients$$

$$\mathbf{U_{Client}} = \Sigma U_{Screen}$$

$$\mathbf{U_{Screen}} = N_{Columns} * N_{Rows} * RTDCell\_Cost / I_{Screen}$$

where

- screen refers to one of the displays, such as Agent, Application, Nodal, or Skillset
- I_{Screen} is the requested refresh interval for a single screen (AgScrUpdateIntvl for Agent screens, RTDScrUpdateIntvl for other screens)
- N_{Rows} is the number of rows displayed on a single screen

- $N_{Columns}$ is the number of columns displayed on a single screen

  Note: The number of columns that come with the standard templates supplied with the product are given in "Real-time display traffic on the CLAN" on page 213.
- *RTDCell_Cost* is the CPU time in seconds required per displayed cell (CpuSec_Cell_Refresh). This value is given in the table on page 172.
- U_{Screen} is the CPU utilization per client per display type.
- U_{Client} is the CPU utilization per client.
- *NFATClients* is the number of non-Web Clients (if the Web Client is not in use, this value is equal to nSupervisors).
- U_{RTD} is the total CPU utilization due to the RTDs.

Real-time API

The equation used for CPU contribution due to the Real-time APIs (RTI) on the PII300 is

$$\mathbf{U_{RTI}} = \mathtt{nRTIClients} * \mathtt{RTICell\_Cost} * \Sigma(N_i / I_i)$$

where

- N_i is the number of cells sent for statistic i which is calculated as the number of rows multiplied by the number of columns sent for the statistic
- *RTICell_Cost* is the CPU time in seconds required per cell sent (CpuSec_Cell_Refresh). This value appears in "CPU measurements" on page 172.
- I_i is the Refresh Interval for statistic i (RTIUpdateIntvl)

Graphical real-time data

The equation used for CPU contribution due to the graphical real-time data (GRTD) application on the PII300 is

$$\mathbf{U_{GRTD}} = \mathtt{nGRTDClients} * \mathtt{RTICell\_Cost} * \Sigma(N_i / I_i)$$

where

- N_i is the number of cells sent for statistic i, which is calculated as the number of rows multiplied by the number of columns sent for the statistic

- *RTICell_Cost* is the CPU time in seconds required per cell sent (CpuSec_Cell_Refresh). This value appears in “CPU measurements” on page 172.
- I_i is the refresh interval for statistic i (RTIUpdateIntvl)

Real-time Statistics Multicast

The CPU cost due to Real-time Statistics Multicast (RSM) can be broken down into two parts—a base cost associated with the creation of raw data tables by SDP and RDC, and a multicast cost incurred by RSM while multicasting the data to a virtual IP address.

Real-time Statistics Multicast Data Collection

The CPU contribution due to the base cost, that is, the Real_Time Statistical Multicast Data Collection (RSC) on the base platform (not including the background cost) is

$$\mathbf{RSCCell\_Cost} = \mathrm{RSCCell\_Incr} * \Sigma(\mathrm{nRSMStr\_RSCi} * N_i/I_{RSC\_i}) + \mathrm{RSC\_Const}$$

$$\mathbf{U_{RSC}} = \mathrm{RSCCell\_Cost} * \Sigma(\mathrm{nRSMStr\_RSCi} * N_i/I_{RSC\_i})$$

where

- N_i is the number of cells sent for statistic i, which is calculated as the number of rows multiplied by the number of columns sent for the statistic.
- *RSCCell_Cost* is the CPU time in seconds required per cell sent. The values used to derive this parameter are given in the table on page 172.
- *RSC_Const* is the constant of linearity for the RSCCell_Cost function.
- *RSCCell_Incr* is the slope of the RSCCell_Cost function.
- I_{RSC_i} is the refresh interval for statistic i (RSCUpdateIntvl). This parameter is set to 1 second for agent statistics, and 2 seconds for other statistics.
- *nRSMStr_RSCi* is the number of streams being kept by the SDP/RSC engine of the statistic i. This number can be 0, 1, or 2.

Real-time Statistics Multicast Data Transmission

The CPU contribution due only to the multicasting activity, that is, the Real_Time Statistical Multicast Data Transmission (RST) on the base platform (not including the background cost) is

$$\mathbf{U}_{RST} = \mathtt{RSTCell\_Cost} * \Sigma_i (\mathtt{nRSMStr\_RSCi} * N_i / I_{RSM\_i})$$

where

- N_i is the number of cells sent for statistic i, which is calculated as the number of rows multiplied by the number of columns sent for the statistic.
- *RSTCell_Cost* is the CPU time in seconds required per cell sent. This value is given in the table on page 172.
- I_{RSM_i} is the refresh interval for statistic i (RSTUpdateIntvl).
- *nRSMStr_RSCi* is the number of streams being sent of the statistic i. This number can be 0, 1, or 2. See "Real-time Statistics Multicast Traffic" on page 220 for an explicit definition.

Event interface

Event interface background

The background CPU due to the Event Interface operation is given as

$$\mathbf{U_{BEI}} = U_{BEI} \text{ if SEI is operating}$$
$$= 0 \text{ otherwise}$$

Event Interface

The equation used for CPU contribution due to the Event Interface on the Symposium Call Center Server system is

$$\mathbf{U_{SEI}} = \mathtt{nSEIClients} * (\mathtt{pEventsCall} * \mathtt{SEIEvent\_Cost} * \mathtt{aNEvents} / 3600 + \mathtt{SEIMessage\_Cost} / \mathtt{aEIUpdateIntvl})$$

where

- *SEIEvent_Cost* is the CPU time in seconds required per event monitored. This value appears in "CPU measurements" on page 172.
- *SEIMessage_Cost* is the CPU time in seconds required per message sent. This value appears in "CPU measurements" on page 172.

- *aNEvents* is the average number of events that occur per hour =

```
SUMOF (
      BCC_CBC_Events * PeakCallRate
      (Local_BCC_CBC_Events + RecsPerCall) *
          LocalPeakCallRate
      (OACC_CBC_Events + RecsPerNWOutCall) *
          nwOAccPeakCallRate
      OREJ_CBC_Events * nwORejPeakCallRate
      (IACC_CBC_Events+ RecsPerNWInCall) *
          nwIAccPeakCallRate
      IREJ_CBC_Events * nwIRejPeakCallRate
  )
```

Note: For more information about RecsPerCall, see Appendix C, "Database table sizes."

Reporting

Symposium Call Center Server is supplied with a number of predefined (standard) reports for periodic and on-demand reporting of various aspects of the Symposium Call Center Server operations. The CPU requirements of the reports depend on the following factors:

- the number of rows per report
- the number of columns per report
- the number of the database views that the report is based on
- the complexity of the operations on these views

It is important to also include CPU calculations for every consolidated report where the current node is one of the nodes selected in the report. For consolidated reports, the value "number of rows per report" should be the number of rows returned from the current node. The number of views and the number of columns for each of the standard reports is shown in Table 9 in Appendix D, "Symposium Call Center Server standard reports."

Interval reporting is done every 15 minutes. Based on this, the CPU load for the interval reports can be determined.

The CPU impact depends on the number of views the report is based on. Some reports are based on a single database view (for example, report Summarized Application Performance is based on a single view). Others are based on the data from multiple views (for example Application Performance).

Single-view reports

For single-view reports the impact is approximately linear with respect to the number of columns.

The following formula estimates the number of milliseconds of PII300 CPU required to generate single-view reports. Before applying this formula, you must know the number of rows to be generated by the report (ReportRows):

```
ReportRowCPU_msec =
  ReportColumns * ColRow_Cost + BaseRow_Cost
```

Note: This formula can also be used for single-view reports other than the standard reports. Single-view standard reports are identified with “1” in the Views column in Table 9 in “List of standard reports” on page 395.

Multiple-view reports

For multiple-view reports, the impact depends on the complexity of the data selection operation and on the state of the database at the time the report is generated. The ReportRowCPU_msec is taken as MultiRow_Cost.

```
ReportCPU_msec = ReportRowCPU_msec * ReportRows
```

Interval reports

For interval reports, the CPU utilization is

```
TotalReportIntervalCPU =
  SUMOF_ALL(
  ReportCPU_msec...for reports run each interval
  ) / (1000 * 15 * 60)
```

Reporting impact

To determine the impact of reporting, compute the ReportCPU_msec for each report generated during the busy hour and multiply it by the number of times the report is expected to be executed:

```
TotalReportDailyCPU =
  SUMOF_ALL(
  ReportCPU_msec * ReportsPerDay...for all other reports
  ) / (1000 * 3600)

U_REP = TotalReportDailyCPU + TotalReportIntervalCPU
```

Networking

The networking cost is primarily due to network call processing. The cost includes the basic call processing portion and the processing of the successful request for incoming and outgoing calls (OACC_Cost and IACC_Cost), as well as the cost of processing rejected and canceled requests (OREJ_Cost and IREJ_Cost). Other components (such as routing table updates) are minimal and need not be included in computations. The networking cost is, therefore, computed as

```
U_NET =
  SUMOF (
     IREJ_Cost * nwIRejPeakCallRate
     IACC_Cost * nwIAccPeakCallRate
     OREJ_Cost * nwORejPeakCallRate
     OACC_Cost * nwOAccPeakCallRate
  ) / 3600
```

Detailed CPU for Stratus ftServer 3220 HASM

When ftServer 3220 HASM is the processor used (2PIII800), an extra CPU load of 3 percent must be added to account for the software RAID impact.

Note: In “CPU measurements” on page 172, this value (U_{SW}) has been rescaled to the base processor (PII300) value of 14.273 percent for consistency.

Application Server CPU impact

Since the Application Server does not use the OAM database access API, each IIS hit on the Application Server has an associated direct database access cost on the Symposium Call Center Server. The additional incurred SCCS CPU cost is SCCS_CPU_CD, specified in "CPU measurements" on page 172. The following calculation for the SCCS CPU impact must be added to the total SCCS CPU utilization:

U_{SCCS} = HitRate * SCCS_CPU_CD/ 3600 (PII300)

Use the normal platform conversions to scale to other Intel processors.

Online database backup

The online database backup runs as a low priority background task. Although it consumes CPU resources, it does not impact the CPU time required by Symposium Call Center Server for call processing or reporting.

Calculate ELAN utilization (Meridian 1/CSE 1000)

Introduction

The Embedded LAN is an Ethernet link between the Meridian 1/CSE 1000 switch and the server in Symposium Call Center Server. ELAN bandwith is 10 Mbps (TCPIP_Bandwidth_MBitsSec = 10).

The utilization of the ELAN is dependent mainly on

- call rate
- call complexity

ELAN traffic

The ELAN carries the following traffic:

- Call Processing AML traffic (AML_Utilization)
- for Symposium Voice Services on CallPilot, ACCESS traffic (ACC_ELAN_Utilization)

Maximum acceptable utilization

The maximum acceptable utilization of the ELAN depends on the amount of traffic on the LAN, the length of the cable, and the size of the messages. The probability of collision of packets depends on these factors and affects the average delay within the network. Nortel Networks recommends that total utilization of ELAN not exceed 10 percent. For more information on utilization, refer to Appendix E, “Ethernet delay factors versus bandwidth utilization.”

Detailed ELAN requirements computations

If more than one server in Symposium Call Center Server is on the same ELAN, then the total ELAN utilization is the sum of the ELAN utilization for each system.

For a Meridian 1/CSE 1000 switch using Symposium Voice Services on Meridian Mail, ELAN utilization is computed as

```
EmbeddedLan_Utilization =
  AML_Utilization
```

For a Meridian 1/CSE 1000 switch using Symposium Voice Services on CallPilot, ELAN utilization is computed as

```
EmbeddedLan_Utilization =
  AML_Utilization + ACC_ELAN_Utilization
```

The utilization of the ELAN is not expected to be the performance bottleneck. Even in the case of the Upper End workload, the ELAN utilization is under 6 percent.

The following sections describe the detailed computations for each component of the ELAN traffic.

Call processing traffic impact on ELAN

The call processing Application Module Link (AML) provides the connection between Meridian 1/CSE 1000 and the server in Symposium Call Center Server for call processing-related traffic over the ELAN.

AML cost for basic local calls

The following table shows the number of bytes transferred for common AML services (that is, services that occur for every call) for basic calls handled by local agents. BCC_AMLBytes represents the amount of information that is transferred over the ELAN for these calls:

AML service	Bytes transferred	#Messages
Call Arrival	246	1

AML service	Bytes transferred	#Messages
Give Ringback	243	2
Give Silence	243	2
Route to...	559	3
Agent Answer	500	4
Call Disconnect	364	3
Total per Call—BCC_AMLBytes	2155	
Total per Call—BCC_AMLMessages		15

Note: Bytes transferred include the standard TCP/IP overhead of 88 bytes per message.

AML cost for basic outgoing accepted network calls

The following table shows number of bytes transferred for common AML services (that is, services that occur for every call) for basic calls originating on the local node that are handled by agents on other nodes. nwOAcc_AMLBytes represents the amount of information that is transferred over the ELAN for these calls:

AML service	Bytes transferred	#Messages
Call Arrival	246	1
Give Ringback	243	2
Give Silence	243	2
Route to...	559	3
Total per Call—nwOAcc_AMLBytes	1291	
Total per Call—nwOAcc_AMLMessages		8

Note: Bytes transferred includes the standard TCP/IP overhead of 88 bytes per message.

AML services for basic incoming accepted network calls

The following table shows number of bytes transferred for common AML services (that is, services that occur for every call) for basic calls originating on other nodes that are handled by local agents. nwIAcc_AMLBytes represents the amount of information that is transferred over the ELAN for these calls:

AML service	Bytes transferred	#Messages
Call Arrival	246	1
Route to...	559	3
Agent Answer	500	4
Call Disconnect	364	3
Total per Call—nwIAcc_AMLBytes	1669	
Total per Call—nwIAcc_AMLMessages		11

Note: Bytes transferred includes the standard TCP/IP overhead of 88 bytes per message.

AML cost for call treatments

Symposium Call Center Server calls can also use a number of voice services that require communication with Meridian 1/CSE 1000 via the ELAN (using the AML link). These services and the sizes of messages associated with them are shown in the following table:

AML service	Variable name	Bytes	Variable name	#Messages
Basic Call Services	BCC_AMLBytes	2155	BCC_AMLMessages	15
Give Controlled Broadcast (Start/ Stop)	GCB_AMLBytes	673	GCB_AMLMessages	5
Give Controlled Broadcast (Continuous)	GCBC_AMLBytes	673	GCBC_AML Messages	5

AML service	Variable name	Bytes	Variable name	#Messages
Collect Digits Session (including play prompt)	VSCDG_AML Bytes	673	VSCDG_AML Messages	5
Give IVR Session	GIVR_AMLBytes	673	GIVR_AML Messages	5
Give RAN	GRAN_AML Bytes	359	GRAN_AML Messages	3
Give Music	GMUSIC_AML Bytes	249	GMUSIC_AML Messages	2

Note: The sizes of GCBC, VSCDG, and GIVR messages are assumed to be similar to the size of GCB messages.

The number of AML bytes and messages generated per call due to treatments is computed as

```
Treatments_AMLBytes =
  SUMOF(
     GCB_AMLBytes * aGCBPerCall
     GCBC_AMLBytes * aGCBCPerCall
     VSCDG_AMLBytes * aVSCDGPerCall
     GIVR_AMLBytes * aGIVRPerCall
     GRAN_AMLBytes * aGRANPerCall
     GMUSIC_AMLBytes * aGMUSICPerCall
  )

Treatments_AMLMessages =
  SUMOF(
     GCB_AMLMessages * aGCBPerCall
     GCBC_AMLMessages * aGCBCPerCall
     VSCDG_AMLMessages * aVSCDGPerCall
     GIVR_AMLMessages * aGIVRPerCall
     GRAN_AMLMessages * aGRANPerCall
     GMUSIC_AMLMessages * aGMUSICPerCall
  )
```

AML cost for transferring calls

The following table shows the number of bytes transferred when a call is transferred to another agent:

AML service	Bytes transferred	#Messages
Transfer Init	308	2
Call Answer	428	3
Call Disconnect	382	3
Trn_AMLBytes	1118	
Trn_AMLMessages		8

AML cost for conferencing calls

The following table shows the number of bytes transferred when a call is conferenced to another agent:

AML service	Bytes transferred	#Messages
Conference Init	297	2
Call Answer	704	5
Call Disconnect	525	4
Conf_AMLBytes	1526	
Conf_AMLMessages		11

Total AML cost

Total AML bytes and messages generated per various local and network calls are then calculated as follows. Note that there are no treatments associated with network incoming calls:

```
ELAN_BCC_Bytes = BCC_AMLBytes + Treatments_AMLBytes

ELAN_BCC_Messages =
  BCC_AMLMessages + Treatments_AMLMessages
```

```
ELAN_OACC_Bytes = nwOAcc_AMLBytes + Treatments_AMLBytes

ELAN_OACC_Messages =
  nwOAcc_AMLMessages + Treatments_AMLMessages

ELAN_IACC_Bytes = nwIAcc_AMLBytes

ELAN_IACC_Messages = nwIAcc_AMLMessages

ELAN_Tx_Bytes =
  Trn_AMLBytes * pTransferIn * (1 – pTrnf_MLS)

ELAN_Cf_Bytes =
  Conf_AMLBytes * pConferenceIn * (1 – pConf_MLS)

ELAN_Tx_Messages =
  Trn_AMLMessages * pTransferIn * (1 – pTrnf_MLS)

ELAN_Cf_Messages =
  Conf_AMLMessages * pConferenceIn * (1 – pConf_MLS)

ELAN_TxOut_Bytes =
  Trn_AMLBytes * pTransferOut * (1 – pTrnf_MLS)

ELAN_CfOut_Bytes =
  Conf_AMLBytes * pConferenceOut * (1 – pConf_MLS)

ELAN_TxOut_Messages =
  Trn_AMLMessages * pTransferOut * (1 – pTrnf_MLS)

ELAN_CfOut_Messages =
  Conf_AMLMessages * pConferenceOut * (1 – pConf_MLS)
```

The average size of a message is computed as

```
ELAN_CallMessageSize =
  SUMOF(
     (ELAN_BCC_Bytes / ELAN_BCC_Messages) *
         (LocalPeakCallRate + PeakOutCallRate)
     (ELAN_OACC_Bytes / ELAN_OACC_Messages) *
         nwOAccPeakCallRate
     (ELAN_IACC_Bytes / ELAN_IACC_Messages) *
         nwIAccPeakCallRate
      (ELAN_Tx_Bytes / ELAN_Tx_Messages) *
         AgentPeakCallRate
```

```
    (ELAN_Cf_Bytes / ELAN_Cf_Messages) *
        AgentPeakCallRate
    (ELAN_TxOut_Bytes / ELAN_TxOut_Messages) *
        PeakOutCallRate
    (ELAN_CfOut_Bytes / ELAN_CfOut_Messages) *
        PeakOutCallRate)
) / (PeakCallRate + nwIAccPeakCallRate +
        PeakOutCallRate)
```

The total contribution to the AML bandwidth is computed as

```
AML_BW_Required_MbitsSec =
  ((SUMOF(
    ELAN_BCC_Bytes * (LocalPeakCallRate +
        PeakOutCallRate)
    ELAN_OACC_Bytes * nwOAccPeakCallRate
    ELAN_IACC_Bytes * nwIAccPeakCallRate
    ELAN_Tx_Bytes * AgentPeakCallRate
    ELAN_Cf_Bytes * AgentPeakCallRate
    ELAN_TxOut_Bytes * PeakOutCallRate
    ELAN_CfOut_Bytes * AgentPeakCallRate
  ) /3600)*8)/1000000
```

Finally, the AML link utilization can be calculated as

```
AML_Utilization =
  100% * AML_BW_Required_MbitsSec /
  TCPIP_Bandwidth_MbitsSec
```

ACCESS traffic (Symposium Voice Services on CallPilot only)

Symposium Voice Services on CallPilot results in ACCESS traffic on the ELAN. ELAN utilization for ACCESS traffic is computed as

```
ACC_ELAN_Utilization =
  100% * ACC_BW_Required_KbitsSec /
  TCPIP_Bandwidth_KBitsSec1:Num1InProcCell:NumInProc
```

To calculate ACC_BW_Required, see “ACCESS requirements” on page 286.

Note: In most cases, even in the Upper End workloads, this traffic load is less than 1 percent for a 10-Mbps LAN, and, therefore, is considered negligible.

Calculate ELAN utilization (DMS/MSL-100)

Introduction

The Embedded LAN is an Ethernet link between the DMS/MSL-100 switch and the server in Symposium Call Center Server. The Intelligent Call Management (ICM) link is considered to be part of the ELAN.

The utilization of the ELAN is dependent mainly on

- call rate
- call complexity

ELAN bandwith is 10 Mbps (TCPIP_Bandwidth_MBitsSec = 10).

ELAN traffic

The ELAN carries the following traffic:

- Call Processing ICM traffic (ICM_Utilization)
- External IVR traffic (IVR_Utilization)

Note: IVR caller-entered data (CED) can use either ELAN or CLAN.

Maximum acceptable utilization

The maximum acceptable utilization of the ELAN depends on the amount of traffic on the LAN, the length of the cable, and the size of the messages. The probability of collision of packets depends on these factors and affects the average delay within the network. Total utilization of ELAN should not exceed 45 percent (if the components are under 300 meters [1000 feet] apart), or 30 percent (if they are 3000 meters [10 000 feet] apart). For more information on utilization, refer to Appendix E, “Ethernet delay factors versus bandwidth utilization.”

Detailed ELAN requirements computations

ELAN utilization is computed as

```
EmbeddedLan_Utilization =
  ICM_Utilization + IVR_Utilization
```

The utilization of the ELAN is not expected to be the performance bottleneck. Even in the case of the Upper End workload the ELAN utilization is under 6 percent.

The following sections describe the detailed computations for each of the components of the ELAN traffic.

Call processing traffic impact on the ELAN

The call processing traffic is broken into two components: the traffic from the server in Symposium Call Center Server to the DMS/MSL-100 (inbound), and the traffic from the DMS/MSL-100 to the server in Symposium Call Center Server (outbound). LAN utilization for this traffic is computed as

```
ICM_Utilization =
    Inbound_ICM_Utilization + Outbound_ICM_Utilization
```

Traffic from the server to the switch for common ICM services

Intelligent Call Manager (ICM) provides the connection between the DMS/MSL-100 and the server in Symposium Call Center Server for call processing-related traffic over the ELAN. The common ICM services (that is, the ones that occur for every call) for basic calls are shown in the following table:

ICM service	Variable name	Bytes transferred
Give Treatment(Ringback)	GRNG_ICMBytes	128
Route Call	RCall_ICMBytes	130
Total per Call	BCC_In_ICMBytes	258

Note: Bytes transferred includes standard TCP/IP overhead of 88 (78 + 10 for collisions) bytes per message.

BCC_ICMBytes represents the amount of information that is transferred over the ELAN for every basic Symposium Call Center Server call.

Traffic from the server to the switch for voice services

Symposium Call Center Server calls may also use a number of voice services that require communication with the DMS/MSL-100 via the ELAN (using the ICM link). These services and the sizes of messages associated with them are shown in the following table:

ICM service	Variable name	Bytes transferred
Give Treatment(Ringback)	GRNG_ICMBytes	128
Give Treatment(RAN)	GRAN_ICMBytes	128
Give Treatment(Music)	GMUS_ICMBytes	128

Note: Bytes transferred includes standard TCP/IP overhead of 88 (78 + 10 for collisions) bytes per message.

Traffic from the server to the switch generated due to treatments

The number of ICM bytes and messages generated per call due to treatments is computed as

```
Treatments_In_ICMBytes =
  SUMOF(
     GRAN_ICMBytes * aGRANPerCall
     GMUS_ICMBytes * aGMUSPerCall
  )
```

Total ICM bytes generated per various calls are then calculated as

```
ELAN_In_ICMBytes =
  BCC_In_ICMBytes + Treatments_In_ICMBytes
```

The average size of an inbound message is computed as

```
ELAN_ICM_In_MessageSize =
  SUMOF(
     GRNG_ICMBytes * 1
     RCall_ICMBytes * 1
     GRAN_ICMBytes * aGRANPerCall
     GMUS_ICMBytes * aGMUSPerCall
  ) / (2 + aGRANPerCall + aGMUSPerCall)
```

The total contribution to the ICM bandwidth is computed as

```
ICM_In_BW_Required_MbitsSec =
  ELAN_In_ICMBytes * PeakCallRate / 3600 * 8 / 1000000
```

Finally, the inbound ICM link utilization can be calculated as

```
Inbound_ICM_Utilization =
  100% * ICM_In_BW_Required_MbitsSec /
  TCPIP_Bandwidth_MbitsSec
```

Traffic from the switch to the server for basic calls

The messages sent from the DMS/MSL-100 to Symposium Call Center Server for basic calls (that is, the ones that occur for every call) are shown in the following table:

ICM message	Bytes transferred	#Messages
Call Queued (Arrival)	152	1
Give Treatment(Ringback) Response	112	1
Route Call Response	112	1
Call Released (CDN)	140	1
Call Answered (Agent)	158	1
Call Released (Agent)	140	1
Set Action (Agent)	106	1
Total per Call—BCC_Out_ICMBytes	920	

ICM message	Bytes transferred	#Messages
Total per Call—BCC_Out_ICMMessages		7

Note: Bytes transferred includes standard TCP/IP overhead of 88 (78 + 10 for collisions) bytes per message.

BCC_Out_ICMBytes represents the amount of information that is sent from the ICM Ethernet Interface Unit (EIU) to Symposium Call Center Server over the ELAN for every basic Symposium Call Center Server call.

Traffic from the switch to the server for other services

Symposium Call Center Server calls may also use a number of services that require communication with the DMS/MSL-100 across the ELAN using the ICM link. The response messages sent for each service message and their sizes are shown in the following table:

Treatment type	Response messages	Bytes transferred	Variable name	#Messages
Ringback	Response	112	GRNG_Out_ICM Bytes	1
RAN	Response, Treatment Complete	224	GRAN_Out_ICM Bytes	2
Music	Response	112	GMUS_Out_ICM Bytes	1

Note: Bytes transferred includes standard TCP/IP overhead of 88 (78 + 10 for collisions) bytes per message.

Traffic from the switch to the server for transferred calls

Calls can also be transferred to another agent by the agent who receives the call. The additional messages sent from the DMS/MSL-100 to Symposium Call Center Server for each call transferred and their sizes are shown in the following table:

ICM message	Bytes transferred	#Messages
Consult Init	128	1
Call Offered (New DN)	156	1
Call Answered (New DN)	158	1
Call Transferred (New DN)	132	1
Call Released (New DN)	140	1
Agent Not Ready (New DN)	106	1
Agent Ready (New DN)	106	1
Total per Call—TRN_Out_ICMBytes	926	
Total per Call—TRN_Out_ICMMessages		7

Note: Bytes transferred includes standard TCP/IP overhead of 88 (78 + 10 for collisions) bytes per message.

Traffic from the switch to the server for conferenced calls

Calls may also be conferenced with another agent by the agent who receives the call. The additional messages sent from the DMS/MSL-100 to Symposium Call Center Server for each call conferenced and their sizes are shown in the following table:

ICM message	Bytes transferred	#Messages
Consult Init	128	1
Call Offered (New DN)	156	1

ICM message	Bytes transferred	#Messages
Call Answered (New DN)	158	1
Call Conferenced (New DN)	144	1
Call Conferenced (Agent)	144	1
Call Released (New DN)	140	1
Agent Not Ready (New DN)	106	1
Agent Ready (New DN)	106	1
Total per Call—Conf_Out_ICMBytes	1082	
Total per Call—Conf_Out_ICMMessages		8

Note: Bytes transferred includes standard TCP/IP overhead of 88 (78 + 10 for collisions) bytes per message.

Traffic from the switch to the server generated due to treatments

The number of ICM bytes generated per call due to treatments is computed as

```
Treatments_Out_ICMBytes =
  SUMOF(
    GRAN_Out_ICMBytes * aGRANPerCall
    GMUS_Out_ICMBytes * aGMUSPerCall
    TRN_Out_ICMBytes * pTransferIn * (1 - pTrnf_MLS)
    Conf_Out_ICMBytes * pConferenceIn * (1 - pConf_MLS
  )
```

Total ICM bytes generated per various calls are then calculated as

```
ELAN_Out_ICMBytes =
  BCC_Out_ICMBytes + Treatments_Out_ICMBytes
```

The average size of an outbound message is computed as

```
ELAN_ICM_Out_MessageSize =
  (BCC_Out_ICMBytes + Treatments_Out_ICMBytes) /
  SUMOF(
     BCC_Out_ICMMessages
     GRAN_Out_ICMMessages * aGRANPerCall
     GMUS_Out_ICMMessages * aGMUSPerCall
     TRN_Out_ICMMessages * pTransferIn * (1 - pTrnf_MLS)
     Conf_Out_ICMMessages * pConferenceIn
         * (1 - pConf_MLS)
     )
```

The total contribution to the ICM bandwidth is computed as

```
ICM_Out_BW_Required_MbitsSec =
  ELAN_Out_ICMBytes * PeakCallRate / 3600 * 8 /1000000
```

Finally, the outbound ICM link utilization can be calculated as

```
Outbound_ICM_Utilization =
  100% * ICM_Out_BW_Required_MbitsSec /
  TCPIP_Bandwidth_MbitsSec
```

External IVR traffic impact on the ELAN

Most traffic related to IVR on the ELAN is sent to Symposium Call Center Server from the DMS/MSL-100 as a result of actions taken by the IVR system. It is assumed that this traffic is identical for all IVR systems.

Cost of IVR messages

The messages described in the following table are sent from the DMS/MSL-100 to Symposium Call Center Server for each call handled by the IVR system. IVR caller-entered data (CED) messages may also be sent from the IVR system to Symposium Call Center Server over the ELAN, if the IVR system is connected to the ELAN.

ICM service	Bytes transferred	#Messages
Call Offered	156	1
Call Answered	158	1
Consult Init	128	1
Transfer Complete	112	1
Call Released	140	1
Total per Call—DMS_IVRBytes	694	
Total per Call—DMS_IVRMessages		5

Note: Bytes transferred include standard TCP/IP overhead of 88 (78 + 10 for collisions) bytes per message.

This table shows only the messages sent from ICM to Symposium Call Center Server. It does not include any messages from ICM that are sent to the IVR system via the MLS interface.

The average size of an IVR outbound message is computed as

```
ELAN_IVR_Out_MessageSize =
  DMS_IVRBytes / 5
```

The total contribution to the ICM bandwidth is computed as

```
IVR_BW_Required_MbitsSec =
  (((DMS_IVRBytes * PeakCallRate) / 3600) * 8) / 1000000
```

Cost of caller-entered data (CED) messages

If the IVR system is connected to the ELAN, CED messages are sent from the external IVR system to Symposium Call Center Server over the ELAN. This traffic is assumed to be identical for all IVR systems. The messages described in the following table are sent between the IVR system and Symposium Call Center Server for each call arrival.

IVR service	Bytes transferred	#Messages
Caller Entered Data Overhead	115	1
Caller Entered Data Response	101	1
Total per Call—CED_IVR_OH_Bytes	216	
Total per Call—CED_IVRMessages		2

Note: Bytes transferred include standard TCP/IP overhead of 88 (78 + 10 for collisions) bytes per message.

Total IVR bytes generated per call is then calculated as

```
CED_IVR_Bytes =
  CED_IVR_OH_Bytes + aExternal_IVR_Size
```

The total contribution to the ICM bandwidth is

```
CED_BW_Required_MbitsSec =
  (((CED_IVR_Bytes * PeakCallRate) / 3600) * 8) / 1000000
```

If the external IVR is on ELAN then

```
ELAN_CED_BW_Required_MbitsSec = CED_BW_Required_MbitsSec
```

else

```
ELAN_CED_BW_Required_MbitsSec = 0
```

Finally, the IVR link utilization can be calculated as

```
IVR_Utilization =
  100% * (IVR_BW_Required_MbitsSec +
  ELAN_CED_BW_Required_MbitsSec) /
  TCPIP_Bandwidth_MbitsSec
```

DMS/MSL-100 external IVR fast transfer impact

If the IVR system is using the MLS capability of the Symposium Call Center Server system to transfer the call from the IVR voice port to the Symposium Call Center Server CDN, then this additional traffic must be included in CPU and CLAN computations. For more information, refer to “Inbound call services” on page 176 and “MLS traffic on the CLAN” on page 224.

If the IVR system is using the TAPI/LinkPlexer Server to transfer the call from the IVR voice port to the Symposium Call Center Server CDN, then this additional traffic should be included in the CLAN and ELAN traffic calculations. The characterization of this traffic is outside the scope of this document.

Calculate CLAN utilization

Introduction

The Customer LAN is an Ethernet or a Token Ring link between the server in Symposium Call Center Server and the Symposium Call Center Server Client PCs. CLAN bandwith is 10 Mbps.

Network call processing and NCC traffic are now routed over the CLAN. This affects the computations for CLAN requirements, as described in the following sections.

CLAN traffic

CLAN traffic consists of the following elements:

- real-time display traffic (RTDisp_Utilization)
- real-time data API traffic (RTI_Utilization)
- Graphical Real-Time Display (GRTD) traffic
- Real-time Statistics Multicast (RSM) traffic
- MLS traffic (MLink_Utilization)
- Host Data Exchange traffic (HDX_Utilization)
- reporting-related traffic (Reporting_Utilization)
- Meridian 1/CSE 1000 elements
  - Event Interface traffic (SEI_Utilization)
  - Network Control Center traffic (NCCUpd_Utilization)
  - network CBC traffic to the NCC (NCBC_Utilization)
  - network call processing traffic (NCP_Utilization)
  - Network Consolidated Real Time traffic (NCRTD_Raw Remote_Utilization, NCRTD_Cons_Utilization)
- DMS/MSL-100 elements
  - external IVR traffic (CLAN_IVR_Utilization)
- non-Symposium Call Center Server customer traffic

Notes:

- IVR caller-entered data (CED) can use either CLAN or ELAN.
- If the NCC and nodal server share the same CLAN, then the traffic contributions from both must be totalled to derive the total CLAN impact on bandwidth. Nortel Networks recommends that an IP router be used to separate the traffic on the ELAN and CLAN.

Maximum acceptable utilization

The maximum acceptable utilization of the CLAN depends on the amount of traffic, the length of the wire, and the size of the messages. The probability of packet collision depends on these factors and affects the average delay within the network. Total utilization of the CLAN should not exceed 45 percent (if the components are under 300 meters [1000 feet] apart) or 30 percent (if the components are 3000 meters [10 000 feet] apart).

Symposium Call Center Server utilization of the CLAN can be as high as 9 percent for a system with 500 agents. Make sure that the CLAN has enough spare capacity to accommodate Symposium Call Center Server traffic in addition to customer traffic.

For more information, refer to Appendix E, “Ethernet delay factors versus bandwidth utilization.”

Detailed CLAN requirements computations

```
CustomerLan_Utilization =
  SUMOF(
    RTDisp_Utilization
    RTI_Utilization
    GRTD_Utilization
    RSM_Utilization
    MLink_Utilization
    HDX_Utilization
    Data_Extraction_Utilization
    Reporting_Utilization
    NCRTD_Raw_Remote_Utilization
    NCRTD_Cons_Utilization
```

```
        SEI_Utilization (Meridian 1/CSE 1000 only)
        NCP_Utilization (Meridian 1/CSE 1000 only)
        NCCUpd_Utilization (Meridian 1/CSE 1000 only)
        NCBC_Utilization (Meridian 1/CSE 1000 only)
        CLAN_IVR_Utilization (DMS/MSL-100 only)
    )
```

Real-time display traffic on the CLAN

Real-time display traffic provides the communications between the server in Symposium Call Center Server and the Symposium Call Center Server Client PCs over the CLAN (or WAN in the networked Symposium Call Center Server environment). This traffic consists of messages related to the supervisor real-time display screens. This traffic depends on

- the amount of update information
- the frequency of updates for each screen
- the number of screens
- the number of Fat (non-Web) Clients (If the Web Client is not in use, this value is equal to nSupervisors.)

Other CLAN traffic, such as agent Operation, Administration, and Management (OA&M) information, constitutes a negligible portion of the total amount of traffic on the CLAN. The following computations assume the standard TCP/IP overhead of 88 bytes per message and a toolkit overhead of 55 bytes per message for a total of 143 bytes of overhead per message.

The computations are based on the bandwith required for each real-time display screen. The amount of information per screen depends on the number of rows and the size of each row.

Note: A Fat Client can have a maximum of four RTD screens open at a time.

Row size

The following table shows row size for each of the standard real-time displays:

RTD screens	Record_Size—No networking (bytes)	Record_Size—Networking (bytes)
Agent Statistics Screen	51	51
Application Statistics Screen	48	72
Nodal Screen	24	36
Skillset Statistics Screen	48	60
IVR Statistics (M1/CSE 1000 only)	36	36
Route Statistics (M1/CSE 1000 only)	12	12

Notes:

- Records for the networking case contain more fields than those for the case without networking.
- IVR and Route statistics are only available for the Meridian 1/CSE 1000 switch.

Rows per screen

The number of rows per screen is determined by the supervisor. Usually, this number corresponds to the number of agents reporting to the supervisor (for the Agent screen), or the number of applications per supervisor (for the Applications screen). The number of rows per screen is defined in the following parameters: nRTDAgRows, nRTDAppRows, nRTDCCRows and nRTDSkillRows.

The screen update interval specifies how often the screen information is transferred from Symposium Call Center Server to the Fat Client. The interval is determined by the supervisor. This interval is defined in AgScrUpdateIntvl and RTDScrUpdateIntvl. AgScrUpdateIntvl defines the interval for agent screen and RTDScrUpdateIntvl defines the interval for all other screens.

The RTD bandwidth required is computed as

```
RTDisp_Screen_BW_Required_MbitsSec=
  (nFATClients * (nScreenRows * ScreenRowBytes + 143)
    * 8) / RTDScrUpdateIntvl /1000000
```

where

- *nScreenRows* is one of nRTDAgRows, nRTDAppRows, nRTDCCRows or nRTDSkillRows, depending on the screen
- *ScreenRowBytes* is determined from the preceding table
- *RTDScrUpdateIntvl* is defined by AgScrUpdateIntvl for agent screens and RTDScrUpdateIntvl for all other screens

If an agent screen contains all of the columns suggested in “Row size” on page 214, then use the formula above. If the agent screen does not contain the Time In State column, then the updates need not be sent every time, but only whenever the state of the agent changes.

The following formula computes the average number of agent state changes per screen update interval:

```
AgentStateChange_Update=
  AgScrUpdateIntv * (2 * nIntPerShift/nShiftHrs +
  aAgStatesCall * ((AgentPeakCallRate + nwIRejPeakCallRate
  + PeakOutCallRate) / nAgents)) / 3600
```

This formula assumes that the agent changes state twice for every interruption during the shift (for example, Ready/NotReady), and twice for every call handled, and that calls are distributed evenly between the agents. The probability that an agent will change his or her state during the screen update interval is computed as

```
AgentStateChange_Prob = MIN(1,AgentStateChange_Update)
```

The bandwith required for the agent screen is then computed as

```
Agent_Screen_BW_Required_MbitsSec=
  (nFATClients * (nScreenRows * ScreenRowBytes + 143)
  * 8) * AgentStateChange_Prob / (AgScrUpdateIntv
  * 1000000)
```

The total bandwidth required for all real-time display screens is computed using the following formula:

```
RTDisp_BW_Required_MbitsSec=
  SUMOF_ALL(RTDisp_Screen_BW_Required_MbitsSec)
          . . . (for all screens)

RTDisp_Utilization =
  100% * RTDisp_BW_Required_MbitsSec /
  TCPIP_Bandwidth_MBitsSec
```

Each screen update is transferred as a single message over the network. Therefore, the message rate per second depends on the number of Fat Clients, the number of RTD screens per Client, and the real-time display refresh interval. The maximum number of screens per Client is four. Therefore, the number of messages transferred per second can be estimated as

```
RTDisp_MessagesPerSecond=
  (nFATClients * 4) / RTDScrUpdateIntvl
```

The average message size can be computed as

```
RTDisp_AvgBytesPerMessage =
  (RTDisp_BW_Required_MbitsSec / 8) /
  RTDisp_MessagesPerSecond
```

Real-time Data API traffic on the CLAN

The real-time API (RTI) sends real-time data over the CLAN for the use of customer applications. The calculations used to derive the LAN utilization due to the RTI traffic are similar to the real-time display bandwidth calculations. As with RTD traffic, RTI traffic also consists of messages related to the agent time-in-state data. However, the smallest update interval possible is 2 seconds. Agents, therefore, change state every 2 seconds and, as a result, all rows are updated at every refresh interval. This simplifies the calculations since the mean number of agent state changes per update interval does not have to be accounted for.

Note: The following computations assume the standard TCP/IP overhead of 88 bytes per message and a toolkit overhead of 55 bytes per message for a total of 143 bytes of overhead per message.

The number of statistics sent, the corresponding number of columns, the update interval, and the size of the row in bytes is shown in the following table:

Real-time API screens	Record_Size—No networking (bytes)	Record_Size—Networking (bytes)
Agent Statistics Screen	51	51
Application Statistics Screen	48	72
Nodal Screen	24	36
Skillset Statistics Screen	48	60
IVR Statistics (M1/CSE 1000 only)	36	36
Route Statistics (M1/CSE 1000 only)	12	12

Notes:

- Records for the networking case contain more fields than those for the case without networking.
- IVR and Route statistics are only available for the Meridian 1/CSE 1000 switch type.

The number of rows per RTI screen is defined in the following parameters: nRTIAgRows, nRTIAppRows, nRTICCRows, nRTISkillRows, nRTIRouteRows and nRTIIVRRows.

The Real-time API (RTI) traffic per is calculated then as

```
RTI_BW_Required_MbitsSec =
  SUMOF_ALL
  ((nRecords * Record_Size + 143) * 8 / RTIUpdateIntvl /
  1000000 * nRTIClients
  ) ... for all screens
```

where the summation is taken over all RTI screens.

The LAN utilization due to the RTI is then calculated as

```
RTI_Utilization =
  100% * RTI_BW_Required_MbitsSec /
  TCPIP_Bandwidth_MBitsSec
```

Each RTI screen update is transferred as a single message over the network. Therefore, the message rate per second depends on the number of RTI screens and the RTI refresh interval. The number of RTI screens is six. Therefore, the number of messages transferred per second can be estimated as

```
RTI_MessagesPerSecond=
  6 / RTIUpdateIntvl
```

The average message size can be computed as

```
RTI_AvgBytesPerMessage =
  (RTI_BW_Required_MbitsSec / 8) / RTI_MessagesPerSecond
```

Graphical Real-Time Display data traffic on the CLAN

The Graphical Real-Time Display (GRTD) application sends real-time data over the CLAN for the use of customer applications. The calculations used to derive the LAN utilization due to GRTD traffic are similar to the Real-Time Display (RTD) bandwidth calculations. As with RTD traffic, GRTD traffic also consists of messages relating to the agent time-in-state data. However, the smallest update interval possible is 2 seconds. Agents, therefore, change state every 2 seconds with the result that all rows are updated at every refresh interval. This simplifies the calculations since the mean number of agent state changes per update interval does not have to be accounted for. The following computations assume the standard TCP/IP overhead of 88 bytes per message and a toolkit overhead of 55 bytes per message for a total of 143 bytes of overhead per message.

The following table shows the number of statistics sent, the corresponding number of columns, the update interval, and the size of the row in bytes for each standard real-time display:

Real-time screens	Record_Size—No networking (bytes)	Record_Size—Networking (bytes)
Agent Statistics Screen	51	51
Application Statistics Screen	48	72
Nodal Screen	24	36
Skillset Statistics Screen	48	60

Note: Records for the networking case contain more fields than those for the case without networking.

The number of rows per GRTD screen is defined in the following parameters: nGRTDAgRows, nGRTDAppRows, nGRTCCRows and nGRTDSkillRows.

The Graphical Real-Time Display traffic is calculated as

```
GRTD_BW_Required_MbitsSec =
  SUMOF
     ((nRecords * Record_Size + 143) * 8
     / RTIUpdateIntvl / 1000000 * nGRTDClients
  ) ... for all screens
```

where the summation is taken over all GRTD screens.

The LAN utilization due to the GRTD data is then calculated as

```
GRTD_Utilization =
  100% * GRTD_BW_Required_MbitsSec /
  TCPIP_Bandwidth_MBitsSec
```

Each GRTD screen update is transferred as a single message over the network. Therefore, the message rate per second depends on the number of GRTD screens and the GRTD refresh interval. The number of messages transferred per second can be estimated as

```
GRTD_MessagesPerSecond=
  4 / GRTDUpdateIntvl
```

The average message size can be computed as

```
GRTD_AvgBytesPerMessage =
  (GRTD_BW_Required_MbitsSec / 8) / GRTD_MessagesPerSecond
```

Real-time Statistics Multicast Traffic

Real-time Statistics Multicast (RSM) sends real-time data over the CLAN for the use of customer applications. The calculations used to derive the bandwidth utilization due to RSM traffic are similar to the calculations used to derive real-time API bandwidth utilization. However, the data is sent as a byte stream of UDP packets (in this description, we use the terms *packet* and *message* interchangeably), whose packet size is a function of the number of items being sent. Since multicast technology is being employed, only one set of packets is sent every refresh interval, regardless of the number of clients.

Note: The following computations assume the standard UDP overhead of 72 bytes per packet and a header overhead of 68 bytes per message, for a total of 140 bytes of overhead per packet. The difference between a TCP and UDP packet is 16 octets (bytes). The UDP overhead is calculated by taking 16 bytes from the standard 88 bytes to yield 72. The maximum packet (stream) size is 64 kbytes. The 140-byte overhead is incurred whenever a new packet is sent.

The record sizes in bytes are given in the following table:

RSM statistic	Bytes sent per packet	Variable name
UDP Header	72	
RSM Header	68 (Constant)	
Agent Statistics	84 (per agent)	nRSM_Agt_Size_Bytes

RSM statistic	Bytes sent per packet	Variable name
RSM Packet Size	64 kbytes/packet (maximum)	nRSM_Pkt_Size_Bytes
Application Statistics	84 (per application)	nRSM_App_Size_Bytes
Skillset Statistics	116 (per skillset)	nRSM_Skl_Size_Bytes
Nodal Statistics	28 (Constant)	nRSM_Nod_Size_Bytes
IVR Statistics (M1/CSE 1000 only)	32 (per IVR Port)	nRSM_IVR_Size_Bytes
Route Statistics (M1/CSE 1000 only)	10 (per route)	nRSM_Rte_Size_Bytes

Note: IVR and Route statistics are only available for the Meridian 1/CSE 1000 switch.

Each statistic can be sent as *time in state* or *moving window* information. At each refresh interval, either one or both may be sent for each statistic (this is a user-configurable option). Therefore, each statistic can be sent in one or two streams.

The number of streams for statistic *i* is

nRSMStr_RSC*i*= 0 if statistic *i* is not sent
= 1 if statistic *i* is sent as one stream
= 2 if statistic *i* is sent as two streams

where *i* is one of Agt, App, Skill, Nod, IVR, or Rte.

The number of packets sent at each refresh interval is

nRSMPkts = Sum of (nRSMStr_RSCi) for all *i*

The RSM traffic in Mbps is calculated as

$$
\begin{aligned}
&\mathtt{\mathbf{RSM\_BW\_Required\_MbitsSec}} = \\
&\quad \mathtt{SUMOF\ (} \\
&\quad \mathtt{(Packet\_length_{Agt}\ *\ nRSMStr\_Agt\ /\ I_{RSM\_Agt}} \\
&\qquad \mathtt{Packet\_length_{App}\ *\ nRSMStr\_App\ /\ I_{RSM\_App}} \\
&\qquad \mathtt{Packet\_length_{Skl}\ *\ nRSMStr\_Skill\ /\ I_{RSM\_Skl}} \\
&\qquad \mathtt{Packet\_length_{Nod}\ *\ nRSMStr\_Nod\ /\ I_{RSM\_Nod}} \\
&\qquad \mathtt{Packet\_length_{IVR}\ *\ nRSMStr\_IVR\ /\ I_{RSM\_IVR}} \\
&\qquad \mathtt{Packet\_length_{Rte}\ *\ nRSMStr\_Rte\ /\ I_{RSM\_Rte}} \\
&\quad \mathtt{)} \\
&\quad \mathtt{*\ 8\ /\ 1000000} \\
&\quad \mathtt{)}
\end{aligned}
$$

where the following table indicates the packet length for each statistic type.

RSM Statistic Type	$\textbf{Packet\_Length}_{\textbf{Stat\_Type}}$
Agent Statistics	nRSMAgtRows * nRSM_Agt_Size_Bytes + Ceiling (nRSMAgtRows * nRSM_Agt_Size_Bytes / nRSM_Pkt_Size_Bytes), 1) * (UDP Header + RSM Header)
Applications Statistics	nRSMAppRows * nRSM_App_Size_Bytes + Ceiling ((nRSMAppRows * nRSM_App_Size_Bytes / nRSM_Pkt_Size_Bytes), 1) * (UDP Header + RSM Header)
Skillset Statistics	nRSMSklRows * nRSM_Skill_Size_Bytes + Ceiling ((nRSMSklRows * nRSM_Skl_Size_Bytes / nRSM_Pkt_Size_Bytes), 1) * (UDP Header + RSM Header)
Nodal Summary Statistics	nRSMNodRows * nRSM_Nod_Size_Bytes + Ceiling ((nRSMNodRows * nRSM_Nod_Size_Bytes / nRSM_Pkt_Size_Bytes), 1) * (UDP Header + RSM Header)
IVR Statistics (M1 only)	nRSMIVRRows * nRSM_IVR_Size_Bytes + Ceiling ((nRSMIVRRows * nRSM_IVR_Size_Bytes / nRSM_Pkt_Size_Bytes), 1) * (UDP Header + RSM Header)

RSM Statistic Type	Packet_Length$_{Stat_Type}$
Route Statistics (M1 only)	nRSMRteRows * nRSM_Rte_Size_Bytes + Ceiling ((nRSMRteRows * nRSM_Rte_Size_Bytes / nRSM_Pkt_Size_Bytes), 1) * (UDP Header + RSM Header)

The LAN utilization due to the RSM then is calculated as

```
if Web Client is used without NCRTD then
  RSM_Utilization =
    2 * 100% *RSM_BW_Required_MbitsSec /
    TCPIP_Bandwidth_MBitsSec
  else
    100% *RSM_BW_Required_MbitsSec /
    TCPIP_Bandwidth_MBitsSec
```

Note: For more information about NCRTD, see “Application Server LAN/WAN impact” on page 253.

Each RSM update is transferred as a single message per statistic over the network. Therefore, the message rate per second depends on the number of statistics being sent and the RSM refresh interval. For the Meridian 1/CSE 1000, the maximum number of RSM statistics is 6 for interval to date and 6 for moving window for a total of 12. (For the DMS/MSL-100, the total is 8, given that there are no IVR queue and route statistics available). Therefore, the number of messages transferred per second can be estimated as

```
RSM_MessagesPerSecond =
  nRSMPkts / Avg.RSM UpdateINtvl
```

where Avg.RSM UpdateIntvl is the average update interval for all RSM statistics.

The average message size can be computed as follows:

```
RSM_AvgBytesPerMessage =
  (RSM_BW_Required_MbitsSec / 8) / RSM_MessagesPerSecond
```

MLS traffic on the CLAN

Meridian Link Services (MLS) provides the connection between the switch and third-party applications. MLS traffic is combined with Symposium Call Center Server traffic en route from the switch to the third-party application. The MLS traffic is sent over the CLAN.

MLS traffic can be subdivided into traffic resulting from inbound calls and traffic resulting from outbound calls.

Inbound call traffic

Inbound MLS traffic is dependent on the number of MLS messages associated with each inbound call (including screen pops), and the MLS messages due to transferring and conferencing inbound calls. The total bandwidth requirement for MLS inbound traffic can be expressed as

```
MLinkIn_BW_Required_MbitsSec =
  SUM OF (
    aMMSGPerCall
    aMSPPerCall
    aMMSGPerTx * pTransferIn * pTrnf_MLS
    aMMSGPerConf * pConferenceIn * pConf_MLS
  ) * PeakCallRate * (aMMSG_Size + 88) * 8 / (3600 *
  1000000)
```

Note: Symposium Voice Services on CallPilot uses MLS for communication between Call Pilot and Symposium Call Center Server. If you are using Symposium Voice Services on CallPilot, increase aMMSGPerCall by 10.

The inbound MLS utilization is defined as

```
MLinkIn_Utilization =
  100% * MLinkIn_BW_Required_MbitsSec /
  TCPIP_Bandwidth_MBitsSec
```

Outbound call traffic (Meridian 1/CSE 1000 only)

For the outbound call contribution, the traffic is made up by MLS messages for successful calls (including screen pops), unsuccessful connected calls and unconnected calls, as well as MLS messages. The total bandwidth requirement for MLS outbound traffic can be expressed as

```
MLinkOut_BW_Required_MbitsSec=
  SUM OF(
    aMMSGPerOutCall
    aMSPPerOutCall
    aMMSGPerConUCall * aAttPerOutCall *
        (1 – pUCallsNCon)
    aMMSGPerNCon * aAttPerOutCall * pUCallsNCon
    aMMSGPerTx * pTransferOut * pTrnf_MLS
    aMMSGPerConf * pConferenceOut * pConf_MLS
  ) * PeakOutCallRate * (aMMSG_Size + 88) * 8 /
  (3600 * 1000000)
```

The outbound MLS utilization is defined as

```
MLinkOut_Utilization =
  100% * MLinkOut_BW_Required_MbitsSec /
  TCPIP_Bandwidth_MBitsSec
```

Host Data Exchange traffic on the CLAN

The Host Data Exchange feature provides the connection between Symposium Call Center Server and third-party applications on the CLAN. Host Data Exchange is used to exchange information during the execution of a script whenever Send Request, Get Response, and Send Info script commands are used. Host Data Exchange is not used for any of the predefined workloads or scripts.

All Host Data Exchange script commands may have up to 10 parameters, and each parameter may be up to 256 bytes. The actual number of parameters and the parameter sizes are determined by the application. Each Host Data Exchange command also contains a 20-byte provider ID field.

There are two basic DX applications: the Send Request/Get Response pair and Send Info. The amount of information transferred per application is computed as

```
DX_ReqResp_Bytes =
  aDX_SndReq_ParNum * aDX_SndReq_ParSize +
  aDX_GetResp_ParNum * aDX_GetResp_ParSize + 2 * 20 + 2 *
  88

Max_DX_ReqResp_Bytes = 1816

DX_GetInfo_Bytes =
  aDX_SndInfo_ParNum * aDX_SndInfo_ParSize + 20 + 88

Max_DX_SendInfo_Bytes = 908
```

The proportion of calls that use the Send Request/Get Response pair is defined as aHDXRGPerCall. The proportion of calls that use Send Info is defined as aHDXSIPerCall. (See "Record your workload parameters" on page 134 for definitions.) These proportions are determined from the customer traffic projections. The bandwidth required by the DX feature, based on the assumption of 20 percent overhead, is computed as

```
DX_BW_Required_MbitsSec =
  SUMOF(
    aHDXRGPerCall * DX_ReqResp_Bytes
    aHDXSIPerCall * DX_SendInfo_Bytes
  ) * (LocalPeakCallRate + nwIAccPeakCallRate) * 1.2* 8 /
  (3600 * 1000000)

HDX_Utilization =
  100% * DX_BW_Required_MbitsSec /
  TCPIP_Bandwidth_MBitsSec
```

The following table shows example Host Data Exchange utilization rates for different numbers of commands per hour:

DX Application Rate / Hour	Send Request/ Get Response	Send Info	Send Request/ Get Response & Send Info
1000	0.0%	0.0%	0.1%
5000	0.2%	0.1%	0.4%

DX Application Rate / Hour	Send Request/ Get Response	Send Info	Send Request/ Get Response & Send Info
10 000	0.5%	0.2%	0.7%
15 000	0.7%	0.4%	1.1%
20 000	1.0%	0.5%	1.5%
25 000	1.2%	0.6%	1.8%

The number of messages transferred per second by the Host Data Exchange feature can be estimated as

```
HDX_MessagesPerSecond =
  SUMOF(
    aHDXRGPerCall * DX_RG_Messages
    aHDXSIPerCall * DX_SI_Messages
  ) * (LocalPeakCallRate + nwIAccPeakCallRate) / 3600
```

The average size of message can be computed as

```
HDX_AvgBytesPerMessage =
  (DX_BW_Required_MbitsSec / 8) / HDX_MessagesPerSecond
```

Data extraction traffic on the CLAN

Symposium Call Center Server data extraction results in the transfer of data between the server in Symposium Call Center Server and a customer server over the CLAN. The amount of information transferred depends on

- the number of rows
- the amount of information per row
- the frequency of invocation of the data extraction process

The estimate of the LAN impact of the data extraction function depends on the approximate size of each extraction (DataRows) and the number of extractions per hour (ExtractsPerHour).

CLAN traffic for each data extraction is computed based on 40 percent protocol overhead as follows for each report:

```
DataTraffic_Mbits =
  DataRows * DataRowBytes * 8 * ExtractsPerHour * 1.4 /
  1000000
```

Note: The amount of information per row for each of the views (DataRowBytes) is shown in Appendix H, “Symposium Call Center Server database views.”

Total bandwidth required for Symposium Call Center Server data extraction is computed as

```
Data_BW_Required_MbitsSec =
  SUMOF_ALL (DataTraffic_Mbits) / 3600
  ...for all data extractions

Data_Extraction_Utilization =
  Data_BW_Required_MbitsSec / TCPIP_Bandwidth_MBitsSec *
  100%
```

Reporting traffic on the CLAN

Symposium Call Center Server reporting results in transfer of report data between the server in Symposium Call Center Server and the Client PC over the CLAN. The amount of information transferred depends on the size of report (number of rows), the amount of information per row, and the frequency of invocation of the report.

The amount of information can be calculated using the following formula:

```
Reporting_Utilization =
 SUMOF(
   Local__Historical_Reporting_BW_Required_MbitsSec
   Local__CBC_Reporting_BW_Required_MbitsSec
   Cons_Reporting_BW_Required_MbitsSec (M1/CSE 1000 only)
   Cons_CBC_Reporting_BW_Required_MbitsSec (M1/CSE 1000 only)
 ) / TCPIP_Bandwidth_MBitsSec * 100%
```

Local historical reporting traffic

Local reporting traffic consists of configuration, historical statistics, and call detail reports extracted from the local Symposium Call Center Server system on the same CLAN. The estimate of the LAN impact of the reporting function depends on the approximate size of each report (ReportRows) and the number of reports per hour (ReportsPerHour).

Note: For reports other than the standard reports, the number of bytes per row can be determined by using the **sp_help *<table_name>*** Sybase command for the tables on which the report is based. This determines the size of each column in the report. Once the individual column sizes are obtained, the size of the row is computed as the sum of the sizes of columns.

CLAN traffic for each report is computed based on 40 percent protocol overhead as follows for each report:

```
ReportTraffic_Mbits =
  ReportRows * ReportRowBytes * 8 * ReportsPerHour * 1.4 /
  1000000
```

Note: The amount of information per row for each of the standard reports (ReportRowBytes) is shown in Appendix D, "Symposium Call Center Server standard reports."

Total bandwidth required for Symposium Call Center Server reporting is computed as

```
Local_Historical_Reporting_BW_Required_MbitsSec =
  SUMOF_ALL (ReportTraffic_Mbits) / 3600      ... for all reports
```

Local CBC reporting traffic

It is assumed that all data collected is reported on once. As such, the amount of CBC data sent to the Client PC every hour from the local node is equal to the amount of data collected at the local node. The amount of CBC data collected per day is CallByCallSizeKb, described in “Event tables disk space” on page 165. Assuming a 40 percent protocol overhead, the amount of information retrieved per hour is computed as

```
Nodal_CBC_Reporting_Data =
  CallByCallSizeKb / 24

Local_CBC_Reporting_BW_Required_MbitsSec =
  Nodal_CBC_Reporting_Data * 8 * 1.4 / (3600 * 1000)
```

Consolidated historical statistics reporting traffic (Meridian 1/CSE 1000 only)

Consolidated Historical Statistics reports can be generated from any PC in the network that can connect to the NCC server. For each consolidated report, the user can select the set of nodes on which the report will be based. The CLAN of both the current node and the selected nodes will be affected.

```
Cons_Reporting_BW_Required_MbitsSec =
  SUMOF(
     Client_Cons_Reporting_BW_Required_MbitsSec
     Node_Cons_Reporting_BW_Required_MbitsSec
  )
```

Reports generated by a client PC on the CLAN (Meridian 1/CSE 1000 only)

Clients can connect to the NCC from any CLAN and request a consolidated report on network activity. Consolidated reports combine data from multiple nodes in the network. The estimate of the LAN impact of the function depends on

- the number of nodes that are selected (NumberOfNodes)
- the approximate size of each report (ReportRowsPerNode)
- the number of reports per hour (ReportsPerHour)

CLAN traffic for each report is computed based on 40 percent protocol overhead for each report as

```
Client_Cons_ReportTraffic_Mbits =
  ReportRowsPerNode * NumberOfNodes * ReportRowBytes * 8 *
  ReportsPerHour * 1.4 / 1000000
```

Note: The amount of information per row for each of the standard reports (ReportRowBytes) is shown in Appendix D in the "List of standard reports" on page 395.

Total bandwidth required for Symposium Call Center Server reporting is computed as

```
Client_Cons_Reporting_BW_Required_MbitsSec =
  SUMOF_ALL (Client_Cons_ReportTraffic_Mbits) / 3600
```

...for all reports

Reports selected from any node (Meridian 1/CSE 1000 only)

If the PC from which the report is generated is at a different site, then the local CLAN is used whenever any consolidated report selects data from the local node. The estimate of the LAN impact of the reporting function depends on

- the approximate size of each report (ReportRowsPerNode) for this node
- the number of reports per hour (ReportsPerHour) for this node

CLAN traffic for each report is computed based on 40 percent protocol overhead as follows for each report:

```
Node_Cons_ReportTraffic_Mbits =
  ReportRowsPerNode * ReportRowBytes * 8 * ReportsPerHour
  * 1.4 / 1000000
```

Note: The amount of information per row for each of the standard reports (ReportRowBytes) is shown in Appendix D in the "List of standard reports" on page 395.

Total bandwidth required for Symposium Call Center Server reporting is computed as

```
Node_Cons_Reporting_BW_Required_MbitsSec =
  SUMOF_ALL (Node_Cons_ReportTraffic_Mbits) / 3600
          ...for all reports
```

Consolidated CBC reporting traffic (Meridian 1/CSE 1000 only)

Clients connected to the NCC can request a consolidated CBC report on network activity. For each report, customers can specify a single node on which the report is based. Nortel Networks recommends that the client PC that generates the report be on the same CLAN as the node on which the report is based; however, this is not assumed in the following calculations:

```
Cons_CBC_Reporting_BW_Required_MbitsSec =
  SUMOF(
    Client_Cons_CBC_Reporting_BW_Required_MbitsSec
    Node_Cons_CBC_Reporting_BW_Required_MbitsSec
  )
```

Report selected from local node (Meridian 1/CSE 1000 only)

It is assumed that all data collected is reported on once. As such, the amount of CBC data sent to the Client PC every hour from the local node is equal to the amount of data collected at the local node plus the amount of data collected at the NCC on behalf of this node. Reporting on local data is accounted for in “Local CBC reporting traffic” on page 230. To determine the amount of bandwidth required for network CBC data retrieved from the NCC, assume a 40 percent protocol overhead, and compute as follows:

```
Node_Cons_CBC_Reporting_Data =
  SUMOF (
    IREJ_CBC_Events * nwORejPeakCallRate
    IACC_CBC_Events * nwOAccPeakCallRate
  ) * NetCBCRecSize

Node_Cons_CBC_Reporting_BW_Required_MbitsSec =
  Node_Cons_CBC_NCC_Data * 8 * 1.4 / (3600 * 1000)
```

Reports generated by a client PC on the CLAN (Meridian 1/CSE 1000 only): Method 1

The consolidated network CBC report is limited to 1 hour of data for any single invocation of the report. However, an end user can run multiple reports for different nodes. For the purpose of engineering enough LAN capacity, it is assumed that the amount of CBC data retrieved for any particular report is equal to the amount of network CBC data that is collected at the NCC and the source node for all network out calls that originate at the node selected in the report. Therefore, the amount of information that can be retrieved per hour for a single node is computed as

```
CBC_Cons_ReportTraffic_Mbits =
  SUMOF(
     NetwCBC_NCC_Data
     Node_Cons_CBC_Reporting_Data
  ) ...for each node
```

where

```
NetwCBC_NCC_Data =
  SUMOF(
     IREJ_CBC_Events * nwORejPeakCallRate
     IACC_CBC_Events * nwOAccPeakCallRate
  ) * NetCBCRecSize
```

where the values for IREJ_CBC_Events, IACC_CBC_Events, nwORejPeakCallRate, and nwOAccPeakCallRate are for the node selected in the report (not necessarily the current node).

The amount of local CBC data collected at the node selected in the report is the value Nodal_CBC_Reporting_Data for that node (not necessarily the current node).

Note: Since the reporting of local CBC data is already accounted for in "Local CBC reporting traffic" on page 230, it is important that the reporting of this data is not accounted for twice unless it is actually extracted twice in different reports.

With a 40 percent protocol overhead, the total amount of information retrieved is computed as follows, where the value for CBC_Cons_ReportTraffic_Mbits is for the node selected in the report (not necessarily the current node):

```
Client_Cons_CBC_Reporting_BW_Required_MbitsSec =
  SUMOF_ALL (CBC_Cons_ReportTraffic_Mbits) * 8 * 1.4 /
  (3600 * 1000) ...for all reports
```

Reports generated by a client PC on the CLAN (Meridian 1/CSE 1000 only): Method 2

The amount of traffic due to network CBC consolidated reporting can be estimated using the method in “Report selected from local node (Meridian 1/CSE 1000 only)” on page 232. The estimate of the LAN impact of the reporting function depends on

- the approximate size of each report (ReportRows)
- the number of reports per hour (ReportsPerHour)

CLAN traffic for each report is computed based on 40 percent protocol overhead, as follows for each report:

```
ReportTraffic_Mbits =
  ReportRows * ReportRowBytes * 8 * ReportsPerHour * 1.4
  / 1000000
```

Note: The amount of information per row for each of the standard reports (ReportRowBytes) is shown in Appendix D in the “List of standard reports” on page 395.

Total bandwidth required for Symposium Call Center Server reporting is computed as

```
Client_Cons_CBC_Reporting_BW_Required_MbitsSec =
  SUMOF_ALL (ReportTraffic_Mbits) / 3600...for all reports
```

Event Interface traffic on the CLAN (Meridian 1/CSE 1000 only)

The Symposium Event Interface (SEI) feature provides the connection between third-party applications on the CLAN and Symposium Call Center Server event handlers. SEI is used by third-party applications to receive notification messages when call processing events are recognized by Symposium Call Center Server. The sending of notification messages from SEI to third-party applications is done on a periodic basis. This period can range from a half second to 5 seconds and is set for each time an application registers for notification with SEI. Each third-party application receives notification for the events that they choose and that are recorded in the CBC database. The application can receive notification for all or a subset of all possible events.

```
SEI_BASE = 200 bytes

SEI_Event_Size = 550 bytes

SEI_NotificationsPerSecondPerClient =
  SUMOF (
     (BCC_CBC_Events + RecsPerCall) * PeakCallRate
     (OACC_CBC_Events + RecsPerNWOutCall) *
         nwOAccPeakCallRate
     OREJ_CBC_Events * nwORejPeakCallRate
     (IACC_CBC_Events + RecsPerNWInCall) *
         nwIAccPeakCallRate
     IREJ_CBC_Events * nwIRejPeakCallRate
     ) / 3600 * pEventsCall
```

Note: For more information about RecsPerCall, see Appendix C, “Database table sizes.”

```
SEI_NotificationsPerMessage =
  SEI_NotificationsPerSecondPerClient * EIUpdateIntvl

SEI_MessageSize =
  SEI_Base + SEI_NotificationsPerMessage * SEI_Event_Size

SEI_MessagesPerSecond =
  1 / EIUpdateIntvl * nSEIClients
```

The bandwidth required by the SEI feature is computed as

```
SEI_BW_Required_MbitsSec =
  88 + SEI_MessageSize * 8 * SEI_MessagesPerSecond / 1000000

SEI_Utilization =
  100% * SEI_BW_Required_MbitsSec /
  TCPIP_Bandwidth_MBitsSec
```

Network agent requests impact on the CLAN (Meridian 1/CSE 1000 only)

A networked Symposium Call Center Server results in CLAN traffic used for communicating the network agent requests between the different Symposium Call Center Server nodes. Network call processing (NCP) traffic consists of messages sent by the Symposium Call Center Server nodes in a network to request a remote agent to service an incoming call. The messages associated with sending and canceling these requests, as well as receiving responses and agent reservations, are shown in the following table:

Message	Variable name	Message size
Network Agent Request	NARequest	199
Network Agent Response	NAResponse	403
Network Agent Reserved	NAReserved	403
Network Agent Canceled Request	NACancRequest	199

Note: Message sizes include the standard TCP/IP overhead of 88 bytes plus toolkit overhead of 55 bytes, yielding a total of 143 bytes of total overhead.

Three basic functions are associated with network agent requests:

- requesting an agent
- receiving a reservation
- canceling a request

These basic operations are associated with four types of requests:

- successful requests on the local node

- successful requests on the network node
- canceled requests on the local node
- canceled requests on the network node

Bytes transferred for each type of request

The amounts of information related to these four types of requests are summarized in the following table:

Name	Bytes transferred per request	Notes
nwAcc_Bytes	NARequest + NAResponse + NAReserved	Successful request for an agent on the local node.
nwRej_Bytes	NARequest + NAResponse + NAReserved + NACancRequest	Cancellation of the request for an agent on the local node. Assume that an agent has already been reserved.
nwAccFrom_Bytes (out calls)	NARequest	Bytes sent for the successful request for an agent on another node.
nwAccTo_Bytes (in calls)	NAResponse + NAReserved	Bytes received for the successful request for an agent on another node.
nwRejFrom_Bytes (out calls)	NARequest + NACancRequest	Bytes sent for the unsuccessful request for an agent on another node.
nwRejTo_Bytes (in calls)	NAResponse + NAReserved	Bytes received for the unsuccessful request for an agent on another node.

The amount of traffic depends on the rate of the requests. The total amount of NCP traffic, therefore, is computed as

```
NCP_BW_Required_MbitsSec =
  SUMOF(
     nwIAccPeakCallRate * nwAcc_Bytes
     nwIRejPeakCallRate * nwRej_Bytes
     nwOAccPeakCallRate * nwAcc_Bytes
     nwORejPeakCallRate * nwRej_Bytes
  ) * 8 / (3600 * 1000000)

NCP_Utilization =
  100% * NCP_BW_Required_MbitsSec / TCPIP_Bandwidth
```

Network call-by-call traffic per node (CLAN) (Meridian 1/CSE 1000 only)

Events associated with a networked call that originates on another node are recorded in the local CBC database. The events associated with successful as well as with rejected and canceled network calls are sent to the NCC. The following formula describes the number of events reported to the NCC per hour:

```
NCBC_Records_PerNodePerHour = SUMOF (
  IACC_CBC_Events * nwIAccPeakCallRate
  IREJ_CBC_Events * nwIRejPeakCallRate
  ) * pCBCNetworkNode
```

It is assumed that the size of each record is the size of a record in the NIeNetCallByCallStatYYYYMMDD event table (NetCbcRecSize)—see Appendix C, "Database table sizes." Therefore, the amount of information sent per hour, assuming 30 percent protocol overhead, is computed as

```
NCBC_Traffic_KbHr =
  NCBC_Records_PerNodePerHour *
  NetCbcRecSize * 1.3

NCBC_BW_Required_MbitsSec =
  (NCBC_Traffic_KbHr / 1000) * 8 / 3600

NCBC_Utilization =
  100% * NCBC_BW_Required_MbitsSec /
  TCPIP_Bandwidth_MBitsSec
```

Networking NCC updates impact on the CLAN (Meridian 1/CSE 1000 only)

NCC update traffic consists of periodic broadcasting of the routing tables by NCC nodes. The assumption is made that these updates occur once every NCC_Period_Min (currently, this value is 5 minutes). The impact of such updates is expected to be negligible. Therefore, NCCUpd_Utilization = 0.

Network Consolidated Real-Time Display traffic (Meridian 1/CSE 1000 only)

The Web client generates Network Consolidated Real Time Display Data, which is also carried over the CLAN. If you are using the Web client, you must account for this traffic when calculating the total CLAN bandwidth requirement. For details of this calculation, see “Application Server LAN/WAN impact” on page 253.

External IVR traffic (DMS/MSL-100)

The external IVR system can be connected to either the ELAN or CLAN. If it is connected to the CLAN, all IVR caller-entered data traffic transferred between the server and IVR system travels over the CLAN. The traffic is assumed to be identical for all IVR systems. Link utilization due to call-entered data traffic is calculated in “Cost of caller-entered data (CED) messages” on page 209.

If the external IVR system is connected to the CLAN, then

```
CLAN_CED_BW_Required_MbitsSec = CED_BW_Required_MbitsSec
```

else

```
CLAN_IVR_BW_Required_MbitsSec = 0
```

Finally, the IVR link utilization can be calculated as

```
CLAN_IVR_Utilization =
  100% * CLAN_CED_BW_Required_MbitsSec /
  TCPIP_Bandwidth_MbitsSec
```

Calculate WAN requirements (Meridian 1/CSE 1000)

Introduction

A WAN can be used to provide communication between multiple nodes in the networked Symposium Call Center Server environment.

Network call processing and NCC traffic are now routed over the customer WAN rather than the ELAN. This change affects the computations for WAN requirements, as described in the following sections.

WAN traffic

The WAN is used to carry the following types of data:

- networking call processing-related traffic between the servers
- network call events recording traffic between the servers and NCC
- NCC routing table update traffic between the NCC and the individual servers
- CBC and consolidated reporting traffic between the client PCs and the NCC or servers
- nodal Real-Time Display multicast data between the server in Symposium Call Center Server and the Application Server
- Network Consolidated Real-Time data between the Application Server and Web clients

Network call processing (NCP) traffic must take into account all activity during the peak busy hour of incoming calls. Reporting traffic must take into account all traffic during the period of highest reporting activity. These two times are usually mutually exclusive. (Nortel Networks recommends against running large reporting activities during the peak busy hour.)

To engineer sufficient WAN capacity to handle system needs, engineer the WAN to handle both the NCP traffic and reporting traffic during the busiest periods for each. In the following WAN bandwidth calculations, use reporting information for the busiest network reporting period.

Dedicating the WAN network

Ideally, the WAN network is dedicated to Symposium Call Center Server call processing, although this is not always possible. In a shared WAN environment, network administrators may not have enough control over the network traffic to prevent a large file transfer from impacting other traffic and to guarantee that latency time requirements are met. In an uncontrolled environment, it is difficult to engineer a system that meets specified performance constraints.

Timeouts

The primary factors that determine the maximum acceptable latency time of the NCP messages are the timeouts defined in the networking code. The timeout set for NCP traffic is 10 seconds. This includes the time to send a message from one node to another and receive a response. (Responses are not received for every message, but the exceptions can be ignored.) The largest NCP messages are approximately 400 bytes, including TCP/IP and Media Access Control (MAC) overhead, as shown in “Bytes transferred for each type of request” on page 237. However, testing was done with a simulated latency time of less than 1 second. As such, it has been concluded that the maximum acceptable latency time to transmit a single message from node to node through the CLAN over a WAN connection is 1 second.

WAN traffic between the local node and a remote node

The traffic between any two nodes consists of the NCP traffic described in “Network agent requests impact on the CLAN (Meridian 1/CSE 1000 only)” on page 236. The WAN traffic between the local node and a remote node in the network is the proportion of the total NCP traffic that is sent between the pair of nodes.

WAN traffic from the local node on the CLAN

The traffic on the WAN between the CLANs of two nodes can include both Consolidated Historical Statistics reporting traffic and Consolidated Network CBC reporting traffic. This section is only concerned with the traffic from the local node to a particular node rather than from the local node to all other remote nodes.

Network call processing traffic

The traffic on the WAN between the CLANs of two nodes includes network call processing traffic. The total network call processing WAN bandwidth required from the node is computed as

```
N2NC_BW_From = SUMOF(
  nwIAccPeakCallRate * nwAccTo_Bytes * pNetInOtherNode
  nwIRejPeakCallRate * nwRejTo_Bytes * pNetInOtherNode
  nwOAccPeakCallRate * nwAccFrom_Bytes * pNetOutOtherNode
  nwORejPeakCallRate * nwRejFrom_Bytes * pNetOutOtherNode
  ) * 8 * 1.3 / (3600 * 1000000)
```

Consolidated historical and network CBC reporting traffic

Traffic results from each historical report, CBC report, or data extraction that is generated by a Client PC located on a remote node connected to the CLAN, and selected from the local node. Traffic is computed based on 40 percent protocol overhead as follows:

```
CONS_Traffic_Node_Mbits =
  DataRowsPerNode * ReportRowBytes * 8 * #_Times_Run * 1.4
  / 1000000
```

Note: The amount of information per row for each of the reports (ReportRowBytes) is shown in Appendix D, “Symposium Call Center Server standard reports.”

Total bandwidth required for Symposium Call Center Server consolidated reporting is computed as

```
CONS_Data_From_BW_Required_Mbits =
  SUMOF_ALL (CONS_Traffic_Node_Mbits)
  ...for all reports from node
```

Computing the required bandwidth for LAN traffic from the local node on the CLAN

The required WAN capacity is based on the maximum allowable duration for running all of the reports included in “Consolidated historical and network CBC reporting traffic” on page 242. The duration value represents the maximum allowable amount of time to execute this set of reports/data extractions:

```
Duration_Sec = min(3600; Maximum_duration_in_hours * 3600)

CONS_Data_From_BW_Required_MbitsSec =
  Cons_Data_From_BW_Required_Mbits / Duration_Sec

N2N_Data_From_BW_Required_MbitsSec =
  Cons_Data_From_BW_Required_MbitsSec + N2NC_BW_From

N2NC_BW_Required_From_MbitsSec =
     if N2N_Data_From_BW_Required_MbitsSec > 0 or
     N2N_Data_To_BW_Required_MbitsSec > 0

         Max(0.056, 2 *
              (N2N_Data_From_BW_Required_MbitsSec +
              0.2 * N2N_Data_To_BW_Required_MbitsSec))

     Otherwise
         0
```

WAN traffic to the local node on the CLAN

The traffic on the WAN between the CLANs of two nodes can include both Consolidated Historical Statistics reporting traffic and Consolidated Network CBC reporting traffic. This section is only concerned with the traffic to the local node from a remote node rather than the traffic to the local node from all other remote nodes.

Network call processing traffic

The traffic on the WAN between the CLANs of two nodes includes network call processing traffic. The total network call processing WAN bandwidth required to the node is computed as

```
N2NC_BW_To = SUMOF(
  nwIAccPeakCallRate * nwAccFrom_Bytes * pNetInOtherNode
  nwIRejPeakCallRate * nwRejFrom_Bytes * pNetInOtherNode
  nwOAccPeakCallRate * nwAccTo_Bytes * pNetOutOtherNode
  nwORejPeakCallRate * nwRejTo_Bytes * pNetOutOtherNode
  ) * 8 * 1.3 / (3600 * 1000000)
```

Consolidated historical and network CBC reporting traffic

Traffic results from each historical report, CBC report, or data extraction that is generated by a Client PC attached to the local node, and selected by a Client PC attached to a remote node that is connected by the CLAN. Traffic is computed based on 40 percent protocol overhead as follows:

```
CONS_Traffic_Node_Mbits =
  DataRowsPerNode * ReportRowBytes * 8 * #_Times_Run * 1.4
  / 1000000
```

Note: The amount of information per row for each of the reports (ReportRowBytes) is shown in Appendix D, “Symposium Call Center Server standard reports.”

Total bandwidth required for Symposium Call Center Server consolidated reporting is computed as

```
CONS_Data_To_BW_Required_Mbits =
  SUMOF_ALL (CONS_Traffic_Node_Mbits)
  ...for all reports from node
```

Computing the required bandwidth for traffic to the local node on the CLAN

The required WAN capacity is based on the maximum allowable duration for running all the reports included in “Consolidated historical and network CBC reporting traffic” on page 244. The duration value represents the maximum allowable amount of time to execute this set of reports and data extractions.

```
Duration_Sec = min(3600; Maximum_duration_in_hours * 3600)

CONS_Data_To_BW_Required_MbitsSec =
  Cons_Data_To_BW_Required_Mbits / Duration_Sec

N2N_Data_To_BW_Required_MbitsSec =
  Cons_Data_To_BW_Required_MbitsSec + N2NC_BW_From

N2NC_BW_Required_To_MbitsSec =
  if N2N_Data_To_BW_Required_MbitsSec > 0 or
  N2N_Data_From_BW_Required_MbitsSec > 0

    Max(0.056, 2 * (N2N_Data_To_BW_Required_MbitsSec +
        0.2 * N2N_Data_From_BW_Required_MbitsSec))

  Otherwise
    0
```

A circuit between the CLAN on the local node and the CLAN on the remote node must be able to handle this amount of traffic.

WAN traffic between the local node and the NCC

An NCC node receives the network call recording events from all local nodes and sends the events records whenever they are requested by local nodes generating CBC reports. This traffic per node is NCBC_BW_Required_MbitsSec, defined in “Network call-by-call traffic per node (CLAN) (Meridian 1/CSE 1000 only)” on page 238.

For many customers, the NCC may be located at the same site as one or more of the nodes in the network. In this case, a WAN connection is not needed between the two CLANs, but Nortel Networks recommends that the CLANs be separated by a router.

To compute the WAN bandwidth between a remote node and a node located at the same site as the NCC, add the WAN bandwidth requirements between the remote node and the local node, and between the remote node and the NCC for the CLAN.

WAN traffic from the NCC on the CLAN

The traffic on the WAN between the CLANs of the NCC and the node consists of updates to the routing tables and remote applications table. These tables are only updated at configuration time and periodically thereafter. The following table lists the tables involved in this process and specifies the data that is propagated when a particular item is changed:

Object changed	Tables involved	Data propagated	Sent to
Network Skillset (Added/ Modified/Deleted)	NINCCNetworkSkillset	Affected rows	All Nodes
Routing Information (Added/Modified/Deleted)	NINCCRanking	Affected rows for each skillset for each source node	Source Node
Site (Added/Modified/ Deleted)	NINCCSite	Affected rows	All Nodes
Application (Added/ Deleted at any site)	NINCCRemote Application	Entire Table	All Nodes
Network/Local CBC collection (Modified at any site)	NINCCRemote Application	Entire Table	All Nodes

The objects that result in the majority of traffic affect the NINCCRemoteApplication table. Therefore, only the propagation of the NINCCRemoteApplication table is considered in the following analysis:

```
Propagation_Data_Mbits =
  SizeOf(NINCCRemoteApplication) * 8 / 1000

Propagation_Data_MbitsSec =
  Propagation_Data_Mbits * 1.3 / (60 * NCC_Period_Min)
```

Network CBC reporting traffic

The traffic on the WAN between the CLANs from the NCC to the node may consist of network CBC reporting traffic. For the purpose of engineering enough WAN capacity, it is assumed that an individual on the CLAN of the current node runs a consolidated network CBC report such that all network CBC data collected at the NCC is reported on once. If this is not the case, then the WAN connection required capacity must be at least 56 kbps.

The bandwidth required to transmit this data is computed as NCBC_BW_Required_MbitsSec (see "Network call-by-call traffic per node (CLAN) (Meridian 1/CSE 1000 only)" on page 238) based on 30 percent protocol overhead for Bulk Copy Procedure (BCP). Consequently, the reporting traffic is computed based on 40 percent protocol overhead as

```
If Network CBC data is retrieved from the NCC

  BW_From_MbitsSec =
     NCBC_BW_Required_MbitsSec * 1.4 / 1.3

Else

  BW_From_MbitsSec = 0
```

Computing the required capacity

The required capacity on the WAN connection from the NCC to the local node is calculated as

```
NCC_Data_From_BW_Required_MbitsSec =
  BW_From_Mbits + Propagation_Data_MbitsSec

NCPC_BW_Required_From_MbitsSec =
  Max(0.056, 2* (NCC_Data_From_BW_Required_MbitsSec + 0.2
  * Total_NCC_To_BW_Required_MbitsSec))
```

WAN traffic to the NCC on the CLAN

The traffic on the WAN between the CLANs from the node to the NCC consists of CBC traffic plus any data for consolidated reporting performed by a Client PC on the CLAN of the NCC.

Network CBC reporting traffic

The WAN bandwidth required to transmit the CBC data is computed based on the total amount of CBC traffic that is sent to the NCC every hour. Based on 30 percent protocol overhead for BCP, the total WAN bandwidth required from the node is computed as

```
NCBC_Records_PerHour =
  SUMOF (
    IACC_CBC_Events * nwAccNetwPeakCallRate
    IREJ_CBC_Events * nwRejNetwPeakCallRate
  ) * pCBCNetwork
```

It is assumed that the size of each record is the size of a record in the CBC database, namely the NIeNetCallByCallStatYYYYMMDD event table (NetCbcRecSize). You obtain this size from “Computing the number of rows per table” on page 388. During each 15-minute interval, the network must be capable of transferring the historical statistics and the local CBC data as well as the network CBC data. Therefore, the WAN must have the capacity to transfer the network CBC data to the NCC in one-third of every 15-minute interval. That is, the WAN must be able to transfer 1 hour’s worth of network CBC data in 20 minutes. The amount of information sent per hour, assuming 30 percent protocol overhead, is computed as

```
Total_NCBC_Traffic_KbHr =
  NCBC_Records_PerHour * NetCbcRecSize * 1.3

Total_NCBC_BW_Required_MbitsSec =
  (Total_NCBC_Traffic_KbHr / 1000) * 8 / 1200
```

Consolidated historical and network CBC reporting traffic

The reporting traffic can consist of both consolidated historical statistics reporting traffic and consolidated network CBC reporting traffic.

Traffic is computed for each report that is from this node for a Client PC on the NCC based on 40 percent protocol overhead as

```
NCC_Cons_Traffic_Mbits =
  DataRowsPerNode * ReportRowBytes * 8 * #_Times_Run * 1.4
  / 1000000
```

Note: The amount of information per row for each of the reports (ReportRowBytes) is shown in Appendix D, "Symposium Call Center Server standard reports."

Total bandwidth required for Symposium Call Center Server consolidated reporting is computed as

```
NCC_Cons_Data_BW_Required_Mbits =
  SUMOF_ALL (NCC_Cons_Traffic_Mbits)
     ...for all reports from node
```

Computing the required capacity

The required WAN capacity is based on the maximum allowable duration for running all of the reports included in "Consolidated historical and network CBC reporting traffic" on page 248. The duration value represents the maximum allowable amount of time to execute this set of reports or data extractions:

```
Duration_Sec = min(3600; Maximum_duration_in_hours * 3600)

Total_NCC_To_BW_Required_MbitsSec =
  NCC_Cons_Data_BW_Required_Mbits / Duration_Sec +
  Total_NCBC_BW_Required_MbitsSec

NCPC_BW_Required_To_MbitsSec =
  Max(0.056, 2 * (Total_NCC_To_BW_Required_MbitsSec + 0.2
  * NCC_Data_From_BW_Required_MbitsSec))
```

A circuit to the CLAN on the NCC from the CLAN on the local node must be able to handle this amount of traffic.

Sample analysis of network CBC data collection capacity requirements

Since nwAccNetwPeakCallRate and nwRejNetwPeakCallRate are functions of the NetworkPeakCallRate, the bandwidth required is dependent on the number of nodes in the network and the proportion of network CBC data that is collected. The collection of network CBC data can be disabled on an application basis at each node giving the administrator control over the amount of data collected (pCBCNetwork). The following tables demonstrate how the required bandwidth for a single node depends on the number of nodes in the network and the proportion of CBC data collected.

CLAN WAN bandwidth required to NCC in kbps per node to support network CBC data collection with 10 percent of calls networked

	pCBCNetwork				
# Nodes in network	**20%**	**40%**	**60%**	**80%**	**100%**
2	8.4	16.5	24.9	33	42
3	18.6	36	57	72	90
4	33	66	102	132	168
5	42	84	126	168	210
6	51	102	150	204	252
10	84	168	252	336	420
20	168	336	N/A	N/A	N/A
30	252	N/A	N/A	N/A	N/A

Note: This table assumes a daily call rate of 10 000 CPH and a value of 10 percent for pNetOut for each node.

CLAN WAN bandwidth required to NCC in kbps per node to support network CBC data collection with 50 percent of calls networked

	pCBCNetwork				
# Nodes in network	**20%**	**40%**	**60%**	**80%**	**100%**
2	42	84	123	168	210
3	93	180	285	N/A	N/A
4	165	330	N/A	N/A	N/A
5	210	420	N/A	N/A	N/A
6	252	N/A	N/A	N/A	N/A
10	420	N/A	N/A	N/A	N/A
20	N/A	N/A	N/A	N/A	N/A
30	N/A	N/A	N/A	N/A	N/A

Note: This table assumes a daily call rate of 10 000 CPH and a value of 50 percent for pNetOut for each node.

Since the maximum allowable amount of network CBC data that can be collected is limited to 10 000 calls per hour, the value of pCBCNetwork must decrease for all nodes as the number of nodes in the network is increased.

WAN traffic at the local node

At every local node (site), some of the CLAN networking-related traffic is routed to other nodes via a WAN. The CLAN traffic routed over the WAN consists of network agent requests and responses described in "Network agent requests impact on the CLAN (Meridian 1/CSE 1000 only)" on page 236. The CLAN traffic consists of the

- network agent requests and responses—described in "Network agent requests impact on the CLAN (Meridian 1/CSE 1000 only)" on page 236
- network call event information that is recorded on the NCC—described in "Consolidated historical and network CBC reporting traffic" on page 242
- reporting traffic—described in "Consolidated historical and network CBC reporting traffic" on page 242

If each LAN has a router, then the total WAN bandwidth that the router connected to the CLAN must be able to handle is computed as

```
WAN_CLAN_MbitsSec =
  N2NC_BW_Required_From_MbitsSec +
  N2NC_BW_Required_To_MbitsSec +
  NCPC_BW_Required_From_MbitsSec +
  NCPC_BW_Required_To_MbitsSec
```

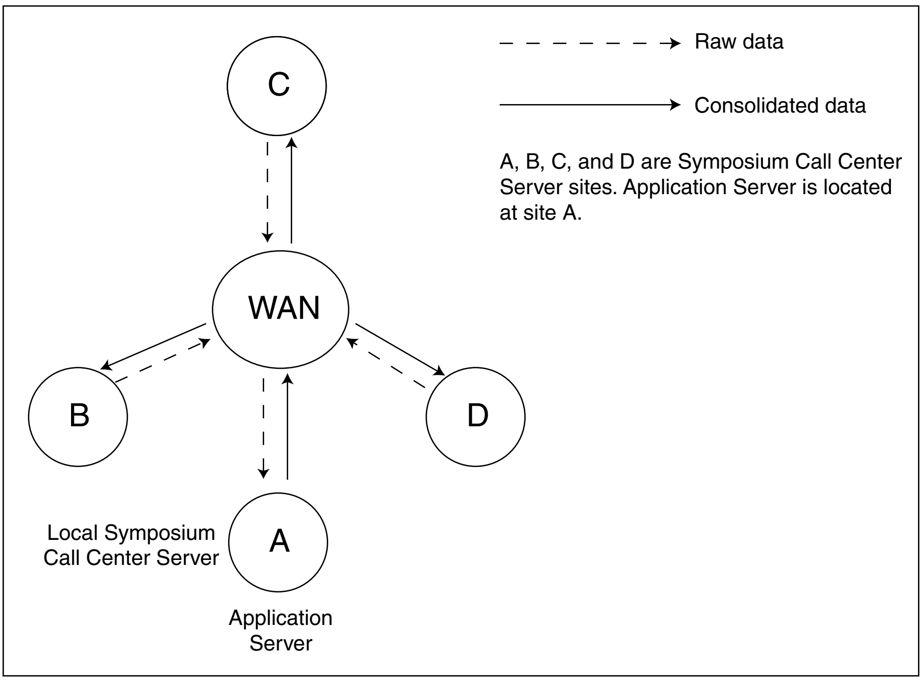
Application Server LAN/WAN impact

The LAN/WAN impact from the Application Server can be divided into two categories:

- nodal RTD Multicast data (RSM_BW_Required_MbitsSec)
- Networked Consolidated Real Time Display Data

Symposium Call Center Server sends nodal RTD Multicast data to the Application Server from the server in Symposium Call Center Server. The impact of this traffic is included in the CLAN calculations (see “Real-time Statistics Multicast Traffic” on page 220).

Networked Consolidated Real Time Display data is transmitted over the LAN/WAN as a result of NCRTD requests from clients anywhere in the network (see the following illustration).



This illustration shows one Application Server located at Node A. All of the servers in Symposium Call Center Server send raw real-time data to the Application Server (RSM_BW_Required_MbitsSec). RSM_BW_Required_MbitsSec can be calculated for all nodes sending raw real-time data to the Application Server for consolidation. If the Application Server is located on this node, then this traffic will impact the “From” WAN links of all remote nodes and the local LAN traffic.

The Application Server in turn sends consolidated data to all of the Web clients. The consolidated real-time traffic from the Application Server to clients requesting this data is approximately equal to the sum of all of the raw data. Very little compression is currently performed. This traffic impacts the “To” WAN links to all remote nodes, assuming that at least one client from every remote site requests NCRTD.

For each remote site Y:

```
NCRTD_Raw_RemoteY_MbitsSec =
  RSM_BW_Required_SiteY_MbitsSec
```

Here RSM_BW_Required_SiteY_MbitsSec is calculated for the remote node identically to RSM_BW_Required_MbitsSec for the local node using the respective parameters of the remote node.

The total incoming raw traffic from remote sites then is

```
Total_NCRTD_Raw_Remote_MbitsSec =
  Sum over all remote sites Y (NCRTD_Raw_RemoteY_MbitsSec)
```

The total consolidated data transmitted to all clients on all remote nodes is

```
NCRTD_MbitsSec =
  Total_NCRTD_Raw_Remote_MbitsSec +
  RSM_BW_Required_MbitsSec
```

If the NCRTD impact has not been included in the CLAN bandwidth requirement calculated in "Real-time Statistics Multicast Traffic" on page 220, then the network impact for the CLAN should be

```
CustomerLan_Utilization =
  SUMOF(
    CustomerLan_Utilization
        (calculated in "Real-time Statistics Multicast Traffic" on page 220)
    NCRTD_Raw_Remote_Utilization
    NCRTD_Cons_Utilization
  )
```

```
NCRTD_Raw_Remote Utilization =
  100%*Total_NCRTD_Raw_Remote_MbitsSec/
  TCPIP_Bandwidth_MBitsSec
```

```
NCRTD_Cons_Utilization =
  100%*NCRTD_MbitsSec/ TCPIP_Bandwidth_MBitsSec
```

The network impact for the WAN formulas found in "Computing the required bandwidth for LAN traffic from the local node on the CLAN" on page 243, and "Computing the required bandwidth for traffic to the local node on the CLAN" on page 245 for traffic *to* and *from* a remote site Y, respectively, should be modified as follows:

```
N2N_Data_From_BW_Required_MbitsSec =
  SUMOF(
    Cons_Data_From_BW_Required_MbitsSec
    N2NC_BW_From
    NCRTD_MbitsSec
  )
```

```
N2N_Data_To_BW_Required_MbitsSec =
  SUMOF(
    Cons_Data_To_BW_Required_MbitsSec
    N2NC_BW_To
    NCRTD_Raw_RemoteY_MbitsSec
  )
```

Online database backup elapsed time

Introduction

The local online database backup runs as a low-priority background task and does not impact the CPU time required by Symposium Call Center Server for call processing or reporting. The CPU time required by Symposium Call Center Server does impact the elapsed time of the online database backup. Since the database backup can use only the unused portion of the CPU, the busier the system, the longer the backup takes.

Calculating online backup elapsed time

The elapsed time of the online database backup can be computed as

Available_CPU =
1.0 - U_{Total} (from "Detailed CPU requirement computations" on page 169)

DB_CPU_Cost =
DBBackupDAT_cost (if a Seagate DAT tape drive is used)
DBBackupMLR_cost (if a Tandberg MLR tape drive is used)

BackupElapsedTime_Hours =

```
Max(
   TotalBackupSizeKb / 1 000 000 * DB_CPU_Cost * 1.5
       / (3600 * Available_CPU/100%)

   (TotalBackupSizeKb/1,000,000 * 0.3)
)
```

Note: TotalBackupSizeKb is obtained in "Backup size computations" on page 168.

A remote backup over the network cannot be reliably estimated. The factors affecting a remote backup consist of

- remote processor CPU speed, utilization, and type
- remote hard drive speed, utilization, and type
- LAN speed and utilization

Chapter 6

Engineering the NCC server

In this chapter

Overview

Introduction

This chapter presents the performance characteristics of the Symposium Call Center Server Network Control Center (NCC) server, and describes the CPU, memory, disk, CLAN, and WAN resources required for the NCC.

Note: Traffic formerly carried on the ELAN has been moved to the CLAN.

NCC server hardware platforms

Introduction

You can use any of the acceptable PVI platforms for the NCC server. For information on minimum requirements for PVI platforms, refer to “Hardware platforms” on page 24.

NCC server performance parameters

Introduction

The NCC performance parameters used for the Symposium Call Center Server NCC server can be found in "Record your workload parameters" on page 134. The common parameters for the NCC have the same values as those given in "Common parameters" on page 339, except for Historical Data. The NCC does not maintain historical statistics, although the nDCallbyCall parameter is used. The NCC does not support real-time displays, agent operations, or voice services.

Call load

The NCC is a service provider to all Symposium Call Center Server network nodes. It does not perform any call processing directly. However, the resource load for the NCC server is a function of the total network call rate to the Symposium Call Center Server network. A large portion of the NCC load is due to the receiving (recording) and sending (reporting) of call-by-call (CBC) records to and from the individual network nodes. The resource limits on the NCC server may thus limit the individual networked call rates per site, which in turn limits the overall call rate per site.

The call load on the NCC server is proportional to the number of events generated by network calls from occurrences of acceptances and rejections at the destination nodes. See "Network agent requests impact on the CLAN (Meridian 1/CSE 1000 only)" on page 236 for the definitions of call types.

Resource usage

The major contributor to resource usage on the NCC is the rate of CBC records being sent by the network nodes to the NCC. This is a function of the number of Queue to Network Skillsets (QTNS) applied per call, and whether the collection of network CBC data has been enabled for the original application that handled the call at the source node. An example of this is given in "WAN traffic from NCC on CLAN" on page 272. The mean number of QTNSs per call is given by aQTNSPerNetwCall and is the average number of QTNSs per call over all calls.

NCC server performance summary

Resource usage on the NCC is a function of CBC recording and reporting, routing table updates, and the number of network nodes. Since the amount of network CBC data that can be collected at the NCC is limited to 10 000 calls per hour (CPH), the NCC performance is not affected significantly by the number of nodes in the network.

The following sections detail the CPU, memory, LAN, and disk space requirements of the Symposium Call Center Server NCC server. The CPU and memory requirements are estimated based on performance test measurements. The disk space and LAN requirements are estimated based on the size of the database tables and the number of messages passed between the Symposium Call Center Server components during normal operation.

NCC server CPU requirements

Introduction

The total NCC server CPU utilization is comprised of the following components:

- background CPU
- CBC recording
- CBC reporting
- routing table operations

Each of these components are described in the following sections.

NCC workload CPU scenario requirements

The capacity of the NCC server depends on the amount of network CBC data being collected, the rate at which routing table updates are distributed to the nodes, and the amount of reporting done by the client systems. A detailed analysis of the network call center operation capacity can be derived using the computations that appear in the following sections.

Most processing done by the NCC tends to be performed in bursts. Either there is network CBC data being loaded into the database or the data is being extracted for reporting purposes. The average CPU utilization of the NCC is expected to remain below the engineering point of 50 percent although there can be short periods where the CPU utilization exceeds this. The limiting factor for running reports is normally the bandwidth of the WAN and LAN connections to the NCC.

NCC detailed CPU requirement computations

The total CPU requirement given is derived by summing all the contributions to CPU utilization. The same notation is used to represent the individual CPU utilization components as given in “Detailed CPU requirement computations” on page 169:

$$NCC\_U_{Total} = \Sigma U_i$$

The utilization components used for the NCC CPU requirements are given in the following table:

NCC CPU utilization components

Description	Utilization component (U_i) (% of CPU)
Background CPU (BG)	U_{BG}
NCC CBC Event Recording	U_{NER}
NCC Event Reporting	U_{NERP}
Routing Table Operations (RTO)	U_{RTO}

The CPU requirements are based on measurements taken during performance testing. These measurements are summarized in the following table for the PII300 processor:

CPU measurements summary (based on PII300)

Parameter	Value	Units	Notes
U_{BG}	0.5	% (=1%)	Overall background CPU (%) on PP200
NBCP_RInsert_Cost	0.00028	CpuSec	Cost of a single BCP remote insert (Sybase)
NCC_Retrieve_Cost	0.00026	CpuSec	Cost for a row selected

In the following sections, details of each utilization calculation are given, followed by the total CPU utilization summary:

NCC background CPU

The background CPU is the amount of CPU resource that is used when no other utilization components are running. Background CPU is a measured quantity.

NCC CBC recording CPU

Events associated with the processing of networked calls at the destination node are recorded at the destination and then sent periodically to the NCC. The NCC inserts these records into the NCC CBC database. The CPU cost of doing this depends on the number of records that have to be inserted per unit of time.

NCBC_BCP_RecordsPerHour is the number of records generated in the NCC CBC database in an hour. This number depends on the call rate and the proportion of network incoming and outgoing calls.

```
NCBC_BCP_RecordsPerHour =
  SUMOF(
     IACC_CBC_Events * nwAccNetwPeakCallRate
     IREJ_CBC_Events * nwRejNetwPeakCallRate
  )* pCBCNetwork/100
```

Each node inserts these records into the NCC CBC database using remote bulk copy procedure (BCP). The CPU cost of doing this depends on the number of records that have to be inserted per unit of time. The BCP disk insert rate is a function of the number of CBC records sent per hour.

```
NCBC_BCP_DiskInsertRate_InsertsSec =
  NCBC_BCP_RecordsPerHour /3600
```

The CPU cost for the event recording is stated as

```
NCBC_ER_CPU% =
  NCBC_BCP_DiskInsertRate_InsertsSec * NBCP_RInsert_Cost
  * 100%
```

U_{NER} = NCBC_ER_CPU%

NCC CBC events reporting CPU

Reports can be requested by clients throughout the network. CBC data recorded at the destination are stored at the NCC and must be accessed by each client to generate reports. It is assumed that the number of records retrieved from the NCC for reporting is roughly equivalent to the number of records sent to the NCC. The rate of CBC records sent to the NCC per hour is derived in the previous section “NCC CBC recording CPU” on page 264, and is NCBC_BCP_Records_PerHour. The rate of CBC record retrieval then is

```
NCBC_Retrieve_RecordsPerSec =
  NCBC_BCP_Records_PerHour / 3600
```

The CPU cost for retrieving CBC records for reporting is

```
NCBC_RetrieveCPU% =
  NCBC_Retrieve_RecordsPerSec * NCC_Retrieve_Cost * 100%
```

U_{NERP} = NCBC_RetrieveCPU%

NCC routing table operations CPU

NCC routing tables are configured for each node at the NCC. The routing tables are then propagated to each respective node. The configuration itself is expected to have a negligible impact on the CPU. These tables are also sent to each of their respective nodes if any of the configuration parameters have changed. The sending is done on a periodic basis, and the CPU cost incurred from this activity is considered to be negligible, as in the following formula:

U_{RTO} = 0%

Impact of online database backup

The online database backup runs as a low priority background task. Although it consumes CPU resources, it does not impact the CPU time required by the NCC for CBC record processing or routing table processing.

NCC server memory requirements

Introduction

Standard Symposium Call Center Server system configurations currently come with 256 Mbytes of RAM. In these systems, performance on the Symposium Call Center Server is limited by the CPU and not by the memory. Present memory configurations are adequate for the NCC server.

NCC server disk space requirements

Introduction

Disk space on the NCC is required primarily for the network CBC database. Since the NCC performs no call processing, the size of the database is static.

NCC detailed disk requirements

The calculations to derive the disk size requirements are identical to those for Symposium Call Center Server since the database structures are identical. However, the table sizes are different. For the calculations, refer to “Calculate server disk utilization” on page 163.

NCC configuration tables disk space

The determination of the NCC configuration table sizes is identical to “Configuration tables disk space” on page 165, except that most values are zero, with the exception of nNetNodes, nNetSkillsets, and the predefined constants that are documented in Table 8 on page 384.

Note: The System database is sized to accommodate both the NCC configuration tables and any applications that may be added in the future. As a result, the size of the NCC configuration tables is not an engineering issue at this time.

NCC Interval, Daily, Weekly, and Monthly tables disk space

All of these tables are empty since none of these statistics are recorded at the NCC. When using the Symposium Call Center Server model, set all of the historical data parameters to zero.

NCC event tables disk space

The Agent Login, IVR Port, and Call-by-Call statistics tables contain no records.

The Network Call-by-Call Statistics table contains all of the incall network call events for all calls that originate at a source node with the call detailed reporting option enabled for the application that initially processes the call.

Note: One Network Call-by-Call Statistics table is generated for each day of CBC records.

The size of a Network CBC database record (NetwCBCRecSize) in kbytes is the row size of table NIeNetCallByCallStatYYYYMMDD. (For more information, refer to "Symposium Call Center Server database table sizes" on page 374.) The size of the NIeNetCallByCallStatYYYYMMDD event table in the NCC is a function of the call rate, proportion of network calls, and data retention period.

```
NCallByCallSizeKb =
  SizeOf(NIeNetCallByCallStatYYYYMMDD)
```

CC total disk space requirements

Calculations for the total disk space requirements for the NCC are similar to those for Symposium Call Center Server given in "Detailed computations" on page 167. The overhead is the same for the sizes of the Windows and Symposium Call Center Server executables, as well as the Master and User databases. The C and D drive partitioning scheme is the same. The only difference is in the Blue (system) database where there are only configuration tables. Some of the overheads for log files and temporary disk space are modified for the NCC. The differences in the calculations are given below:

```
NDB_Log_Overhead = 0.2 (20%)

NDB_Temp_Overhead = 0.3 (30%)

NCBC_Log_Overhead = 0.05 (5%)

NCBC_Temp_Overhead = 0.3 (30%)

NCBC_DB_SpaceKb =
  NCallByCallSizeKb * (nDCallbyCall + 1.5) *
  (1 + NCBC_Log_Overhead + NCBC_Temp_Overhead)

NBlue_DB_SpaceKb = 2097152
```

```
NTotalDiskSpaceRequiredGb =
  ((NCBC_DB_SpaceKb + NBlue_DB_SpaceKb) /
  Max_Disk_Utilization + Overhead_SpaceKb) / 1000000
```

NCC CLAN requirements

Introduction

The traffic on the CLAN consists of CBC event data and consolidated CBC reporting traffic. The NCC CLAN utilization is calculated as

```
NCC_CLan_Utilization =
  NCC_NCBC_Utilization + NCBC_Reporting_Utilization
```

The following sections describe the detailed computations for each component.

Network CBC recording traffic

When processing a networked call that originates on another node, the server records events associated with this call in the local CBC database. These events are also reported to the NCC. The events associated with successful, as well as with rejected and canceled network calls are sent to the NCC. The number of records generated in NCC CBC database in an hour is calculated as NCBC_BCP_RecordsPerHour (see “NCC CBC recording CPU” on page 264).

Assuming 30 percent protocol overhead for bulk copy procedure (BCP), the required bandwidth for the NCC CLAN is

```
NCC_NCBC_BW_Required_MbitsSec =
  NCBC_BCP_RecordsPerHour * NetwCBCRecSize * 1.3 / 1000 *
  8 / 3600
```

Note: NetwCBCRecSize is the record size of the NIeNetCallByCallStatYYYYMMDD table documented in “Symposium Call Center Server database table sizes” on page 374.

The utilization component for the NCC CLAN then is

```
NCC_NCBC_Utilization =
  NCC_NCBC_BW_Required_MbitsSec / TCPIP_Bandwidth
```

Consolidated reporting traffic

It is assumed that all clients connected to the NCC reside on the CLAN of the local node. As such, the running of consolidated reports does not affect the CLAN of the NCC unless the NCC CLAN and the CLAN of the local node are constructed such that all traffic flows across both LANs.

Network CBC reporting traffic

Clients connected to the NCC can request a CBC report on network activity. For each report run, the user must specify which node the report is based on. It is assumed that all data collected is reported on once. Therefore, it is assumed that the amount of information retrieved from the local nodes for network CBC reporting is roughly equivalent to the amount of information sent to the NCC due to reporting activities on the local node. With a 40-percent protocol overhead for reporting, the amount of information retrieved per hour is computed as

```
NCBC_Reporting_BW_Required_MbitsSec =
  NCBC_BCP_RecordsPerHour * NetwCBCRecSize * 1.4 / 1000 *
  8 / 3600
```

The utilization component for the NCC CLAN then is

```
NCC_Reporting_Utilization =
  NCBC_Reporting_BW_Required_MbitsSec / TCPIP_Bandwidth
```

Networking NCC updates

Periodically, the NCC broadcasts the routing tables to all the nodes in the network. The assumption is made that these updates occur once every *NCC_Period_Min* (currently this value is 5 minutes). The impact of such updates is expected to be negligible. Therefore, *NCCUpd_Utilization = 0*.

NCC server and WAN traffic

Introduction

An NCC node receives the network call recording events from local nodes and sends the events records whenever they are requested by local nodes generating CBC reports. This traffic is defined as NCC_NCBC_BW_Required_MbitsSec in "Network CBC recording traffic" on page 270.

Note: Routing table update traffic is now routed over the CLAN. This affects the computations for WAN requirements, as described in the following sections.

WAN traffic from NCC on CLAN

The only traffic from the NCC CLAN is the network CBC reporting traffic. CLAN WAN traffic for each server is computed as

```
CWAN_BW_From_NCC_MbitsSec =
  NCPC_BW_Required_From_MbitsSec
```

This is the amount of traffic that a router on an NCC CLAN must be able to handle. To analyze the required bandwidth for each individual circuit between the different nodes and the NCC, see "WAN traffic from the NCC on the CLAN" on page 246.

WAN traffic to NCC on CLAN

The only traffic to the NCC CLAN is the network CBC event data. CLAN WAN traffic for each server is computed as

```
CWAN_BW_To_NCC_MbitsSec =
  NCPC_BW_Required_To_MbitsSec
```

This is the amount of traffic that a router on an NCC CLAN must be able to handle. To analyze the required bandwidth for each individual circuit between the different nodes and the NCC, see "WAN traffic to the NCC on the CLAN" on page 248.

Total WAN traffic at NCC

If there is a router on each LAN, then the total WAN bandwidth required by the router connected to the ELAN or CLAN is the same as presented above. If there is a single router on both LANs, then the total WAN bandwidth that this router must be able to handle is computed as

```
NCC_WAN_MbitsSec =
  CWAN_BW_From_NCC_MbitsSec + CWAN_BW_To_NCC_MbitsSec
```

Online database backup elapsed time calculation

Introduction

The local online database backup runs as a low-priority background task and does not impact the CPU time required by Symposium Call Center Server for call processing or reporting. The CPU time required by Symposium Call Center Server does impact the elapsed time of the online database backup. Since the database backup can only use the unused portion of the CPU, the busier the system, the longer the backup takes. The elapsed time of the online database backup can be computed as

NCC_Available_CPU =
100% - NCC_U_{Total} (from section "NCC detailed CPU requirement computations" on page 263)

NCC_Database_Size_MB =
sizeof(NIeNetCallbyCallStatYYYMMDD) / 1024

NCC_DB_CPU_Cost = DBBackupMLR_cost

NCC_BackupElapsedTime_Hours =
NCC_Database_Size_MB / 1000 * NCC_DB_CPU_Cost * 1.5
/ (3600 * NCC_Available_CPU/100)

A remote backup over the network cannot be reliably estimated. The factors affecting a remote backup consist of

- remote processor CPU speed, utilization, and type
- remote hard drive speed, utilization, and type
- LAN speed and utilization

Chapter 7

Planning voice processing system requirements (Meridian 1/CSE 1000 only)

In this chapter

Voice port requirements

Introduction

This chapter provides information for determining the number of voice ports required to provide voice processing services on a Symposium Call Center Server system.

The number of voice ports required depends on

- the rate of port requests
- the duration of voice sessions
- the Grade of Service (GOS)

Grade of Service refers to the probability that requests will be delayed by more than a certain number of seconds.

For CallPilot and Meridian Mail, the standard GOS used is 5 percent probability that the calls will be delayed for more than 6 seconds, and 95 percent of the calls will incur a delay of less than 6 seconds.

Note: Voice ports must be dedicated to Symposium Call Center Server. They cannot be shared with other services.

ACCESS port usage

Symposium Call Center Server can support a single ACCESS connection to control voice processing. A single ACCESS connection supports up to 96 voice ports. This may limit Symposium Call Center Server performance by limiting the rate of calls that require Symposium Call Center Server control of voice processing.

Notes:

- CallPilot supports a maximum of 96 voice ports. However, one voice port must be reserved for messaging. Therefore, 95 voice ports are available to provide voice services for Symposium Call Center Server.

- None of the predefined applications (and, therefore, workloads) require controlled voice services; therefore, none of them result in ACCESS traffic.

Non-ACCESS port usage

Symposium Call Center Server voice services that do not require local voice port control (such as Give IVR) do not result in ACCESS usage and, therefore, are not subject to the 96-port limitation. Additional voice ports may be required, however, to support these services.

Note: For the predefined workloads with an SVP call model (see "Workload types" on page 333), it is estimated that Symposium Call Center Server requires 64 to 96 voice ports or more, depending on the call rate.

To calculate voice port requirements

Total number of ports required is computed as

```
TotalVoicePorts =
  nGIVR_Ports + nVSCDG_Ports + nGCB_Ports + nGCBC_Ports
```

Total number of ports required by Symposium Call Center Server-controlled voice processing (control is maintained over the ACCESS connection) is based on the ports required for GCB, GCBC, and collect digits voice session (VSCDG) services:

```
TotalSVPVoicePorts =
  nVSCDG_Ports + nGCB_Ports + nGCBC_Ports
```

Note that TotalSVPVoicePorts cannot exceed 96 (see "ACCESS port usage" on page 276).

The computations of voice port requirements for Give Controlled Broadcasts in Start/Stop mode (GBC) include the computation of port request rate based on

- Broadcast Port Wait timer
- Poisson request arrival rate
- maximum number of calls per port (=50)

Once the port request rate is computed, the Erlang C computations are applied.

The computations of voice port requirements for Give Controlled Broadcasts in Continuous mode (GCBC) are based on Erlang B and the maximum number of calls per port (=50).

For the predefined workloads with the Symposium Voice Processing (SVP) call model (see “Workload types” on page 333), the number of voice ports required is 36 for 1000 CPH, 90 for 5000 CPH, and 154 for 10 000 CPH. Detailed computations appear in the following sections.

GIVR_Ports computations

The number of voice ports required for Give IVR (GIVR) voice service depends on the rate of GIVR requests and the duration of the GIVR treatment. The formula for determining the rate of GIVR services is

```
GIVR_Rate = PeakCallRate * aGIVRPerCall
```

In the following table, use the nearest values for IVR rate and duration (GIVR_Rate and nGIVR_Duration) to determine the number of ports required, as

```
nGIVR_Ports = ports from the following table
```

Number of ports required for GIVR and VSCDG voice services

GIVR_Rate VSCDG_Rate	nGIVR_Duration or nVSCDG_Duration (Seconds)			
	15	**30**	**45**	**60**
250	4	5	7	8
500	5	8	11	13
1000	8	13	18	23
2000	13	23	32	41
3000	18	32	45	59
4000	23	41	59	76

GIVR_Rate VSCDG_Rate	nGIVR_Duration or nVSCDG_Duration (Seconds)			
	15	30	45	60
5000	28	50	72	93
6000	32	59	84	110
7000	37	67	97	127
8000	41	76	110	144
9000	45	84	123	161
10 000	50	93	136	178

VSCDG_Ports computations

The number of voice ports required for collect digits voice sessions (VSCDG) depends on the rate and duration of VSCDG requests. To determine the rate of VSCDG services, use the following formula:

```
VSCDG_Rate = PeakCallRate * aVSCDGPerCall
```

In the preceding table, use the nearest values for VSCDG rate and duration (VSCDG_Rate and nVSCDG_Duration) to determine the number of ports required, as in the following formula:

```
nVSCDG_Ports = ports from the preceding table
```

For the predefined workloads (see “Workload types” on page 333), the number of required voice ports for VSCDG is 18 for 1000 CPH, 72 for 5000 CPH, and 136 for 10 000 CPH.

GCB_Ports computations

The number of voice ports required for Give Controlled Broadcast (Start/Stop) voice sessions depends on

- the rate of GCB requests
- the duration of the GCB announcements

- the average number of distinct continuous broadcast announcements executed at a time
- the length of the broadcast port wait timer

The following estimations assume that the distinct start/stop broadcasts are used equally. To determine the rate of GCB services, use this formula:

```
GCBC_Rate =
  PeakCallRate * aGCBPerCall / nGCB_Simultaneous
```

The following table shows the number of ports required for service rates from 500 to 6000 requests per hour, and Broadcast port timer values from 0 to 20 seconds. In the table on page 278, use the nearest values for GCB rate and duration (GCB_Rate and nGCB_Duration) to determine the number of ports required:

```
nGCB_Ports =
  nGCB_Simultaneous * (ports from the following table)
```

For the predefined workloads (see “Workload types” on page 333), the number of required voice ports for GCB is 18 for all call rates greater than 1000 CPH.

Number of ports required for Give Controlled Broadcast Start/Stop

	Announcement duration (seconds)			
nGCB_WTimer	**30**	**60**	**90**	**120**
Rate = 500 GCB Per Hour				
0	8	13	18	23
2	8	13	18	23
4	8	13	18	23
6	8	13	18	23
8	8	12	17	21
10	7	11	14	18

nGCB_WTimer	Announcement duration (seconds) 30	60	90	120
12	6	9	12	15
14	5	8	11	14
16	5	8	10	12
18	5	7	9	11
20	4	7	9	11
Rate = 1000 GCB per hour				
0	13	23	32	41
2	13	23	32	41
4	12	21	29	37
6	9	15	21	27
8	8	12	17	21
10	7	11	14	18
12	6	9	12	15
14	5	8	11	14
16	5	8	10	12
18	5	7	9	11
20	4	7	9	11
Rate = 2000 GCB per hour				
0	23	41	59	76
2	21	37	53	69
4	12	21	29	37

	Announcement duration (seconds)			
nGCB_WTimer	**30**	**60**	**90**	**120**
6	9	15	21	27
8	8	12	17	21
10	7	11	14	18
12	6	9	12	15
14	5	8	11	14
16	5	8	10	12
18	5	7	9	11
20	4	7	9	11
Rate = 4000 GCB per hour				
0	41	76	110	144
2	21	37	53	69
4	12	21	29	37
6	9	15	21	27
8	8	12	17	21
10	7	11	14	18
12	6	9	12	15
14	5	8	11	14
16	5	8	10	12
18	5	7	9	11
20	4	7	9	11

	Announcement duration (seconds)			
nGCB_WTimer	30	60	90	120
Rate = 6000 GCB per hour				
0	59	110	161	212
2	21	37	53	69
4	12	21	29	37
6	9	15	21	27
8	8	12	17	21
10	7	11	14	18
12	6	9	12	15
14	5	8	11	14
16	5	8	10	12
18	5	7	9	11
20	4	7	9	11

GCBC_Ports computations

The number of voice mail ports required for Give Controlled Broadcast (Continuous) voice sessions depends on

- the rate of GCBC requests
- the duration of the GCBC announcements
- the average number of distinct continuous broadcast announcements executed at a time

The following estimations assume that the distinct continuous broadcasts are used equally. To determine the rate of GCBC services, use this formula:

```
GCBC_Rate =
  PeakCallRate * aGCBCPerCall / nGCBC_Simultaneous
```

In the following table, use the nearest values for GCBC rate and duration (GCBC_Rate and nGCBC_Duration) to determine the number of ports required:

```
nGCBC_Ports =
  nGCBC_Simultaneous * (ports from following table)
```

For the predefined workloads (see "Workload types" on page 333), the number of required voice ports for GCBC is zero (0).

Number of ports required for Give Controlled Broadcast Continuous

Rate (calls per hour)	nGCBC_Duration (Seconds)			
	30	60	90	120
250	1	1	1	1
500	1	1	1	1
1000	1	1	1	1
2000	1	1	2	2
3000	1	2	2	3
4000	1	2	3	3
5000	1	2	3	4
6000	2	3	4	5
7000	2	3	4	5
8000	2	3	5	6
9000	2	4	5	7

Rate (calls per hour)	nGCBC_Duration (Seconds)			
	30	60	90	120
10 000	2	4	6	8

ACCESS requirements

Introduction

Symposium Call Center Server generates ACCESS traffic when it communicates with the integrated voice processing system (CallPilot or Meridian Mail) to obtain the following controlled voice services:

- Give Controlled Broadcast command
- Open/Close Voice Session commands

Note: See "Workload parameters" on page 135 for the call script used for analysis of the regular controlled Voice service.

For Symposium Voice Services on Meridian Mail, ACCESS traffic is transmitted over a dedicated high-speed serial connection. For Symposium Voice Services on CallPilot, ACCESS traffic travels on the ELAN.

ACCESS traffic cost

The following table shows the variables and their values used in the ACCESS traffic calculations. For more information, see Appendix G, "Symposium Call Center Server detailed calculations."

Variable	Definition	Value
nGCB_Simultaneous	Average # simultaneous calls per port on GCB	2
GCB_Acc_Size	Message size of GCB	154 (Meridian Mail) 242 (CallPilot)
VSCDG_Acc_Size	Message size of voice session collect digits	184 (Meridian Mail) 272 (CallPilot)
ACC_Bandwidth_KBitsSec	Access Link Bandwidth	one of (4.8, 9.6, 19.2, 38.4)

ACC_Max_Utilization	Maximum Access Link Utilization	0.5 (50%)

Note: The sizes include overhead. For CallPilot, the message size includes TCP/IP overhead of 88 bytes per message.

The following is the computation of the bandwidth required for ACCESS traffic:

```
GCB_Acc_BW_KbitsSec =
  ((((LocalPeakCallRate + nwIAccPeakCallRate)/
  nGCB_Simultaneous) * GCB_Acc_Size * AvgGBCPerCall * 8) /
  1000) / 3600

VSCDG_Acc_BW_KbitsSec =
  ((((LocalPeakCallRate + nwIAccPeakCallRate)/
  nGCB_Simultaneous) * VSCDG_Acc_Size * aVSCDGPerCall * 8)
  / 1000)/3600

ACC_BW_Required_KbitsSec =
  GCB_Acc_BW + VSCDG_Acc_BWGCB_Acc_Size
```

Meridian Mail requirements

Introduction

Meridian Mail, Release 11 or higher, must be used with Symposium Call Center Server.

Meridian Mail platforms

The following table shows the four Meridian Mail platforms, the number of ports available on each of these platforms, and the increments for port additions:

Meridian Mail platform	Ports	Port increments	Approx. maximum CCS	Maximum port requests at 1 min MHT	Maximum port requests at 30 sec MHT
Card Opt	2–12	2 ports	247	412	824
EC 11	4–48	4 or 8 ports	1342	2237	4474
Modular Opt/ Modular Opt GP	4–64	4 or 8 ports	1858	3097	6194
Modular EC	4–96	4 ports	2912	4853	9706

Notes:

- 1 CCS is 100 call-seconds. 36 CCS is the equivalent of 1 Erlang and is the amount of traffic one port can handle if it is busy all the time.
- MHT is not to be confused with call rate. A single call can create more than one port request.

ACCESS link

The bandwidth of the ACCESS link ranges from 4.8 Kbits/sec to 38.4 Kbits/sec. The maximum utilization of the link is assumed never to exceed 50 percent. The recommended ACCESS link speed is 19.2 Kbps.

Installation grounding

To avoid damage that can occur to the server in Symposium Call Center Server, the switch, or the voice processing system as a result of poor grounding, electro-optical isolators should be installed for use on the RS-232 ACCESS cable. Use this type of isolator to ensure that no surges occur during electrical disturbances.

ACCESS link utilization

The following table shows the utilization of the ACCESS link for different call rates. Each call is assumed to include one CDGT and one CB:

Call Rate	ACCESS Utilization (%)
1000	2.0%
5000	9.8%
10 000	19.6%
15 000	29.3%
20 000	39.1%
25 000	48.9%
30 000	58.7%
35 000	68.5%

Note: Maximum utilization is 70 percent.

The following formula calculates utilization of the ACCESS link:

```
ACC_Utilization =
  100% * ACC_BW_Required_KbitsSec / ACC_Bandwidth_KBitsSec
```

ACCESS link capacity

The following is the computation of the maximum rate of ACCESS-related calls that the link can support for 100 percent Give Controlled Broadcast (GCB) calls and 100 percent Voice Session Collect Digits (VSCDG) calls:

```
Max_AC_GCB_PerHour =
  (ACC_Bandwidth * ACC_Max_Utilization * 1000 * 3600) /
  (GCB_Acc_Size * 8)

Max_AC_VSCDG _PerHour =
  (ACC_Bandwidth * ACC_Max_Utilization * 1000 * 3600) /
  (VSCDG_Acc_Size * 8)
```

CSL

Command and status link (CSL) traffic is used for communication between Meridian 1/CSE 1000 and Meridian Mail. CSL traffic is generated only when voice services are required for a call.

For Symposium Voice Services on Meridian Mail, CSL traffic is transmitted over a dedicated high-speed serial connection. For Symposium Voice Services on CallPilot, CSL traffic travels on the ELAN.

CSL traffic cost

The following table shows the variables and their values used in the CSL traffic calculations. For further details, see Appendix G, “Symposium Call Center Server detailed calculations.”

CSL services (sizes include overhead)

Variable	Definition	Value
CSL_Bandwidth_KBitsSec	CSL Bandwidth (kbps)	9.6
CSL_Max_Utilization	CSL Maximum Utilization	0.7 (70%)
nGCB_Simultaneous	Average # simultaneous calls per port on GCB	(See “Common parameters” on page 339.)

The following is the computation of the bandwidth required for CSL traffic:

```
CSL_BW_Required_KbitsSec =
  (((PeakCallRate)/nGCB_Simultaneous)*
  CSL_Bytes_PerSession * AvgGCBCall * 8) / 1000) / 3600
```

The bandwidth of the CSL is 9.6 kbps. The maximum utilization of the CSL is 70 percent.

CSL utilization

The following table shows the utilization of the CSL based on workload and the call rate:

Call rate	CSL utilization per workload (%)
1000	1.2
5000	6.2
10 000	12.4
15 000	18.6
20 000	24.8
25 000	31.0

Note: Maximum utilization is 70 percent.

The following formula is used to calculate utilization of the CSL:

```
CSL_Utilization =
  100% * CSL_BW_Required_KbitsSec / CSL_Bandwidth_KBitsSec
```

CSL capacity

The following formula calculates the maximum rate of CSL-related calls (voice) supported by the link. Using the computations below, the maximum CSL call rate is estimated to be 56 523 calls per hour, if all calls require voice service.

```
Max_CSL_Sessions_PerHour =
  (CSL_Bandwidth * CSL_Max_Utilization * 1000 * 3600) /
  (CSL_Bytes_PerSession * 8)
```

NLI link

The network loop interface (NLI) link facilitates the voice path between Meridian 1/CSE 1000 and Meridian Mail. It is used only for calls requiring IVR service. The number of voice ports needed for this link must be calculated based on the number of voice sessions required by Symposium Call Center Server, namely Voice_Services, which is the rate of voice services per hour that is determined from the Symposium Call Center Server applications.

CallPilot requirements

CallPilot version

Symposium Voice Services on CallPilot requires CallPilot Release 2.0 or higher.

CPU impact

Symposium Voice Services on CallPilot uses MLS for communication between CallPilot and Symposium Call Center Server. To estimate the additional CPU load generated by Symposium Voice Services on CallPilot, use the MLSM CPU-sec per message cost (MLINK_Msg_Cost) specified in "CPU measurements" on page 172, and increase the number of MLS messages by 10. Calculate CPU requirements using the formula in "Inbound call services" on page 176.

ELAN impact

For Symposium Voice Services on CallPilot, ACCESS traffic is carried on the ELAN. To determine the additional load on the ELAN:

1. Calculate ACC_BW_Required_KbitsSec using the formulas in "ACCESS requirements" on page 286.
2. Add the results to EmbeddedLan_Utilization in "Calculate ELAN utilization (Meridian 1/CSE 1000)" on page 192.

CLAN impact

Symposium Voice Services on CallPilot results in additional MLS traffic on the CLAN. When calculating CLAN bandwidth required for MLS traffic (see "MLS traffic on the CLAN" on page 224), increase aMMSGPerCall by 10.

Chapter 8

Planning Meridian 1/CSE 1000 switch requirements

In this chapter

Meridian 1 switch requirements

Supported software loads

Symposium Call Center Server Release 4.2 requires Meridian 1 Release 24 or 25.

Switch requirements

Meridian 1 switch requirements depend on the following factors:

- rated capacity of the switch
- expected call rate
- call complexity

For switch capacity, refer to the *Engineering Guide* for your switch.

Maximum achievable call rates

To determine the maximum achievable call rates for different Meridian 1 models, you must sum up all contributions resulting from

- the call complexity
- the MLS commands issued by CTI applications
- any other applications that may be communicating over the ELAN with the Meridian 1

You can achieve this by calculating the total Equivalent Basic Call (EBC) value for all incoming traffic.

Calculating Equivalent Basic Calls

The complexity of Symposium Call Center Server calls in terms of EBC is computed using the values from the following table for the appropriate switch software release:

Service	Parameter name	R24 EBC	R25 EBC
Basic Symposium Call Center Server Call Operations Services			
Inbound Calls			
Basic Call	BCC_Ebc	2.40	2.40
QTS - Queue To Skillset	QTS_Ebc	0	0
QTNS - Queue To Network Skillset	QTNS_Ebc	0	0
GCB - Give Controlled Broadcast Start/Stop	GCB_Ebc	1.70	1.70
GCB - Give Controlled Broadcast Continuous	GCBC_Ebc	1.70	1.70
VSCDG - Collect Digits Voice Session	VSCDG_Ebc	2.29	2.29
GIVR - Give IVR (including transfer)	GIVR_Ebc	2.29	2.29
GRAN - Give RAN	GRAN_Ebc	0.63	0.63
GMUS - Give Music	GMUS_Ebc	0.25	0.25
Meridian Link Messages / Call (Inc. SP)		0.60	0.60
Meridian Link Call Trans. / Conf		1.72	1.72
Conference / Transfer		1.28	1.59
HDXSI - Data Exchange Send Info	HDXSI_Ebc	0	0
HDXRG - Data Exchange Request / Response	HDXRG_Ebc	0	0
INTR - Script Intrinsic Reference	INTR_Ebc	0	0
If-Then-Else		0	0

Service	Parameter name	R24 EBC	R25 EBC
Incoming Accept Call			
M1 Basic Call + Trunks Incoming		1.11	1.18
Symposium Call Center Server scriptless overhead		1.33	1.33
Outgoing Accept Call			
M1 Basic Call + Trunks Outgoing		1.19	1.16
Symposium Call Center Server scriptless overhead		1.33	1.33
Outbound Calls			
Meridian Link Call Transfer / Conf.		1.28	1.59
Calls Conf. / Trans. Out		1.72	1.72
Successful Out Call overhead		3.51	3.60
Unsuccessful out. call overhead		1.79	1.88
Meridian Link msgs./ call (Incl SP)		0.60	0.60
MLink msgs / conn. unsucc. call		0.60	0.60
MLink msgs. / unsucc. connection		0.60	0.60

Note: Basic call includes one basic switch call, one incoming ACD call, and one Basic Symposium Call Center Server call. For Meridian Configurator computations, use Basic Symposium Call Center Server Call (M1BccEbc).

The complexity due to call treatments applied locally is computed as follows:

```
SCCS_CallTreatment_Ebc =
    SUMOF(
        aQTSPerCall * QTS_Ebc
        aGCBPerCall * GCB_Ebc
        aGCBCPerCall * GCBC_Ebc
        aVSCDGPerCall * VSCDG_Ebc
        aGIVRPerCall * GIVR_Ebc
        aGRANPerCall * GRAN_Ebc
        aGMUSPerCall * GMUS_Ebc
        aHDXSIPerCall * HDXSI_Ebc
        aHDXRGPerCall * HDXRG_Ebc
    )
```

The complexity of local Symposium Call Center Server calls in terms of EBC is computed as follows:

```
SCCS_Local_Complexity_Ebc =
  BCC_Ebc + SCCS_CallTreatment_Ebc
```

The computation of the Symposium Call Center Server Real Time Factor used for Meridian Configurator is similar, but M1BCC_Ebc should be used instead of BCC_Ebc. (The configurator algorithm already takes one basic switch call and one incoming ACD call into account).

```
MC_Local_Symposium_RTF =
  M1BCC_Ebc + SCCS_CallTreatment_Ebc
```

In the networking case, complexity and real-time factors will be different, depending on the type of calls. The complexity of calls that originate locally but are handed over to agents on another node is calculated as follows:

```
SCCS_OACC_Complexity_Ebc =
  OACC_Ebc + SCCS_CallTreatment_Ebc

MC_OACC_Symposium_RTF =
  M1OACC_Ebc + SCCS_CallTreatment_Ebc
```

The complexity of calls that originate outside of the local node but are handed over to local agents is calculated as follows:

```
SCCS_IACC_Complexity_Ebc = IACC_Ebc

MC_IACC_Symposium_RTF = M1IACC_Ebc
```

The impact on the switch is based on the rated capacity of the switch CPU and the software load that is used. The rated capacities of various M1 processors are provided in the *Meridian 1—ICCM Preliminary Engineering Guide*. Use the appropriate values for M1_Rated_Capacity in the following computations to estimate the impact of Symposium Call Center Server call processing on M1:

```
M1Impact% =
  100% * SUMOF(
    LocalCallRate * SCCS_Local_Complexity_Ebc
    nwOAccCallRate * SCCS_OACC_Complexity_Ebc
    nwIAccCallRate * SCCS_IACC_Complexity_Ebc
  ) / M1_Rated_Capacity
```

Administration PC

An administration PC can be attached to the ELAN. This PC can only be used for general Meridian 1 and Symposium Call Center Server-related administration. It cannot be used for bandwidth-intensive applications, such as historical reports or real-time displays.

Meridian 1 Networked ACD

The usage of Networked ACD (NACD) is transparent to Symposium Call Center Server. The call rates used in Symposium Call Center Server engineering are the total calls arriving to Symposium Call Center Server from the local Meridian 1, either directly or from Meridian 1 NACD.

Meridian 1 ISDN

The ISDN circuits to the PSTN must be provisioned to handle the network call traffic to and from each Meridian 1 switch. It is assumed that these circuits are provisioned in a similar manner to that of Meridian 1 NACD.

Succession CSE 1000 and Meridian IE

Introduction

Symposium Call Center Server Release 4.2 provides switch connectivity with the Succession Communication Server for Enterprise 1000 (CSE 1K) switch, Nortel Networks' new IP PBX, and the Meridian 1 Internet Enabled (M1 IE) switch with IP capabilities provided by ITG lines and trunks.

Succession CSE 1000

Succession CSE 1000 is an IP switch and consists of the CSE 1000 Call Server, Succession Media Gateways, and i2004 IP phones and i2050 software phones. The Succession Media Gateways provide interfaces to analog trunks, digital trunks, or analog sets (including conventional fax machines and modems). They also provide DSP functionality for support of these interfaces and conferencing services.

Symposium Call Center Server supports the CSE 1000 Release 1.1 and 2.0.

Note:

- CSE 1000 Release 1.1 does not support ITG (IP) Trunks.
- CSE 1000 does not support Symposium Voice Services on Meridian Mail.

Performance impact

Since the interface between Symposium Call Center Server and these IP switches appears to Symposium Call Center Server to be identical to the one between Symposium Call Center Server and the Meridian 1, no Symposium Call Center Server performance differences are anticipated.

Note: This assumption will be verified by performance testing. If significant differences are observed, then separate engineering capacity models will be developed for either or both the CSE 1K and the M1 IE configurations (depending on the differences observed). These will be documented in upissues of this guide.

At this time, the M1 Capacity model, subject to the associated IP switch constraints, will be used for Symposium Call Center Server under IP Switch connectivity.

Chapter 9

Planning DMS/MSL-100 switch requirements

In this chapter

Overview

Supported software loads

The DMS or MSL-100 with CCM10, CCM11, or CCM12 (Call Center Modules) software loads must be used in conjunction with Symposium Call Center Server Release 4.0. Refer to the DMS/MSL-100 engineering guidelines to properly configure the DMS/MSL-100.

Note: DMS/MSL-100 is not currently supported in Release 4.2.

Number of servers supported

A single DMS/MSL-100 can support up to 16 Symposium Call Center Server systems. Engineer each Symposium Call Center Server system independently of each other, but engineer the DMS/MSL-100 as a shared resource.

DMS/MSL-100 switch requirements

Requirement analysis

To analyze the impact from one or more Symposium Call Center Server systems on the DMS/MSL-100 switch, you must first calculate the workload on each of the servers in Symposium Call Center Server. You can then derive the workload generated against the DMS/MSL-100 switch from each Symposium Call Center Server.

In CCM10 and CCM11, only 128 ICM/SCAI buffers are available to process incoming and outgoing messages. Based on the details of a particular call processing scenario, the number of ICM/SCAI buffers may limit the maximum call rate that can be achieved. The details of the number of messages sent from and received by the server are discussed in “Call processing traffic impact on the ELAN” on page 201, and “External IVR traffic impact on the ELAN” on page 208. These sections do not include messages sent to and received from the switch by another server, such as external IVR fast transfer commands. Contact DMS/MSL-100 engineering organizations to verify that the DMS/MSL-100 can support any particular call processing scenario, including Symposium Call Center Server.

Workload characterization

DMS workload from Symposium Call Center Server is described in terms of the number and types of ICM messages being sent to the DMS.

Normal operation

The types of ICM messages that Symposium Call Center Server uses during normal operations are Give_Treatment and Route_Call.

Call processing

The types of ICM treatments that Symposium Call Center Server uses during call processing operations are described in the following table:

Treatment type	ICM message
Ringback	Give_Treatment(Ringback)
RAN	Give_Treatment(RAN)
Music	Give_Treatment(Music)

The ICM messages sent to the DMS depend on the script commands that are executed by the scripts. It is assumed that each script includes the following:

- one Give_Ringback command
- one Queue_To_Skillset command
- one Quit command

resulting in one GT_Cuc(Ringback) command for the Give_Ringback, and one Route_Cuc command for the completion of the Queue_To_Skillset being sent for the Basic Call. If a script starts with either the Give_RAN or Give_Music command, Symposium Call Center Server automatically sends a Give_Ringback command. For engineering purposes, it is assumed that the script always starts with the Give_Ringback command. The mapping of Symposium Call Center Server script commands to ICM messages is summarized in the following table:

Script command	Parameter name	ICM messages
Basic Symposium Call Center Server Call Operations Services		
Queue To Skillset	aQTSPerCall	0
Queue To Agent	aQTAPerCall	0
Give Ringback		1 - Give_Treatment(Ringback)
Give RAN	aGRANPerCall	1 - Give_Treatment(RAN)
Give Music	aGMUSPerCall	1 - Give_Treatment(Music)
Route Call		1 - Route_Call

Script command	Parameter name	ICM messages
Data Exchange Send Info	aHDXSIPerCall	0
Data Exchange Request / Response	aHDXRGPerCall	0
Script Intrinsic Reference	aINTRPerCall	0
“If Then Else” treatments	aIFTHPerCall	0

Notes:

- For the Queue To Skillset command, this model assumes that the Route_Call message sent after the Remove From Skillset command is included in the definition of the Basic Call.
- For the Queue to Agent command, this model assumes that the Route_Call message sent after the Remove from Agent command is included in the definition of the Basic Call.

The DMS workload of the predefined Symposium Call Center Server call model is based on the expected number of call services per call (see “Number and types of services per call” on page 346), and the cost of the individual script command. The following table shows the resulting number of ICM messages being sent to the DMS for each Symposium Call Center Server call:

ICM message	Number per call
Route_Call	1
Give_Treatment(Ringback)	1
Give_Treatment(Music)	aGMUSPerCall
Give_Treatment(RAN)	aGRANPerCall

The DMS workload is also a function of the number of external events that happen per call. This information is summarized in the following table:

Switch event	Number per call
IVR Call Processed	1 If External IVR; 0 otherwise

Switch event	Number per call
Call Transfer	pTransferIn / 100
Conference Call	pConferenceIn / 100

Audio routes required

Symposium Call Center Server can use up to 512 preconfigured audio routes. The audio routes are classified as either music routes or RAN routes, depending on whether the last give treatment command in the audio route is Give Music or Give RAN respectively. The DMS/MSL-100 must have the capability to assign an audio route to every call waiting for an agent. Symposium Call Center Server supports up to 3000 waiting calls.

Number of CDNs required

The calls arriving at any Symposium Call Center Server DN are held in a series of CDNs. Each CDN holds up to 511 calls. Symposium Call Center Server Release 4.0 supports 1500 active agents with active calls. The server can support up to 3000 waiting calls. For 3000 waiting calls, you require at least six CDNs (3000 / 511).

Impact of MLS support

MLS traffic

Symposium Call Center Server supports a third-party CTI interface. For every CTI command sent to Symposium Call Center Server per call, a corresponding command is sent to the DMS/MSL-100. To analyze this activity, you must analyze the activity of each application that sends CTI commands to Symposium Call Center Server. The only MLS messages supported on the DMS/MSL-100 are

- initiate transfer
- complete transfer
- login
- logout
- ready
- not ready

For performance modeling purposes, only the transfer operations are considered, since the overall contribution due to number of agent interruptions per shift (that is, logon/logoff, ready/not ready) is expected to be insignificant when compared with the above events. If the IVR system is using the MLS capability of the server in Symposium Call Center Server to transfer the call from the IVR voice port to the server CDN, then this additional traffic should be included in the MLS traffic when you calculate

- CPU requirements (see “Calculate server CPU utilization” on page 169)
- MLS traffic on the CLAN (see “MLS traffic on the CLAN” on page 224)

LinkPlexer system

Introduction

LinkPlexer allows Symposium Call Center Server and the external IVR system to control the same DN associations on the DMS/MSL-100. The LinkPlexer system is not always required since some external IVR systems can use the MLS feature of Symposium Call Center Server. However, the MLS feature only provides support for the following CTI commands: login, logout, ready, not ready, initiate transfer, and complete transfer (the last two commands pertain to digital transfer).

Configuring the LinkPlexer system

Refer to the engineering guidelines of the LinkPlexer system to properly configure the LinkPlexer system and the DMS or MSL-100.

Chapter 10

Other guidelines

In this chapter

Symposium Call Center Server client

Introduction

You use Release 4.0 of the Symposium Call Center Server Client application to connect to Symposium Call Center Server Release 4.2.

Client hardware configuration

To avoid performance and reliability problems, the recommended Symposium Call Center Server Client hardware configuration consists of an Intel Pentium 133 MHz PC (or faster) with the following hardware features:

- 64 Mbytes of RAM
- hard drive with 2 Gbytes available (for Windows 9x, Windows NT, or Windows 2000), or 4 Gbytes (for Windows XP)
- one 3.5 inch 1.44 Mbyte floppy disk drive
- 4 speed (or higher) CD-ROM
- one Ethernet Network Interface Card (NIC) or one Token Ring NIC
- parallel printer port
- serial port (16550 UART)
- VGA color monitor
- Windows-compatible mouse

Notes:

- A Pentium 133 with 64 Mbytes of RAM might be sufficient for small sites managing a small number of objects (less than 100) at once and generating simple reports. A faster system is recommended for sites managing large numbers of objects (greater than 1000) and generating large reports.
- A large call-by-call (CBC) report can require up to 1 Gbyte of free disk space, and can take up to two hours to produce with a Pentium 133 processor. A system with a Pentium II or III processor with at least 64 Mbytes of RAM is highly recommended for anyone trying to generate large CBC reports.

Client software configuration

Operating system

The Symposium Call Center Server Client PC uses the Windows 95, Windows 98, Windows 2000 Professional, Windows NT 4.0 Workstation, or Windows XP operating system.

Notes:

- Windows XP is supported on Revision 5 and higher of the Client CD.
- On Revision 5 and higher of the Client CD, Windows 95 is no longer supported.

The following table shows minimum RAM and disk space requirements for each of these operating systems:

Operating system	RAM	Swap file space	Disk space for O/S software
Windows 95	16 Mbytes	100 Mbytes	130 Mbytes
Windows 98	16 Mbytes	100 Mbytes	170 Mbytes
Windows 2000 Professional	64 Mbytes	1.5 * RAM (for example, 1.5 * 64 Mbytes = 96 Mbytes)	2 Gbytes
Windows NT 4.0 Workstation	16 Mbytes	100 Mbytes	130 Mbytes
Windows XP	64 Mbytes	1.5 * RAM (for example, 1.5 * 64 Mbytes = 96 Mbytes)	2 Gbytes

Note: Report generation on a Windows NT 4.0, Windows 2000 Professional, or Windows XP client system can be significantly improved with 64 Mbytes of RAM instead of 32 Mbytes.

SMI Workbench

The Symposium Call Center Server Client PC employs the System Management Interface (SMI) Workbench. The client software requires 130 Mbytes of hard disk space and an additional 10 Mbytes of disk space on the hard drive where the operating system is installed. An optional set of NCC report templates requires 150 Mbytes of disk space. These templates are only applicable in a networking environment.

Virtual memory

Nortel Networks strongly recommends that the operating system manage the virtual memory resources of the PC. This prevents memory problems caused by insufficient disk space for swapping. Nortel Networks recommends that at least 650 Mbytes of free disk be available at run time (after all applications are loaded), on the drive where the swapfile is located.

Temporary files

The report generation process can create large temporary files in the operating system's default temporary ("temp") directory. Reports from the Call Detail Reporting feature can create temporary files of one Gbyte or more, depending on the circumstances. The client system must have enough capacity to generate whatever report is being run. See "Client hardware configuration" on page 312.

Routers

Introduction

For some configurations, you require a router to isolate CLAN and ELAN traffic. The router ensures that ELAN traffic never traverses a CLAN, and CLAN traffic never traverses an ELAN.

Note: Isolation of CLAN and ELAN traffic is required in both networked and non-networked (nodal) environments.

When to use a router

You must use a router if the following conditions apply:

- Your system consists of networked Symposium Call Center Server nodes.

  The router routes traffic between the nodes. It also supports remote administrator logons. You can use any router that supports IP routing and is capable of handling the traffic required.
- Your DMS/MSL-100 switch is located in a different physical location than your Symposium Call Center Server.

  A set of routers with a WAN connection can provide a connection between the Symposium Call Center Server system and the DMS/MSL-100. You can use any router that supports IP routing and that is capable of handling the ELAN traffic.
- Your Meridian 1 switch is connected to your CLAN.

  Use filters to prevent Symposium Call Center Server and other customer traffic (such as broadcast messages) from traversing the LAN.

Interactive Voice Response

Meridian 1/CSE 1000 external IVR system

Refer to the engineering guidelines for the external IVR system to properly configure the external IVR system and the Meridian 1/CSE 1000. External IVR can be used as a replacement for Meridian Mail, specifically for non-controlled Give IVR commands.

DMS/MSL-100 external IVR system

Refer to engineering guidelines for the external IVR system to properly configure the external IVR system and the DMS/MSL-100. The external IVR system must use DMS/MSL-100 ACD queues, and must always be used as a “front-end” to Symposium Call Center Server. Due to limited CTI support in Release 4.2, IVR systems requiring the ability to execute CTI commands can only use the following commands:

- login
- logout
- ready
- not ready
- initiate transfer
- complete transfer

Note: The last two commands pertain to digital transfer.

Antivirus software

Introduction

Since access to servers is very restricted, the risk of virus infection of the server in Symposium Call Center Server is minimal. Normally, only maintenance personnel have local access or remote access through pcAnywhere to servers. Nevertheless, corporate security policies often require customers to install antivirus software on servers.

This section provides guidelines for selecting and installing antivirus software.

Note: Nortel Networks has tested several antivirus software packages, including The Norton Antivirus, McAfee VirusScan, and Innoculate.

Guidelines for antivirus software

The antivirus software you choose must satisfy the following requirements:

- The antivirus software must not increase CPU utilization on the Symposium Call Center Server system to more than 50 percent (averaged over any 20-minute period).

  Note: Use the WINNT 4.0 Performance Monitor tool to gauge CPU utilization.
- The antivirus software must not reduce the disk space available to Symposium Call Center Server and the Windows operating system below the minimum required.
- The software must not cause any improper software shutdowns or out-of-sequence shutdowns.

Guidelines for installing antivirus software

- Install the Symposium Call Center Server software before installing the antivirus software.
- Installation or uninstallation of the antivirus software must not conflict with the Symposium Call Center Server software. For example, if DLL conflicts occur, you may have to rebuild the server.

Guidelines for using antivirus software

- During PEP installations on a client or server, disable all antivirus software, including firewalls, passive scanning, auto updates, and so on. After the entire PEP installation is complete, reenable the antivirus software.
- If personal firewalls are enabled on client PCs, the Report Listener may be flagged as trying to access the Internet. Configure the antivirus software to allow the Report Listener to access Symposium Call Center Server through the firewall.
- Set virus scans to run during off-peak hours, and not to start on the hour.

  Note: Several maintenance tasks are automatically activated on Symposium Call Center Server at midnight. Do not run virus scans at midnight.
- Disable virus scanning when running diagnostic traces or logs on Symposium Call Center Server.
- Do not configure antivirus software to deal with suspected infected files automatically. If the software detects infected files, do not attempt to replace or remove them. Contact your local Nortel Networks customer support representative for assistance in determining if the files are part of the Symposium Call Center Server application or a critical system file.
- Exclude the following files from scanning:
  - F:\Nortel\Database\
  - <additional database drive>:\Nortel\Database\
  - D:\NortelICCM\BIN\Tools2.exe

  You will encounter file access errors in the Scan Activity log if you do not exclude these files.
- Do not connect the Symposium Call Center Server client or server directly to the Internet to download antivirus files, whether original software or upgrades. Such activity is not supported by Nortel Networks.

  Note: Limit Internet access from any Symposium Call Center Server client or server to reduce the risk of downloading virus-infected files. Virus definitions and upgrade files should be downloaded to another location on the customer network, and manually loaded to the Symposium Call Center Server client and server. This procedure is also recommended for downloading Symposium Call Center Server PEPs.

- Scan all PEP files, CD-ROMs, and floppy disks prior to installation or uploading to the server.
- Do not activate the SNMP virus alert feature. Nortel Networks has not tested this feature and is unable to ascertain any potential impact on Symposium Call Center Server.

Notes:

- Nortel Networks does not provide technical support for antivirus software. If you have questions about or problems with the antivirus software, contact the antivirus software vendor.
- These recommendations are intended as guidelines only, and do not constitute a guarantee of compatibility. Nortel Networks does not plan to perform ongoing compatibility testing, or testing on other antivirus packages.
- If you raise performance or functionality issues to Nortel Networks support, the support representative may ask you to remove third-party antivirus software as part of the fault diagnosis process.

Third-party backup software

Introduction

You can create a full backup so that you can restore Symposium Call Center Server to its state at the time of the backup. This type of backup is useful for recovery from situations such as a catastrophic failure in the disk subsystem.

To perform a full backup in Symposium Call Center Server Release 4.2, you must use a third-party backup utility. This section provides guidelines for selecting and using third-party backup software.

Guidelines for third-party backup software

- The third-party backup software must not reduce the hard disk space available to Symposium Call Center Server and the Windows 2000 operating system below the minimum required.
- The installation or uninstallation of the third-party backup software must not impact or conflict with Symposium Call Center Server software (for example, it must not cause .DLL conflicts). If such conflicts are discovered, a rebuild of the server may be necessary.
- If the third-party backup software has its own database, it must not impact the Symposium Call Center Server Sybase database.
- The third-party backup software must not interfere with Symposium Call Center Server services in any way (for example, causing improper or out-of-sequence shutdowns).
- During run-time, the third-party backup software must not degrade the Symposium Call Center Server system beyond an average 50 percent CPU utilization.
- You must run the third-party backup manually. Do not schedule the third-party backup to run in automatic mode.

ATTENTION

Services associated with the third-party backup must not run while the server is running.

- If you are using a tape drive for your Symposium Call Center Server database backups, the third-party backup can use a dedicated tape drive, or it can share the tape drive used for Symposium Call Center Server database backups.
  - If the third-party backup and the Symposium Call Center Server database backup have dedicated tape drives, the tape drive used for the database backup must be configured with the device name "Tape0."
  - If the third-party backup and the Symposium Call Center Server database backup share a tape drive, the drive must meet the requirements of Symposium Call Center Server:
    - It must be a SCSI tape drive listed in the Microsoft Compatibility List for Windows 2000 on the Microsoft web site. Both 1/4-inch cartridge and 4-mm and 8-mm digital audio (DAT) format drives are supported. Both internal and external drives are supported.
    - It must be large enough to hold all the backup data for the complete database on a single backup tape. (Use hardware compression techniques if necessary.) To calculate backup space requirements, see "Backup size computations" on page 168.
    - Its driver must be Sybase-compatible.
- For backups to a remote directory, the third-party backup must not interfere with the server ports used for network connections by Symposium Call Center Server.
- Before putting Symposium Call Center Server in operation, perform comprehensive coresidency testing of the server and the third-party backup utility.

Uninterruptible Power Supply

Introduction

Nortel Networks recommends the use of an Uninterruptible Power Supply (UPS) with Symposium Call Center Server. A UPS provides the following benefits:

- reduction in data loss—A UPS shuts down the server gracefully if an interruption in AC power occurs. This prevents data corruption and reduces the risk of data loss.
- reduction in power dips and spikes—The UPS regulates AC power supplied to the server.

Note: Backups that are running at the time of shutdown are unusable.

Connections

You can connect the following types of equipment to your UPS:

- Symposium Call Center Server
- network hub
- monitor (optional)
- modem (optional)

Laser printers have high instantaneous current demands, which are difficult to factor in to calculations of power requirements. As a result, UPS manufacturers usually state that you must not connect a laser printer to a UPS. If you wish to connect a laser printer, make sure that the UPS supports it. (Add 1000 VA to your calculation of power requirements.)

If your UPS does not support a laser printer, you can choose to use another printer type, such as a dot matrix printer.

Requirements

A UPS used with Symposium Call Center Server must meet the following requirements:

- provides at least 10 minutes of power to stop all services and shut down the server (To calculate power requirements, see “To determine power requirements,” below.)
- physically fits within the workplace
- has minimal environmental impact
- applies power to the server when line voltage reaches a stable state
- if the server has been down for a long time, recharges before powering up the server
- is compatible with Windows 2000 Server
- meets all local regulatory requirements

  Note: For the European market, the UPS must generate a pure sine wave AC waveform.
- has hot-swappable batteries

  Note: Replacement or capacity upgrades of the batteries must not interrupt service.
- connects to the server through a serial port (not COM1 or COM2) on the server platform, or through a network card, depending on the implementation
- does not affect the Symposium Call Center Server software

  UPS software must not replace software or drivers installed on the server with different versions

ATTENTION Never use the server’s AC switch when the server has been shut down by the UPS. This disables the UPS functionality.

To determine power requirements

Note: Consider any planned equipment upgrades and additions when calculating your requirements. For example, if you plan to add an additional LAN hub, take the requirements of that hub into account in the calculations.

1 List the power draw ratings specified on the nameplates of all equipment to be supported by the UPS.

2 For each piece of equipment, convert the power draw to Voltage-Amperes (VA) in one of the following ways:

- If the power draw is expressed in amps, multiply by your nominal line voltage (for example, 120 in North America, and 230 in Europe). Then multiply by 1.4 and round up.
- If the power draw is expressed in watts, multiply by 1.4. Round up the calculations.

3 Calculate the total VA required by adding up the power draw for all devices.

4 Select the UPS with the required VA rating.

Example calculation

The UPS supports the following equipment:

Item	Faceplate rating	VA
702t server	170 watts	170 x 1.4 = 238
monitor	80 watts	80 x 1.4 = 112
modem	0.04 amps	0.4 x 120 * 1.4 = 7
Ethernet hub	6.6 watts	6.6 x 1.4 = 10

Total consumption = 238 + 112 + 7 + 10 = 367 VA

Installation guidelines

When installing a UPS, follow these guidelines:

- If possible, connect the UPS to the CLAN.
- If you must connect the UPS to the ELAN, you may need to install a network hub.
- The LAN to which you connect the UPS must be an Ethernet LAN. If your server is connected to a Token Ring LAN, you must install an Ethernet LAN.
- Charge the UPS batteries several days before installing the UPS.

- Shut down the server before installing the UPS.
- Install only the minimum software components required to shut down the server and support SNMP messaging.
- Configure the UPS to shut down the server immediately after the power loss occurs.
- Follow the instructions in the UPS documentation.

Note: All tasks must be performed by qualified personnel.

To test UPS functionality

ATTENTION Perform this test during off-peak hours to minimize service impact.

1. Make sure that the UPS is properly installed and supplying power to any required components (the server, network hub, and any other devices connected to the UPS).
2. Make sure that the UPS battery is fully charged.
3. Make sure that the UPS is configured to shut down the server when a power loss occurs.
4. Disconnect AC power to the UPS and note the current time.

   Result: The UPS reverts to battery mode, and instructs the server to shut down. (A shutdown message appears in the Windows event log.) The server notifies you that it is shutting down. Within 10 minutes of the time the power was disconnected, the server is shut down.
5. Reconnect AC power.

   Result: Within several minutes, the UPS powers up the server.
6. Check the Windows event log for any related error messages. If any errors occurred, check the configuration of the UPS software.

Smart UPS software

If you install Smart UPS software on the server in Symposium Call Center Server, it should conform to the following guidelines:

- Installation or uninstallation of the Smart UPS software must not conflict with the Symposium Call Center Server software. For example, if DLL conflicts occur, you may have to rebuild the server.
- The Smart UPS software must not increase CPU utilization on the Symposium Call Center Server system to more than 50 percent for more than 20 minutes at a time.

  Note: Use the WINNT 4.0 Performance Monitor tool to gauge CPU utilization.
- Nortel Networks only supports manual shutdown and startup of Symposium Call Center Server. Documentation, testing, and support of Symposium Call Center Server shutdown and startup by UPS software must be done by the UPS supplier.

Note: If the Smart UPS requires a serial port on the server, the server requires an additional serial card, as the existing ports are required for the ACCESS link and modem.

Appendix A

Performance model assumptions

In this appendix

Assumptions underlying the calculations in this guide

CPU limits

For server configurations with 256 Mbytes of RAM, CPU utilization over any 20-minute period does not exceed 50 percent with no backup in progress. (For more information, see Appendix F, “CPU utilization upper limits.”)

Real-time displays and API

1. The RTDs are running.
2. Each RTD client has four screens: Agent Statistics, Application Statistics, Call Center Summary, and Skillset Statistics.
3. All of the displays have refresh intervals specified in the following table:

Parameter	Value
Weighted average update rate of all agent RTD screens, in seconds	3
Weighted average update rate for all other RTD screens (except agent RTDs), in seconds	10
Weighted average update interval for all real-time API and GRTD applications, in seconds	2

4. Each logged-on supervisor has one thick client.
5. Administrators do not have clients. The number of administrators only affects the size of the database.

RSM and Web Client

RSM is off (Web Clients are assumed not to be used).

Event Interface

1. Each SEI message results in one TCP/IP message.
2. One SEI message is generated per SEI client per interval.

Voice processing

SVP and MVP call models are used as defined in “Number and types of services per call” on page 346.

MLS

For a Symposium Call Center Server/MLS scenario, all TNs of all agent phonesets are acquired by the server.

Database

1. The use of a softphone application does not affect the number of call-by-call records collected for transferred or conferenced phone calls.
2. Any screen pop MLS command that is executed does not result in additional call-by-call records being stored in the database.

Links

1. For Meridian Mail, ACCESS link bandwidth is 19.2 kbps and CSL bandwidth is 9.6 kbps.
2. CLAN bandwidth is either 10 or 100 Mbps, and maximum utilization is 30 percent.
3. ELAN bandwidth is 10 Mbps, and maximum utilization is 10 percent for Meridian 1/CSE 1000 or 30 percent for DMS/MSL-100.

Call processing

1. Periodic messages between Symposium Call Center Server and DMS represent an insignificant workload on the server, the DMS switch, and the ELAN.
2. All conferenced calls are conferenced with another DN and are successful on the first attempt.
3. All transferred calls are transferred to another DN and are successful on the first attempt.
4. The number of agents involved in a conference call is always two.
5. The proportion of call processing commands that are call termination commands is insignificant from a performance analysis perspective.
6. There is always one message per TCP/IP packet for ELAN/CLAN traffic analysis.

Networking

1. When calls arrive at the destination node, they are answered by the reserved agent immediately.
2. The minimum WAN bandwidth for networking is either 56 kbps or twice the capacity needed, whichever is greater, to allow for variability in the traffic.

Appendix B

Sample performance characteristics

In this appendix

Overview

Introduction

This appendix provides the following performance characteristics for sample workloads, call complexities, and call volumes:

- server disk space utilization
- server CPU utilization
- ELAN utilization
- CLAN utilization
- NCC disk space utilization
- NCC CLAN utilization

Workload types

Introduction

This section describes the characteristics of the workloads used in the examples in this appendix. The examples use five types of workloads:

- entry
- small
- medium
- large
- upper end

Note: For assumptions underlying the workload calculations, see Appendix A, “Performance model assumptions.”

Characteristics of the workload types

Parameter	Entry	Small	Medium	Large	UprEnd
General parameters					
Number of agents logged on simultaneously	20	100	200	500	1500
Number of agents defined in the system	60	300	500	1000	3000
Number of phonesets	70	350	700	1700	3000
Number of supervisors logged on	2	10	20	50	100
Number of administrators logged on	1	1	1	2	2
Number of scripts	10	50	100	200	500

Parameter	Entry	Small	Medium	Large	UprEnd
Number of applications (that is, exit points from the Master_Script)	5	25	50	100	250
Number of skillsets	5	25	50	125	200
Number of activity codes	25	125	250	625	1250
Inbound calls per hour	400	2000	4000	10 000	30 000
Inbound calls per day	4800	24 000	48 000	120 000	360 000
Network calls per hour (M1/CSE 1000 only)	400	4000	16 000	60 000	750 000
Network calls per day (M1/CSE 1000 only)	4800	48 000	192 000	720 000	9 000 000
Call resources parameters					
Number of IVR queues	5	10	20	30	50
Number of IVR ports	10	50	100	250	500
Number of IVR events per port per day (logon/logoff)	5	5	5	10	10
Number of routes	128	128	128	250	250
Number of trunks (M1/CSE 1000)	60	300	600	1500	3000
Number of CDNs	8	38	75	150	240
Number of RAN and music routes	30	40	50	100	250
Number of DNISs (M1/CSE 1000)	50	100	500	1000	5000
Number of DNISs (DMS/MSL-100)	50	100	200	500	1000
Proportion of DNIS used during a single data collection interval	75%	75%	75%	75%	60%

Parameter	Entry	Small	Medium	Large	UprEnd
Relations parameters					
Average number of skillsets served by an agent	3	3	3	3	3
Average number of skillsets served by a supervisor's agents	5	5	10	10	15
Average number of supervisors an agent reports to	1	2	2	3	3
Average number of local applications per skillset	1	2	4	4	4
Average number of remote applications per network skillset per node (M1/CSE 1000)	1	4	12	16	24
Average number of nodes per network skillset (M1/CSE 1000)	1	2	3	4	6
Average number of trunks per trunk route (M1/CSE 1000)	2	5	10	20	30
Average number of activity codes (not necessarily unique) entered per agent per interval/day/week/month	5	10	10	15	15
Average number of applications that route calls to an particular agent during a interval/day/week/month	3	6	12	12	12
Average number of activity codes entered by an agent for calls that were routed by a particular application during an interval/day/week/month	Average number of activity codes entered per agent / Average number of applications that route calls to a particular agent				

Parameter	Entry	Small	Medium	Large	UprEnd
Networking parameters (M1/CSE 1000 only)					
Global networking parameters					
Number of call processing nodes in the network (including local node)	1	2	4	6	30
Proportion of CBC data collected at all nodes in the network	100%	100%	50%	40%	10%
Number of network skillsets	5	25	50	50	50
Proportion of all calls in the network that are queued to a network skillset	10%	10%	10%	10%	10%
Nodal networking parameters					
Proportion of all incoming network calls that are presented to agents at the local node	100%	50%	25%	17%	3%
Proportion of incoming networked calls originating at a particular node in the network	100%	100%	33%	20%	3%
Proportion of calls arriving at the local node that are queued to a network skillset	10%	10%	10%	10%	10%
Proportion of networked calls originating at this node that are routed to a particular other node in the network	100%	100%	33%	20%	3%
Real-time displays					
Number of rows per agent RTD	10	10	10	10	15

Parameter	Entry	Small	Medium	Large	UprEnd
Number of rows per application RTD	5	25	50	100	250
Number of rows per nodal RTD	1	1	1	1	1
Number of rows per skillset RTD	5	5	10	10	15
Number of rows per IVR RTD (M1/CSE 1000)	5	10	20	30	50
Number of rows per route RTD (M1/CSE 1000)	128	128	128	250	250
Real-time API					
Number of rows of agent statistics	20	100	200	500	1500
Number of rows of application statistics	5	25	50	100	250
Number of rows of nodal statistics	1	1	1	1	1
Number of rows of skillset statistics	5	25	50	125	200
Number of rows of IVR statistics (M1/CSE 1000)	5	10	20	30	50
Number of rows of route statistics (M1/CSE 1000)	128	128	128	250	250

Note: The workload scenarios define typical patterns of system operation and are not directly related to the available hardware configurations. The scenarios are only intended to characterize the marketplace.

Call rate

This guide provides the capacity analysis for inbound and outbound call rates from 1000 to 35 000 calls per hour for every workload (although server capacity is not limited to 35 000 calls per hour). The maximum possible mean service time for each inbound and outbound combination is shown in the following table:

Inbound and Outbound Call Rate (CPH)	Maximum Allowable Mean Service Time (Seconds)				
	Entry (20 Agents)	Small (100 Agents)	Medium (200 Agents)	Large (500 Agents)	UprEnd (1500 Agents)
1000	72	360	720	1800	5400
5000	14	72	144	360	1080
10 000	7	36	72	180	540
15 000	5	24	48	120	360
20 000	4	18	36	90	270
25 000	3	14	29	72	216
30 000	2	12	24	60	180
35 000	2	10	21	51	154

The figures in this table are based on successful call terminations (such as treatment, agent, but not busy), and do not take into account agent activity other than call handling. You can use this table to get an idea of which combination of call rates and workloads may be "reasonable." (For example, Entry x 25 000 combination with maximum mean service time of 3 seconds may be unreasonable for a human agent but is acceptable for an automated voting application.)

Common parameters

The following parameters are assumed to have the same value for all workload scenarios:

Parameter	Value
Real-time displays/Real-time API parameters	
Weighted average update rate of all agent RTD screens, in seconds	3
Weighted average update rate for all other RTD screens (except agent RTDs), in seconds	10
Weighted average update interval for all real-time API and GRTD applications, in seconds	2
Average number of agent states per call	3
Number of RTD API clients	0
Number of GRTD clients	0
Real-time Statistics Multicast	
Refresh interval for statistic i (for agent statistics)	1
Refresh interval for statistic i (for all other statistics)	2
Refresh interval for statistic i (RDTUpdateIntvl)	5
The number of streams sent for statistic i	2
The RSM packet size	64 K
Event interface parameters (M1/CSE 1000 only)	
Average update interval of all Event Interface applications	0.5
Proportion of number of events sent to client applications per call	80%
Number of SEI API clients	0

Parameter	Value
Historical data parameters	
Number of days historical interval data is stored online	21
Number of days historical daily data is stored online	31
Number of weeks historical weekly data is stored online	26
Number of months historical monthly data is stored online	36
Number of days call-by-call data is stored online	3
Number of days agent event records are stored online	3
Number of days skillset event records are stored online	3
Number of days IVR event records are stored online	3
Proportion of local CBC data that is collected at the local node	100%
Agent operations parameters	
Number of agent shifts per day	3
Number of hours per agent shift	8
Number of agent interruptions per shift	10
Proportion of agent-supervisor and agent-skillset assignments that are changed daily	2%
Proportion of agent-supervisor and agent-skillset assignments that are changed weekly	15%
Proportion of agent-supervisor and agent-skillset assignments that are changed monthly	25%
Data characteristics parameters	
Number of RTD formulas defined	50
Number of columns in RTDs	50

Parameter	Value
Number of script variables per script	10
Average depth of script execution tree	10
Proportion of elements assigned in agent to skillset or agent to supervisor assignments	10%
Host Data Exchange	
Average number of Send/Request command parameters	10
Average size of Send/Request command parameters	80
Average number of Get Response parameters	10
Average size of Get Response parameters	80
Average number of Send Info command parameters	10
Average size of Send Info parameters	80
External IVR	
Average number of bytes in caller-entered data sent to the server	20
MLS	
Average number of MLink messages per call transfer	11
Average number of MLink messages per call conference	11
Average MLink message size (in bytes, not including standard overhead of 88 bytes)	50
Proportion of conferenced calls completed by an MLS application	0%
Proportion of conferenced calls completed by an MLS application	0%
Networking (M1/CSE 1000 only)	
Proportion of network CBC data that is collected at the local node when it is a destination node	100%

Parameter	Value
Proportion of all calls queued to network skillsets by this node that are actually routed to another node	100%
Proportion of all calls queued to network skillsets within the network that are actually routed to another node	80%
ActualNetworkingNetw	80%
Average number of network skillset queues entered per network call	2
Routing table update interval	5
Voice services (M1/CSE 1000 only)	
Duration (in seconds) of a Give Controlled Broadcast session in Start/Stop mode	45
Duration (in seconds) of a Give Controlled Broadcast session in Continuous mode	45
Duration (in seconds) of a Collect Digits voice session	45
Duration (in seconds) of a Give IVR session	45
Number of distinct Give Controlled Broadcast sessions played simultaneously in Start/Stop mode	2
Number of distinct Give Controlled Broadcast sessions played simultaneously in Continuous mode	2
The length (in seconds) of the Broadcast Port Wait Timer	10

Real-time displays

For the workload scenarios, it is assumed that the following real-time displays are used:

- Agent
- Application
- Skillset
- Nodal

Reports

For the workload scenarios, it is assumed that the following reports are generated from a PC running the Symposium Call Center Server Client (not the Web Client):

Interval reports

- Application Performance
- Application Delay Before Answer
- Application Delay Before Abandon
- Skillset Performance

Daily reports

- Application Performance
- Application Delay Before Answer
- Application Delay Before Abandon
- Application Call Treatment
- Activity Code By Application
- Application By Activity Code
- Skillset Performance
- Agent Performance
- Agent Performance by Supervisor
- Agent DN Performance
- Agent Average Calls Per Hour

- Estimated Revenue By Agent
- Trunk Performance (M1/CSE 1000 only)
- Route Performance (M1/CSE 1000 only)
- IVR Queue Statistics (M1/CSE 1000 only)
- IVR Port Statistics (M1/CSE 1000 only)
- DNIS Statistics
- CDN Statistics
- Music/RAN Route Statistics

Call complexity

Introduction

Symposium Call Center Server call processing resource requirements (CPU, memory, and so on) vary depending on the complexity of the call and the call rate. Call complexity is defined as the number of each type of service used by the call. Over time, the average number of each type of service per call can be used to estimate the expected resource consumption.

For example, if a typical call in the system is queued to two skillsets then the expected resource cost per call is two times the resource cost of queueing a call to one skillset provided that the costs are a linear function of call rate.

This section describes the call complexity models used for the examples in this appendix.

Basic call

To estimate the resource consumption for different call rates, it is necessary to define the cost of a basic call. A basic call is processed by these script commands:

```
Give Ringback
Queue to Skillset
Quit
```

where an agent is available. The cost of a basic call is the resources consumed during processing of this call.

Inbound call models

Meridian 1/CSE 1000 call models

The following call complexity models apply to the Meridian 1/CSE 1000 switch:

- **SVP** (Symposium Voice Processing)—This call model includes basic call, queuing to two skillsets, and applying voice services controlled by Symposium Call Center Server (Controlled Broadcast and Collect Digits Voice Session).
- **MVP** (Meridian Voice Processing)—This call model includes basic call, queuing to two skillsets, and applying voice services controlled by the Meridian 1/CSE 1000 (Give RAN instead of Controlled Broadcast, and Give IVR instead of Collect Digits Voice Session).

DMS/MSL-100 call models

The following call complexity models apply to the DMS/MSL-100 switches:

- **Simple** (Regular Symposium Call Center Server customer)—In this call model, the customer uses a DMS or MSL-100 switch with an external IVR system. Each call is given IVR treatment and then routed to an agent with a particular skillset.
- **Complex** (Busy Symposium Call Center Server customer)—In this call model, the customer uses a DMS or MSL-100 switch with an external IVR system. Each call is given IVR treatment followed by multiple RAN/music treatments while waiting for an agent.

Number and types of services per call

The following table shows the average number and types of services assumed for calls in each model:

	M1/CSE 1000			DMS/MSL-100	
Parameter	**SVP**	**MVP**	**Hybrid**	**Simple**	**Complex**
Basic Call	1	1	1	1	1
Average number of skillset queues entered per inbound call	2	2	2	1	2.2

	M1/CSE 1000			DMS/MSL-100	
Parameter	**SVP**	**MVP**	**Hybrid**	**Simple**	**Complex**
Average number of agent queues entered per inbound call	0	0	0	0	0.1
Average number of controlled broadcasts in Start/Stop mode per inbound call. Never with Give RAN.	3	0	1	N/A	N/A
Average number of controlled broadcasts in Continuous mode per inbound call	0	0	0	N/A	N/A
Average number of collect digit services per inbound call. Two digits each time (including voice session and play prompt).	1	0	0	N/A	N/A
Average number of Give IVR treatments per inbound call	1	1	1	N/A	N/A
Average number of Give RAN treatments per inbound call. Never with GCB.	1	3	2	0.2	1
Average number of Give Music treatments per inbound call	1	1	1	0	1.5
Average number of Host Data Exchange Send Info treatments per inbound call. Only if Host Data Exchange is present.	1	1	1	1	1
Average number of Host Data Exchange Request/Get Response treatments per inbound call. Only if Host Data Exchange is present.	1	1	1	0	0

	M1/CSE 1000			DMS/MSL-100	
Parameter	**SVP**	**MVP**	**Hybrid**	**Simple**	**Complex**
Average number of Intrinsic References per inbound call (Expected Wait Time, Longest Idle Agent, Oldest Call, Position in Queue)	5	5	5	2	5
Average number of If Then Else treatments per inbound call	5	5	5	2	4
Proportion of inbound calls that are transferred to another agent or DN	5%	5%	5%	0%	5%
Proportion of inbound calls that are conferenced with another agent or supervisor	5%	5%	5%	0%	15%
Proportion of conferenced calls completed by an MLS application (such as Symposium Agent)	0%	0%	0%	5%	10%
Is an external IVR system connected to the DMS/MSL-100 system?	N/A	N/A	N/A	Yes	Yes
Average number of screen pops per inbound call	1.2	1.2	1.2	1.2	1.2
Average number of MLink messages per inbound call (excluding screen pops)	0	0	0	0	0
Collected call-by-call statistics	Yes	Yes	Yes	Yes	Yes
Average number of network skillset queues entered per call	2	2	2	N/A	N/A
Proportion of calls arriving at the local node that are queued to a network skillset	10%	10%	10%	N/A	N/A

Outbound call models (Meridian 1/CSE 1000 only)

Outbound call models apply to calls that originate from the local node. For the purposes of the Symposium Call Center Server performance evaluation, two local outbound call models are defined: predictive dialing and CTI application. Since the DMS/MSL-100 switch supports only a limited set of MLS features, outbound models are only available for the Meridian 1/CSE 1000.

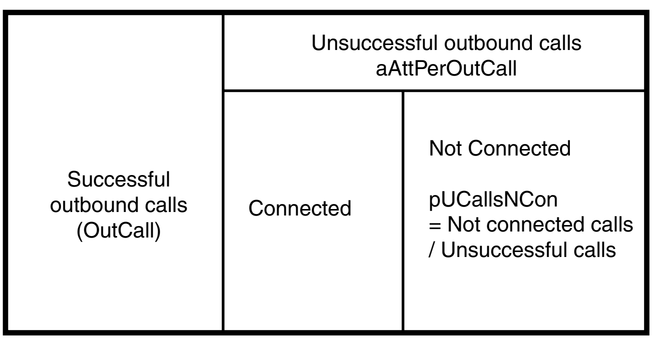
Note: The only MLS messages supported on the DMS/MSL-100 are initiate transfer, complete transfer, login, logout, ready, and not ready).

Outbound call results

Each outbound call attempt may have one of the results listed in the following table:

Event	Result	Example
outbound call	successful	call reaching a live party
PSTN connection established	unsuccessful	call reaching an answering machine
PSTN connection not established	unsuccessful	call receiving a busy signal or unanswered call

The parameter aAttPerOutCall represents the average number of unsuccessful call attempts for each outbound call (that is, a caller contacting a live party), whereas the variable pUCallsNCon denotes the proportion of unsuccessful call attempts not establishing a PSTN connection. These relationships are indicated in the following illustration:



Example

If aAttPerOutCall = 4, then to generate an outbound rate of 5000 CPH, it is necessary to have a total of 25 000 predictive dialing call attempts (5000 successful and 20 000 unsuccessful). If pUCallsNCon = 50 percent for the same example, then for every five call attempts, one is a successful outbound call, two are unsuccessful PSTN connections, and the remaining two are successful PSTN connections that do not reach a person, such as calls connecting to an answering machine.

Predictive dialing

The Predictive Dialing (PD) call model requires the existence of an autodialer that can place a high number of phone calls and then only transfer to the agent those calls that reach a live voice. Digital signal processing (DSP) capabilities enable this type of application to perform the necessary call progress analysis on outbound calls. Use of predictive dialing, therefore, eliminates agent time wasted in calls made to busy or otherwise unavailable parties.

CTI Application

The CTI Application call model assumes that the agents have a desktop application to place outbound calls. In this case, no calls are monitored by the autodialer on behalf of the agent. This application performs third-party call control for agents to place the outbound calls via the TAPI Service Provider software. The previously mentioned parameters also apply to this case; however, aMMSGPerOutCall (the average number of MLINK messages per outbound call) is different, since the call is not being transferred from the autodialer to the agent, as in the predictive dialing application. In addition, aMMSGPerConUCall (the average number of MLINK messages per PSTN connection resulting in an unsuccessful call) can also be different from the above case, since the DSP could be smart enough to detect an answering machine before the call gets connected, whereas the CTI application may not have that capability.

Call types

The call types used for outbound performance evaluation are formally defined by providing the expected number of call services per call type. These numbers are summarized in the following table:

	Symposium Call Center Server M1/CSE 1000	
Parameter	**Predictive dialing**	**CTI application**
Basic Call	1	1
pTransferOut	0%	0%
pConferenceOut	0%	0%
aAttPerOutCall	4	4
pUCallsNCon	100%	50%
aMSPPerOutCall	1	1
aMMSGPerOutCall	14	8
aMMSGPerConUCall	0	8
aMMSGPerNCon	3	2

Server disk space utilization

Introduction

Server disk space utilization is dependent on

- workload type
- call rate

Disk space required

The following tables show the disk space required for each workload and call rate (hybrid call model). The first table shows the total disk space required, and the second table gives the disk space required for the database:

Total disk space required

Call rate (CPH) Peak/Daily	Disk space required (Gbytes)				
	Entry	Small	Medium	Large	UpperEnd
1000 / 500	8.7	9.8	11.4	18.5	38.9
5000 / 2500	11.5	11.5	12.0	19.5	40.3
10 000 / 5000	15.0	15.0	15.0	20.2	41.5
15 000 / 7500	18.5	18.5	18.5	20.7	42.5
20 000 / 10 000	21.9	21.9	21.9	21.9	43.5
25 000 / 12 500	25.4	25.4	25.4	25.4	44.4
30 000 / 15 000	28.9	28.9	28.9	28.9	45.0
35 000 / 17 500	32.4	32.4	32.4	32.4	45.7

Notes:

- This table assumes that both the C and D drives have a logical partition size of 4 Gbytes each. On a server with 2 Gbyte partitions, reduce these values by 4 Gbytes.
- The total disk space required includes disk space required for the database (see the following table).

Disk space required for the database

The following table gives the disk space required for the database:

Call rate (CPH) Peak/Daily	Disk space required (Gbytes)				
	Entry	Small	Medium	Large	UpperEnd
1000 / 500	0.7	1.8	3.4	10.5	30.9
5000 / 2500	3.5	3.5	4.0	11.5	32.3
10 000 / 5000	7.0	7.0	7.0	12.2	33.5
15 000 / 7500	10.5	10.5	10.5	12.7	34.5
20 000 / 10 000	13.9	13.9	13.9	13.9	35.5
25 000 / 12 500	17.4	17.4	17.4	17.4	36.4
30 000 / 15 000	20.9	20.9	20.9	20.9	37.0
35 000 / 17 500	24.4	24.4	24.4	24.4	37.7

Note: Disk space specified in this table is the disk space used by the configuration, not necessarily the amount allocated by the system.

Server CPU utilization

Introduction

Server CPU utilization is dependent on

- call complexity model
- call rate
- number of agents

System performance limits for the Meridian 1/CSE 1000 switch

Mean Holding Time

The following table shows system performance limits for the Meridian 1/CSE 1000 switch with different mean holding times (MHT). The RTD refresh rates are assumed to be 3 seconds for the agent screen and 10 seconds for skillset, application, and call center summary screens. It is assumed that networking is not enabled, and that RSM is turned off for these capacity predictions:

		SVP Call Model		MVP Call Model		Hybrid Call Model	
Processor	**MHT (Minutes)**	**Agents**	**PeakCallRate (CPH)**	**Agents**	**PeakCallRate (CPH)**	**Agents**	**PeakCallRate (CPH)**
PII300	2	122	3646	218	6540	187	5603
	3	164	3272	272	5439	239	4772
	4	198	4464	310	6679	277	5966
PIII733	2	350	10 490	624	18 710	536	16 071
	3	470	9405	775	15 509	683	13 654
	4	568	8524	883	13 244	791	11 869

		SVP Call Model		MVP Call Model		Hybrid Call Model	
Processor	**MHT (Minutes)**	**Agents**	**PeakCallRate (CPH)**	**Agents**	**PeakCallRate (CPH)**	**Agents**	**PeakCallRate (CPH)**
PIII1.0B	2	455	13 665	809	24 274	696	20 888
	3	612	12 246	1000	20 000	886	17 727
	4	740	8400	1143	13 056	1026	11 700
Xeon 1.5 GHz/ PIV1.5G	2	659	19 779	1162	34 848	1000	30 000
	3	885	17 700	1440	28 800	1275	25 485
	4	1069	13 837	1633	21 248	1473	19 134

RTD refresh rates

The following table shows the system performance limits for the Meridian 1/CSE 1000 switch with different RTD refresh rates for the agent and other real-time displays (application, skillsets, and call center summary). The MHT is assumed to be 3 minutes:

		SVP Call Model		MVP Call Model		Hybrid Call Model	
Processor	**Refresh rate (Seconds)**	**Agents**	**PeakCallRate (CPH)**	**Agents**	**PeakCallRate (CPH)**	**Agents**	**PeakCallRate (CPH)**
PII300	2/3	139	2776	186	3711	173	3463
	3/5	151	3020	222	4448	202	2600
	4/10	165	3300	276	5515	242	4830
PIII733	2/3	332	6642	445	8901	415	8298
	3/5	397	7949	584	11 684	531	10 628
	4/10	474	9484	786	15 719	691	13 818

Processor	Refresh rate (Seconds)	SVP Call Model Agents	SVP Call Model PeakCallRate (CPH)	MVP Call Model Agents	MVP Call Model PeakCallRate (CPH)	Hybrid Call Model Agents	Hybrid Call Model PeakCallRate (CPH)
PIII1.0G	2/3	422	8437	565	11 291	527	10 532
	3/5	512	10 234	750	15 000	683	13 661
	4/10	617	12 348	1018	20 363	897	17 939
Xeon 1.5 GHz/ PIV1.5G	2/3	595	11 895	793	15 861	741	14 817
	3/5	732	14 635	1066	21 313	973	19 461
	4/10	893	17 855	1457	29 147	1289	25 786

Peak inbound capacity

The estimated peak sustainable inbound call rates are shown in the following table for the SVP, MVP, and hybrid call models.

Note: The peak capacity call rates can be used to determine upper limits on workload parameters, such as number of logged on agents. This can be used as a rough guide for choosing a processor, provided that the other workload parameters are proportional to the standard workload values. Currently, testing has indicated that Symposium Call Center Server capacity is limited primarily by CPU.

Processor	Peak Capacity per Workload Summary (CPH) Entry	Small	Medium	Large	UprEnd
SVP call model					
PII300	4000	3700	3200	930	
PIII733	13 000	12 600	12 000	9800	
PIII1.0B	17 100	16 800	16 200	13 900	4000

	Peak Capacity per Workload Summary (CPH)				
Processor	**Entry**	**Small**	**Medium**	**Large**	**UprEnd**
Xeon 1.5 GHz/ PIV1.5G	25 200	24 800	24 150	21 800	11 900
MVP call model					
PII300	9400	8700	7400	2150	
PIII733	30 500	29 600	27 900	22 500	
PIII1.0B	40 300	39 350	37 500	31 950	9100
Xeon 1.5 GHz/ PIV1.5G	59 300	58 200	56 000	50 300	27 100
Hybrid call model					
PII300	7345	6800	5800	1700	
PIII733	23 750	23 100	21 900	17 700	
PIII1.0B	31 400	30 700	29 350	25 100	7200
Xeon 1.5 GHz/ PIV1.5G	46 200	45 400	43 900	39 500	21 400

Network call processing

The following table shows performance limits for different hardware platforms. The mean holding time (MHT) is assumed to be 3 minutes. Other parameters were interpolated based on the settings for the five predefined workloads and the number of agents supported as shown in the following table:

		SVP Call Model (M1)		MVP Call Model (M1)		Hybrid Call Model (M1)	
Processor and # of Nodes	**% Calls Network-ed**	**Agents**	**PeakCallRate (CPH)**	**Agents**	**PeakCallRate (CPH)**	**Agents**	**PeakCallRate (CPH)**
PII300 6 nodes	10%	143	2867	220	4400	198	3955
	30%	113	2270	157	3133	145	2900
	50%	93	1850	119	2386	112	2249
PIII733 6 nodes	10%	412	8246	630	12 595	567	11 342
	30%	327	6540	451	9012	418	8350
	50%	267	5337	344	6877	324	6485
PIII1.0B 6 nodes	10%	537	10 739	818	16 351	737	14 741
	30%	426	8522	586	11 726	544	10 870
	50%	348	6957	448	8957	422	8448
Xeon 1.5 GHz / PIV1.5G 6 nodes	10%	777	15 533	1175	23 500	1062	21 237
	30%	617	12 338	846	16 930	785	15 700
	50%	504	10 077	648	12 954	611	12 224

Outbound call processing performance

The following table shows the performance limits for outbound calls for the predictive dialing and CTI Application call models:

		PD Call Model		CTI Call Model	
Processor	**MHT (Minutes)**	**Agents**	**PeakCallRate (CPH)**	**Agents**	**PeakCallRate (CPH)**
PIII733	2	650	19 500	630	18 900
	3	800	16 000	750	15 000
	4	900	13 500	850	12 750
Xeon 1.5 GHz/ PIV1.5G	2	1200	36 000	1100	33 000
	3	1500	30 000	1400	28 000
	4	1800	27 000	1700	25 500

Outbound system capacity

The following table shows the estimated peak outbound call rates for the predictive dialing and CTI call models:

	Peak Capacity per Workload Summary (CPH)				
Processor	**Entry**	**Small**	**Medium**	**Large**	**UprEnd**
Predictive dialing call model					
PIII733	30 400	30 200	29 300	23 600	
Xeon 1.5 GHz	60 000	60 000	58 500	52 600	22 500
CTI call model					
PIII733	30 000	28 500	27 300	22 200	
Xeon 1.5 GHz/ PIV1.5G	57 000	56 000	54 500	50 000	21 200

System performance limits for the DMS/MSL-100 switch

Mean Holding Times

The following table shows the system performance limits for the DMS/MSL-100 switch with different mean holding times (MHT):

		Simple Call Model		Complex Call Model	
Processor	**MHT (Minutes)**	**Agents**	**PeakCallRate (CPH)**	**Agents**	**PeakCallRate (CPH)**
PIII733	2	812	24 370	747	22 401
	3	960	19 198	898	17 960
	4	1056	15 836	999	14 987
Xeon 1.5 GHz/ PIV1.5G	2	1497	44 897	1384	41 517
	3	1759	35 187	1657	33 137
	4	1929	25 186	1838	23 953

RTD refresh rates

The following table shows the system performance limits for the DMS/MSL-100 switch with different RTD refresh rates:

		Simple Call Model		Complex Call Model	
Processor	**RTD Refresh Rates (Seconds)**	**Agents**	**PeakCallRate (CPH)**	**Agents**	**PeakCallRate (CPH)**
PIII733	2/3	496	9918	479	9582
	3/5	679	13 588	648	12 958
	4/10	976	19 517	912	18 240

		Simple Call Model		Complex Call Model	
Processor	**RTD Refresh Rates (Seconds)**	**Agents**	**PeakCallRate (CPH)**	**Agents**	**PeakCallRate (CPH)**
Xeon 1.5 GHz/ PIV1.5G	2/3	880	17 600	852	17 040
	3/5	1231	24 613	1178	23 564
	4/10	1788	35 752	1682	33 641

Peak inbound capacity

The estimated peak inbound call rates are shown in the following tables, for the simple and complex call models respectively.

Note: The peak capacity call rates can be used to determine upper limits on workload parameters, such as number of logged on agents. This can be used as a rough guide for choosing a processor, provided that the other workload parameters are proportional to the standard workload values. Currently, testing has indicated that Symposium Call Center Server capacity is limited primarily by CPU.

	Peak Capacity per Workload Summary (CPH)				
Processor	**Entry**	**Small**	**Medium**	**Large**	**UprEnd**
Simple call model					
PII300	15 800	14 500	12 200	3600	
PIII733	51 000	49 300	46 000	36 900	
PIII1.0B	67 500	65 500	61 700	52 450	15 000
Xeon 1.5 GHz/ PIV1.5G	99 200	96 800	92 200	82 450	44 600
Complex call model					
PII300	13 200	12 150	10 300	3050	

	Peak Capacity per Workload Summary (CPH)				
Processor	**Entry**	**Small**	**Medium**	**Large**	**UprEnd**
PIII733	42 650	41 300	38 700	31 150	
PIII1.0B	56 350	54 850	51 950	44 200	12 700
Xeon 1.5 GHz/ PIV1.5G	82 900	81 100	77 600	69 550	37 700

ELAN utilization

Introduction

ELAN utilization is dependent on

- workload
- call rate

ELAN traffic

Embedded LAN (ELAN) bandwidth is 10 Mbps. The ELAN carries the following traffic:

- call processing AML
- call processing ICM
- external IVR traffic

Note: IVR caller entered data (CED) can use either ELAN or CLAN.

If more than one Symposium Call Center Server system is on the same ELAN, then the ELAN utilization is the sum of the ELAN utilization for each system.

Note: ELAN utilization should not exceed 10 percent for the Meridian 1/CSE 1000 switch or 30 percent for the DMS/MSL-100 switch.

MVP call model (Meridian 1/CSE 1000)

The following table shows ELAN utilization per workload for the MVP call model:

	ELAN Utilization per workload (%)				
Call rate (CPH)	**Entry**	**Small**	**Medium**	**Large**	**UpperEnd**
1000	<1%	<1%	<1%	<1%	<1%
5000	<1%	<1%	<1%	<1%	<1%

	ELAN Utilization per workload (%)				
Call rate (CPH)	**Entry**	**Small**	**Medium**	**Large**	**UpperEnd**
10 000	1%	1%	1%	1%	1%
15 000	1.5%	1.5%	1.5%	1.5%	1.5%
20 000	2.0%	2.0%	2.0%	2.0%	2.0%
25 000	2.5%	2.5%	2.5%	2.5%	2.5%

Complex call model (DMS/MSL-100)

The following table shows ELAN utilization per workload for the Complex call model:

	ELAN utilization per workload (%)				
Call rate	**Entry**	**Small**	**Medium**	**Large**	**UpperEnd**
1000	<1%	<1%	<1%	<1%	<1%
5000	<1%	<1%	<1%	<1%	<1%
10 000	<1%	<1%	<1%	<1%	<1%
15 000	1.1%	1.1%	1.1%	1.1%	1.1%
20 000	1.4%	1.4%	1.4%	1.4%	1.4%
25 000	1.8%	1.8%	1.8%	1.8%	1.8%

CLAN utilization

Introduction

CLAN utilization is dependent on

- workload
- call rate

CLAN traffic

CLAN bandwidth is 10 Mbps. CLAN traffic consists of

- real-time display traffic
- real-time data API traffic
- Graphical Real-time Display (GRTD) traffic
- Real-time Statistics Multicast (RSM) traffic
- Symposium Event Interface traffic
- Host Data Exchange traffic
- MLS traffic
- reporting-related traffic
- external IVR traffic

  Note: IVR caller-entered data (CED) can use either ELAN or CLAN.
- networking call processing traffic
- NCC traffic
- Network Consolidated Real-Time Display traffic (for web client)
- non-Symposium Call Center Server customer traffic (not included)

Note: CLAN utilization should not exceed 30 percent.

CLAN utilization for MVP call model (Meridian 1/CSE 1000)

The following table shows CLAN utilization for different workloads and call rates:

	Customer LAN Utilization per Workload (%)				
Call rate	**Entry**	**Small**	**Medium**	**Large**	**UprEnd**
1000	<1%	<1%	1.2%	3.6%	13.9%
5000	<1%	1.2%	1.8%	4.2%	14.5%
10 000	1.6%	1.9%	2.5%	4.9%	15.2%
15 000	2.3%	2.7%	3.3%	5.7%	16.0%
20 000	3.1%	3.4%	4.0%	6.4%	16.7%
25 000	3.8%	4.2%	4.8%	7.2%	17.5%
30 000	4.6%	4.9%	5.5%	7.9%	18.3%
35 000	5.3%	5.7%	6.3%	8.7%	19.0%

CLAN utilization for real-time display traffic

RT Display LAN Requirements per Workload				
Entry	**Small**	**Medium**	**Large**	**UprEnd**
<1%	<1%	<1%	3.2%	13.0%

CLAN utilization for real-time API traffic

RT Data API CLAN Requirements per Workload				
Entry	**Small**	**Medium**	**Large**	**UprEnd**
<1%	<1%	<1%	1.7%	4.2%

CLAN utilization for Graphical Real-time Display traffic (MVP call model)

GRTD CLAN Requirements per Workload				
Entry	**Small**	**Medium**	**Large**	**UprEnd**
<1%	<1%	<1%	1.5%	3.9%

Network call processing traffic (Meridian 1/CSE 1000)

	NCP Embedded LAN Utilization per Workload (%)				
Call rate	**Entry**	**Small**	**Medium**	**Large**	**UprEnd**
1000	<1%	<1%	<1%	<1%	<1%
5000	<1%	<1%	<1%	<1%	<1%
10 000	<1%	<1%	<1%	<1%	<1%
15 000	<1%	<1%	<1%	<1%	<1%
20 000	<1%	<1%	<1%	<1%	<1%
25 000	<1%	<1%	<1%	<1%	<1%
30 000	<1%	<1%	1%	1%	1%
35 000	<1%	<1%	1.2%	1.2%	1.2%

CLAN utilization for Real-time Statistics Multicast (RSM) (Meridian 1/ CSE 1000 call models)

RSM CLAN Requirements per M1 Workload				
Entry	**Small**	**Medium**	**Large**	**UprEnd**
<1%	<1%	<1%	1.8%	4.3%

CLAN utilization for Symposium Event Interface (SEI) (Meridian 1/CSE 1000 call models)

The following table shows the Event Interface utilization for one SEI client with a refresh interval of 0.5 seconds:

	SEI CLAN Requirements per M1 Workload				
Call Rate	**Entry**	**Small**	**Medium**	**Large**	**UprEnd**
1000	<1%	<1%	<1%	<1%	<1%
5000	1.9%	1.9%	1.9%	1.9%	1.9%
10 000	3.8%	3.8%	3.8%	3.8%	3.8%
15 000	5.7%	5.7%	5.7%	5.7%	5.7%
20 000	7.6%	7.6%	7.6%	7.6%	7.6%
25 000	9.5%	9.5%	9.5%	9.5%	9.5%
30 000	11.3%	11.3%	11.3%	11.3%	11.3%
35 000	13.2%	13.2%	13.2%	13.2%	13.2%

CLAN utilization for HDX

DX application rate per hour	Request/ Response	SendInfo	Request/Response and SendInfo
1000	0.0%	0.0%	0.1%
5000	0.2%	0.1%	0.4%
10 000	0.5%	0.2%	0.7%
15 000	0.7%	0.4%	1.1%
20 000	1.0%	0.5%	1.5%
25 000	1.2%	0.6%	1.8%

DX application rate per hour	Request/ Response	SendInfo	Request/Response and SendInfo
30 000	1.4%	0.8%	2.2%
35 000	1.6%	0.9%	2.5%

NCC disk space requirements

Introduction

NCC disk space utilization is dependent upon

- network-out call rate
- number of nodes

Disk space requirements

The following table shows disk space requirements for networks with different numbers of nodes. The table assumes that

- the peak network-out call rate for each node is constant at 10 000 calls per hour (CPH)
- the total number of calls per day (CPD) for each node is 120 000 calls
- two queue to network skillsets commands are executed per call
- 10 percent of calls are networked out

Number of nodes	Disk space required (Gbytes)
2	13
4	15
6	16
10	18
20	18
30	18

Note: The NCC can collect network call-by-call data for a maximum of 10 000 network-out calls per hour. (The network can support more than 10 000 network-out calls per hour, but network call-by-call data is only collected for the first 10 000.)

NCC CLAN utilization

NCC CLAN workload scenarios requirements

The summary of CLAN utilization is shown in the following table. External load is taken as Call Rate per network node. It is assumed that all nodes in the network have identical workloads of 10 000 CPH and 10 percent of calls networked out.

Number of nodes	CLAN utilization
2	0.14%
4	0.58%
6	0.87%
10	1.5%
20	1.5%
30	1.5%

Appendix C

Database table sizes

In this appendix

Symposium Call Center Server database table sizes

Introduction

The following tables list Symposium Call Center Server database tables, along with corresponding record sizes and the formulas used to compute the numbers of records per table. The record sizes are obtained using the Sybase *sp_estspace* utility for 10 000 000 rows for each table.

Event table sizes

Number of call-by-call events per call

Events associated with each call may be recorded in the call-by-call (CBC) database when CBC recording is turned on for a corresponding application. The number of events associated with each call service is required to calculate the size of the CBC database. One record is generated for each event. The following table gives the number of events associated with each call service:

Table 1 Number of call-by-call events per call for each service

Service	Variable name	# CBC events
Basic Call Processing[a]	BCC_CBC_Events	5
Basic Local Call Processing[b]	Local_BCC_CBC_Events	5
Queue To Skillset	QTS_CBC_Events	2
Queue To Network Skillset[c]	QTNS_CBC_Events	2
Queue To Agent	QTA_CBC_Events	2
Give Controlled Broadcast (Start/Stop)[d]	GCB_CBC_Events	7
Give Controlled Broadcast (Continuous)[e]	GCBC_CBC_Events	7
Voice Session Collect Digits[f]	VSCDG_CBC_Events	9

Table 1 Number of call-by-call events per call for each service (continued)

Service	Variable name	# CBC events
Give IVR[g]	GIVR_CBC_Events	7
Give RAN	GRAN_CBC_Events	2
Give MUSIC	GMUS_CBC_Events	2
Give Overflow	GOFL_CBC_Events	1
Give Busy	GBSY_CBC_Events	1
Give Route To	GRT_CBC_Events	1
Give Silence	GSil_CBC_Events	1
Disconnect	Disc_CBC_Events	1
Host Data Exchange Send Info	HDXSI_CBC_Events	1
Host Data Exchange Request/Get Response	HDXRG_CBC_Events	2
Outbound PSTN Connection[h]	OutConn_CBC_Events	2
Call Entered Data (External IVR)	CED_CBC_Events	1
Call Transfer (External IVR)[i]	IVR_CBC_Events	6
Transfer Call[j]	TRAN_CBC_Events	6
Conference Call[k]	CONF_CBC_Events	7
Network call rejected/cancelled locally[l]	IREJ_CBC_Events	2
Network call accepted locally[m]	IACC_CBC_Events	6
Local request rejected/cancelled elsewhere[n]	OREJ_CBC_Events	2
Local call accepted elsewhere (events due to local portion of processing, plus due to acceptance of call on other node that reported locally)[o]	OACC_CBC_Events	3

a. Includes 1 Call Arrival (2 events), 1 RingBack, 1 Interflow, 1 Call Handed Off.

b. Includes 2 Queue to Skillset, 1 Present to Agent, 1 Call Answered, 1 Call Released.

c. Includes 1 Call Enqueued, 1 Call Dequeued.

d. Includes 1 Give Broadcast, 1 IVR Call Enqueued, 1 IVR Call Session Begin, 1 IVR Port in Use, 1 IVR Call Session Interrupted, 1 IVR Port Free, 1 Give Broadcast Completed.

e. Same as (d) above.

f. Includes 1 Play Prompt, 1 IVR Call Enqueued, 1 IVR Call Session Begin, 1 IVR Port in Use, 1 Digit Collection, 1 Digit Collection Ended, 1 IVR Call Session End, 1 IVR Port Free, 1 Play Prompt Ended.

g. Includes 1 Give IVR, 1 IVR Call Enqueued, 1 IVR Call Session Begin, 1 IVR Port in Use, 1 IVR Call Session End, 1 IVR Port Free, 1 Call Returned from IVR.

h. For a successful outbound call, the 2 events are DN incall answer and DN incall release, whereas for an unsuccessful call resulting in a PSTN connection, the 2 events are DN outcall initiated and DN outcall release.

i. Includes 1 Consult Init, 1 Call Arrival (2 events), 1 Call Answered, 1 Call Transferred, 1 Local Call Released.

j. Includes 1 Consult Init, 1 Call Arrival (2 events), 1 Call Answered, 1 Call Transferred, 1 Local Call Released.

k. Includes 1 Consult Init, 1 Call Arrival (2 events), 1 Call Answered, 2 Call Conferenced, 1 Call Released.

l. Includes 1 Call Enqueued, 1 Call Dequeued.

m. Includes 1 Call Enqueued, 1 Network InCall Arrived, 1 Call Dequeued, 1 Call Presented to Agent, 1 Call Answered, 1 Call Released.

n. Includes 1 Call Enqueued, 1 Call Dequeued. This is in addition to the events documented in footnote (a) and (b).

o. Includes 1 Local Call Networked Out, 1 Call Answered, 1 Call Released. This is in addition to basic call processing as documented in footnote (a).

Table sizes calculations

Table 2 Event tables

Table name	Row size ANSI (kbytes)	Number of rows computations
NIeAgentLoginStat	0.098	nAgents*(2*nIntPerShift+2) * nShifts
NIeSkillsetStateStat	0.014	0
NIeIVRPortLoginStat	0.071	nIVRPortEvents * nIVRPorts
NIeCallByCallStatYYYYMMDD	0.141	RecordsPerHour * 24
NIeNetCallByCallStatYYYYMMDD	0.149	NCCRecordsPerHour * 24

The computations above use parameters RecsPerCall, RecsPerNWInCall, RecsPerNWOutCall, nNetwCallsSDMEvents, and NRequests. RecsPerCall is the average number of records recorded in the CBC database for each local Symposium Call Center Server call due to various call services. RecsPerNWOutCall is the average number of records recorded in the CBC database for each Symposium Call Center Server network out call due to various call services. RecsPerNWInCall is the average number of records recorded in the CBC database for each Symposium Call Center Server network in call due to various call services. RecsPerOutCall is the average number of records recorded in the Call By Call database for each Symposium Call Center Server call due to various outbound call services. These numbers depend on the call complexity and are determined as follows:

```
RecsPerNWOutCall =
  SUMOF(
    aQTSPerCall*QTS_CBC_Events
    aQTNSPerCall*pNetOut/100*QTNS_CBC_Events
    aQTAPerCall*QTA_CBC_Events
    aGCBPerCall*GCB_CBC_Events
    aGCBCPerCall*GCBC_CBC_Events
    aVSCDGPerCall*VSCDG_CBC_Events
    aGIVRPerCall*GIVR_CBC_Events
    aGRANPerCall*GRAN_CBC_Events
    aGMUSPerCall*GMUS_CBC_Events
    aHDXSIPerCall*HDXSI_CBC_Events
    aHDXRGPerCall*HDXRG_CBC_Events
  )
```

```
RecsPerNWInCall =
  SUMOF(
    pTransferIn/100*TRAN_CBC_Events
    pConferenceIn/100*CONF_CBC_Events
  )

RecsPerCall =
  SUMOF(
    RecsPerNWOutCall
    RecsPerNWInCall
  )

RecsPerOutCall =
  SUMOF{
    [1 + aAttPerOutCall * (1 - pUCallsNCon/100)] *
        OutConn_CBC_Events
    pTransferOut/100 * TRAN_CBC_Events
    pConferenceOut/100 * CONF_CBC_Events
  }
```

RecordsPerHour is the number of records generated in the CBC database in an hour. This number depends on the call rate and the proportion of network incoming and outgoing calls, as in the following formula:

```
RecordsPerHour =
  SUMOF (
    BCC_CBC_Events * DailyCallRate
    (Local_BCC_CBC_Events + RecsPerCall) *
        LocalDailyCallRate
    (CED_CBC_Events + IVR_CBC_Events ) * DailyCallRate
        (if External IVR)
    (OACC_CBC_Events + RecsPerNWOutCall) *
        nwOAccDailyCallRate
    OREJ_CBC_Events * nwORejDailyCallRate
    (IACC_CBC_Events + RecsPerNWInCall) *
        nwIAccDailyCallRate
    IREJ_CBC_Events * nwIRejDailyCallRate
    RecsPerOutCall * DailyOutCallRate
  ) * pCBCNode/100
```

NCCRecordsPerHour is the number of records generated in NCC CBC database in an hour. This number depends on the call rate and the proportion of network incoming and outgoing calls, as in the following formula:

```
NCCRecordsPerHour =
  SUMOF(
    IACC_CBC_Events * nwAccNetwDailyCallRate
    IREJ_CBC_Events * nwRejNetwDailyCallRate
  ) * pCBCNetwork/100
```

Statistics table sizes

The computations below use parameters CallsPerInterval and CallsPerDay. These parameters represent the average number of calls processed by Symposium Call Center Server during a single interval (assuming steady call arrival) and during a single day respectively, and are computed as follows:

```
CallsPerInterval = DailyCallRate / 4

CallsPerDay = DailyCallRate * 24

NetCallsPerInterval = nwIAccDailyCallRate / 4

NetCallsPerDay = nwIAccDailyCallRate * 24

NetOutCallsPerInterval = nwOAccDailyCallRate / 4

NetOutCallsPerDay = nwOAccDailyCallRate * 24
```

Table 3 Interval statistics tables (number of records per interval)

Table name	Row size ANSI (kbytes)	Number of rows computations
NIiActivityCodeStat	0.066	aActCode_Agent_Appl_Intv * aAppl_Agent_Intv * nAgents
NIiAgentByAppStat	0.050	min(CallsPerInterval, nAgents * aAppl_Agent_Intv)
NIiAgentBySkillsetStat	0.056	min(CallsPerInterval, nAgents * aSkill_Agent)
NIiAgentPerfStat	0.212	nAgents
NIiAppStat	0.369	nApplications

Table 3 Interval statistics tables (number of records per interval) (continued)

Table name	Row size ANSI (kbytes)	Number of rows computations
NIiCDNStat	0.032	min(CallsPerInterval, nCDN)
NIiDNISStat	0.074	min(CallsPerInterval, nDNIS * pDNISInterval / 100)
NIiIVRPortStat	0.057	nIVRPorts
NIiIVRStat	0.047	min(CallsPerInterval, nIVRQ)
NIiNetworkInCallStat	0.057	min(NetInCallsPerInterval, nApplications * (nNetNodes - 1))
NIiNetworkOutStat	0.053	min(NetOutCallsPerInterval, nApplications * (nNetNodes - 1))
NIiRANMusicRoute Stat	0.018	min(CallsPerInterval, nRMRoutes)
NIiRouteStat	0.021	min(CallsPerInterval, nRoutes)
NIiSkillsetStat	0.055	min(CallsPerInterval, nSkillsets * aAppl_Skill + nNetSkillsets * aAppl_NetSkill * aNodes_NetSkill)
NIiTrunkStat	0.033	min(CallsPerInterval, nTrunks * aTrunk_Routes)

Table 4 Temporary interval statistics tables (number of records per interval)

Table name	Row size ANSI (kbytes)	Number of rows computations
NItActivityCodeStat	0.064	aActCode_Agent_Appl_Intv * aAppl_Agent_Intv * nAgents
NItAgentByAppStat	0.049	min(CallsPerInterval, nAgents * aAppl_Agent_Intv)
NItAgentBySkillsetStat	0.055	min(CallsPerInterval, nAgents * aSkill_Agent)
NItAgentPerfStat	0.205	nAgents
NItAppStat	0.366	nApplications
NItCDNStat	0.032	min(CallsPerInterval, nCDN)
NItDNISStat	0.073	min(CallsPerInterval, nDNIS)

Table 4 Temporary interval statistics tables (number of records per interval) (continued)

Table name	Row size ANSI (kbytes)	Number of rows computations
NItIVRPortStat	0.056	nIVRPorts
NItIVRStat	0.047	min(CallsPerInterval, nIVRQ)
NItNetworkInCallStat	0.056	min(NetInCallsPerInterval, nApplications * (nNetNodes - 1))
NItNetworkOutStat	0.052	min(NetOutCallsPerInterval, nApplications * (nNetNodes - 1))
NItRANMusicRoute Stat	0.017	min(CallsPerInterval, nRMRoutes)
NItRouteStat	0.021	min(CallsPerInterval, nRoutes)
NItSkillsetStat	0.054	min(CallsPerInterval, nSkillsets * aAppl_Skill + nNetSkillsets * aAppl_NetSkill * aNodes_NetSkill)
NItTrunkStat	0.033	min(CallsPerInterval, nTrunks * aTrunk_Routes)

Table 5 Daily statistics tables (number of records per day)

Table name	Row size ANSI (kbytes)	Number of rows computations
NIdActivityCodeStat	0.066	aActCode_Agent_Appl_Day * aAppl_Agent_Day * min(nTAgents, nShifts * nAgents) * (1+pAgDailyReassign/100)
NIdAgentByAppStat	0.052	min[CallsPerDay, min(nTAgents, nShifts*nAgents) * aAppl_Agent_Day * (1+ pAgDailyReassign/100)]
NIdAgentBySkillsetStat	0.060	min[CallsPerDay, min(nTAgents, nShifts*nAgents) * aSkill_Agent * (1+ pAgDailyReassign/100)]
NIdAgentPerfStat	0.288	min(nTAgents, nShifts*nAgents) * (1+ pAgDailyReassign/100)
NIdAppStat	0.657	nApplications
NIdCDNStat	0.042	nCDN

Table 5 Daily statistics tables (number of records per day) (continued)

Table name	Row size ANSI (kbytes)	Number of rows computations
NIdDNISStat	0.099	min(CallsPerDay, nDNIS)
NIdIVRPortStat	0.063	nIVRPorts
NIdIVRStat	0.067	nIVRQ
NIdNetworkInCallStat	0.067	min(NetInCallsPerDay, nApplications * (nNetNodes - 1))
NIdNetworkOutStat	0.059	min(NetOutCallsPerDay, nApplications * (nNetNodes - 1))
NIdRANMusicRoute Stat	0.020	nRMRoutes
NIdRouteStat	0.027	nRoutes
NIdSkillsetStat	0.069	min(CallsPerDay, nSkillsets * aAppl_Skill + nNetSkillsets * aAppl_NetSkill * aNodes_NetSkill)
NIdTrunkStat	0.039	min(CallsPerDay, nTrunks * aTrunk_Routes)

Table 6 Weekly statistics tables (number of records per week)

Table name	Row size ANSI (kbytes)	Number of Rows computations
NIwActivityCodeStat	0.066	aActCode_Agent_Appl_Week * aAppl_Agent_Week * nTAgents * (1+pAgWeeklyReassign/100)
NIwAgentByAppStat	0.052	nTAgents * aAppl_Agent_Week * (1+ pAgWeeklyReassign/100)
NIwAgentBySkillsetStat	0.060	nTAgents * aSkill_Agent * (1+ pAgWeeklyReassign/100)
NIwAgentPerfStat	0.288	nTAgents * 1+ pAgWeeklyReassign/100)
NIwAppStat	0.657	nApplications
NIwCDNStat	0.042	nCDN
NIwDNISStat	0.099	nDNIS
NIwIVRPortStat	0.063	nIVRPorts
NIwIVRStat	0.067	nIVRQ

Table 6 Weekly statistics tables (number of records per week) (continued)

Table name	Row size ANSI (kbytes)	Number of Rows computations
NIwNetworkInCallStat	0.067	nApplications * (nNetNodes - 1)
NIwNetworkOutStat	0.059	nApplications * (nNetNodes - 1)
NIwRANMusicRoute Stat	0.020	nRMRoutes
NIwRouteStat	0.027	nRoutes
NIwSkillsetStat	0.069	nSkillsets * aAppl_Skill + nNetSkillsets * aAppl_NetSkill * aNodes_NetSkill
NIwTrunkStat	0.039	nTrunks * aTrunk_Routes

Table 7 Monthly stat tables (number of records per month)

Table name	Row size ANSI (kbytes)	Number of rows computations
NImActivityCodeStat	0.066	aActCode_Agent_Appl_Month * aAppl_Agent_Month * nTAgents * (1+pAgMonthlyReassign/100)
NImAgentByAppStat	0.052	nTAgents * aAppl_Agent_Month * (1+ pAgMonthlyReassign/100)
NImAgentBySkillsetStat	0.060	nTAgents * aSkill_Agent * (1+ pAgMonthlyReassign/100)
NImAgentPerfStat	0.288	nTAgents * (1+ pAgMonthlyReassign/100)
NImAppStat	0.657	nApplications
NImCDNStat	0.042	nCDN
NImDNISStat	0.099	nDNIS
NImIVRPortStat	0.063	nIVRPorts
NImIVRStat	0.067	nIVRQ
NImNetworkInCallStat	0.067	nApplications * (nNetNodes - 1)

Table 7 Monthly stat tables (number of records per month) (continued)

Table name	Row size ANSI (kbytes)	Number of rows computations
NImNetworkOutStat	0.059	nApplications * (nNetNodes - 1)
NImRANMusicRoute Stat	0.020	nRMRoutes
NImRouteStat	0.027	nRoutes
NImSkillsetStat	0.069	nSkillsets * aAppl_Skill + nNetSkillsets * aAppl_NetSkill * aNodes_NetSkill
NImTrunkStat	0.039	nTrunks * aTrunk_Routes

Configuration table sizes

Table 8 Configuration tables

Table name	Row size ANSI (kbytes)	Number of rows computations
NIActivityCode	0.092	nActCodes
NIAgentByTaskFlow	0.038	nAgents * nScripts
NIAgentByTaskFlow Variable	0.027	nAgents * nScripts * nTFVarsPerTF
NIApplication	0.048	nApplications
NIApplicationByTask Flow	0.016	nApplications * nScripts
NICDN	0.076	nCDN
NIDBSpaceAllocated	0.046	100
NIDBSpaceUsed	0.024	200
NIDNIS	0.096	nDNIS
NIEnums	0.068	308
NIHDCConfig	0.033	200
NIHDMConfig	0.037	100
NIHDMStatus	0.035	100
NIHDSpaceAllocated	0.016	100
NIID	1.265	13

Table 8 Configuration tables (continued)

Table name	Row size ANSI (kbytes)	Number of rows computations
NIIVRPort	0.117	nIVRPorts
NIIVRQueue	0.075	nIVRQ
NINCCConfig	0.035	nCustomers
NINCCNetworkSkillset	0.105	nNetSkillsets
NINCCNetworkSkillsetBy Site	0.022	nNetSkillsets * nNetNodes
NINCCRanking	0.030	nNetNodes * (nNetNodes-1) * nNetSkillsets
NINCCRankingAssign	0.128	nNetNodes * nNetSkillsets * pBatchAssignFactor/100
NINCCRankingAssign Data	0.018	(nNetNodes * nNetSkillsets * pBatchAssignFactor/100) * (nNetNodes * nNetSkillsets * 20)
NINCCRemote Application	0.044	nApplications * nNetNodes
NINCCSite	0.158	nNetNodes
NINetworkConfig	0.044	1
NINetworkSkillset	0.105	nNetSkillsets
NINetworkSkillsetStatus	0.020	nNetSkillsets
NIParameter	0.068	12
NIRanking	0.030	(nNetNodes-1) * nNetSkillsets
NIRDCConfig	0.041	nCustomers
NIRealTimeColumn	0.062	nRTColumns
NIRealTimeFormula	0.229	nRTFormulas
NIRealTimeTemplate	0.045	7
NIRemoteApplication	0.044	nApplications * nNetNodes
NIRoute	0.071	nRoutes + nRMRoutes
NISchema	0.140	1
NISDPConfig	0.018	1
NISite	0.165	nNetNodes

Table 8 Configuration tables (continued)

Table name	Row size ANSI (kbytes)	Number of rows computations
NISkillset	0.150	nSkillsets
NISkillsetAssign	0.125	nTAgents * aSkill_Agent * pBatchAssignFactor/100 / 100
NISkillsetAssignData	0.030	nTAgents * aSkill_Agent * pBatchAssignFactor/100
NISkillsetByAgent	0.033	nTAgents * aSkill_Agent * 1.5
NISkillsetByTaskFlow	0.016	(nSkillsets * nScripts) / aAppl_Skill
NISkillsetByTaskFlow Variable	0.016	(nSkillsets * nScripts/aAppl_Skill) * nTFVarsPerTF
NIStatsTableName	0.050	60
NIStorageConfig	0.031	30
NISupervisorAgent	0.087	nTAgents * aSup_Agent
NITargetSwitchComm	0.052	nNetNodes
NITaskFlow[a]	11.884	nScripts (avg. 10K)
NITaskFlowTree	0.016	nScripts * aTFTreeDepth
NITaskFlowVariable	0.179	nScripts * nTFVarsPerTF
NITaskFlowVariableBy TaskFlow	0.016	nScripts * nTFVarsPerTF
NITaskFlowVariableValue	0.266	nScripts * nTFVarsPerTF * pBatchAssignFactor/100
NITelsetField	0.043	nCustomers * nTelsetFields
NITerminal	0.072	(nTAgents + nSupervisors) * 1.2
NITFFile	109.43	nScripts (avg. 100K)
NIThreshold	0.027	(nDNIS+nIVRQ+nRoutes+nSkillsets+nApplications+nNetSkillsets) * 0.1
NIThresholdTemplate	0.051	nDNIS+nIVRQ+nRoutes+nSkillsets+nApplications+nNetSkillsets

Table 8 Configuration tables (continued)

Table name	Row size ANSI (kbytes)	Number of rows computations
NItRefScript	0.023	20
NIUser	0.149	nTAgents+(nSupervisors+nAdministrators) * nShifts
NIUserAssign	0.125	(nAgents+nSupervisors+nAdministrators) * pBatchAssignFactor/100
NIUserAssignData	0.042	(nAgents+nSupervisors+nAdministrators) * pBatchAssignFactor/100
NIUserTemplate	0.055	nTAgents+(nSupervisors+nAdministrators) * nShifts

a. Assumes the script file takes 3 kbytes of space

Computing the number of rows per table

Introduction

The previous tables can be used to compute the number of records for an individual Symposium Call Center Server table or for a group of tables. To determine the number of rows per individual table, use the number of row computations as specified in Table 2 through Table 8. For example, the number of records per day in the NIdSkillsetStat table is computed as nSkillsets * aAppl_Skill from Table 5.

Throughout the document, the notation NumberOfRecords(<table_name>) is used to specify the number of records in the appropriate Symposium Call Center Server table as specified above. For example, NumberOfRecords(NIdSkillsetStat)=nSkillsets * aAppl_Skill from Table 5.

To simplify notation, this document uses the parameter *NumberOfRecords(<group_of_tables>)* to specify the number of records for a group of tables. The number of records in a group of tables is the sum of the number of records of the individual tables. The groups of tables recognized are as follows:

- *EventTables*—described in Table 2
- *IntervalStatTables*—described in Table 3
- *TempIntervalTables*—described in Table 4
- *DailyStatTables*—described in Table 5
- *WeeklyStatTables*—described in Table 6
- *MonthlyStatTables*—described in Table 7
- *ConfigurationTables*—described in Table 8

For example, NumberOfRecords(EventTables) represents the number of records in the Symposium Call Center Server event tables generated per day and is computed in the following formula:

```
NumberOfRecords(EventTables) =
  SUMOF(
    NumberOfRecords(NIeAgentLoginStat)
    NumberOfRecords(NIeIVRPortLoginStat)
    NumberOfRecords(NIeCallByCallStatYYYYMMDD)
  )

= SUMOF(
    nAgents*(2*nIntPerShift+2)*nShifts
    4*nSkillsets
    nIVRPortEvents*nIVRPorts
    (RecsPerCall+RecsPerNWCall*pNetOut)*DailyCallRate*24
  )
```

Computing the table size

Introduction

The previous tables can be used to compute the size (in kbytes) for an individual Symposium Call Center Server table or for a group of tables. To determine the size per individual table, use the row size as specified in Table 2 through Table 8, multiplied by the appropriate number of records:

```
SizeOf(<table>) = NumberOfRecords(<table>)*<RowSize>
```

For example, the daily size of the NIdSkillsetStat is computed as NumberOfRecords(NIdSkillsetStat)*0.039 from Table 5.

Throughout the document, the notation SizeOf(<table_name>) is used to specify the size of the appropriate Symposium Call Center Server table as specified above. For example,

```
SizeOf(NIdSkillsetStat)=
  NumberOfRecords(NIdSkillsetStat)*0.039=
  nSkillsets*aAppl_Skill*0.039
```

from Table 5.

Note: The Configuration Tables and the Temporary Interval Stat Tables (Table 8 and Table 4) have the size of at least 32 kbytes. Therefore, the computations for these tables are

```
MAX(32,NumberOfRecords(<table>)*<RowSize>)
```

Note: The minimal size of all tables is 32 kbytes; however, the computations for tables other than the Configuration Tables and the Temp Interval Tables represent the size of a portion of the table (daily, weekly, monthly, and so on), and the total size for each of these tables (once the portions are added up) is very unlikely to be less than 32 kbytes.

To simplify notation, the parameter SizeOf(<group_of_tables>) is used to specify the size for a group of tables. The size of a group of tables is the sum of the sizes of the individual tables. The groups of tables recognized is the same as the ones described in “Computing the number of rows per table” on page 388.

For example, *SizeOf(EventTables)* represents the size of the Symposium Call Center Server event tables in kbytes generated per day and is computed as

```
SizeOf(EventTables)
  = SUMOF(
     SizeOf(NIeAgentLoginStat)
     SizeOf(NIeSkillsetStateStat)
     SizeOf(NIeIVRPortLoginStat)
     SizeOf(NIeCallByCallStatYYYYMMDD)
     SizeOf(NIeNetwCallByCallStatYYYYMMDD)
  )

= SUMOF(
     0.094 * NumberOfRecords(NIeAgentLoginStat)
     0.014 * NumberOfRecords(NIeSkillsetStateStat)
     0.071 * NumberOfRecords(NIeIVRPortLoginStat)
     0.141 * NumberOfRecords(NIeCallByCallStatYYYYMMDD)
     0.145 *
         NumberOfRecords(NIeNetwCallByCallStatYYYYMMDD)
  )

= SUMOF(
     0.094 * nAgents*(2*nIntPerShift+2)*nShifts
     0.014 * 0
     0.071 * nIVRPortEvents*nIVRPorts
     0.141 * RecordsPerHour*nShifts*nShiftsHrs
```

Appendix D

Symposium Call Center Server standard reports

In this appendix

Overview

Introduction

Symposium Call Center Server has a number of standard reports, known as "canned" reports, supplied as a part of the system. Table 9 shows the number of columns, the number of bytes per row, and the number of views on which each report is based. This information can be used in the computation of LAN and CPU reporting impact.

List of standard reports

Table 9 Symposium Call Center Server standard reports

Title	M1/CSE 1000			DMS/MSL-100		
	Bytes per row	Columns	Views	Bytes per row	Columns	Views
Configuration Reports						
Activity Code Properties	62	2	1	62	2	1
Agent By Supervisor Properties	305	8	1	305	8	1
Agent Properties	792	24	2	771	22	2
Agent Skillset Assignment	492	9	1	492	9	1
Agent Skillset Properties	347	9	3	315	8	3
Agent Supervisor Assignment	670	13	2	670	13	2
Application Properties	65	4	2	65	4	2
Application Script Properties	60	2	1	60	2	1
Application Template Properties	157	8	2	157	8	2
CDN Properties	120	3	1	120	3	1
Database View Definitions	91	4	1	91	4	1
DNIS Properties	66	3	1	66	3	1
Formula Properties	492	4	1	492	4	1
Historical and Real Time Statistics Properties	17	17	1	15	15	1
IVR Port Properties	N/A			110	5	1
IVR Queue and Port Properties	450	20	3	N/A		
Logged In Agent Position ID	198	8	2	166	7	1
Network Site and Application Properties	69	5	1	N/A		
Network Site and Application Properties (NCC)	69	5	1	N/A		
Network Skillset Routing Properties	67	6	3	N/A		
Network Skillset Routing Properties (NCC)	93	5	2	N/A		

Table 9 Symposium Call Center Server standard reports (continued)

Title	M1/CSE 1000			DMS/MSL-100		
	Bytes per row	Columns	Views	Bytes per row	Columns	Views
Network Table Routing Assignment (NCC)	330	8	2	N/A		
Real Time Template Properties	338	9	3	338	9	3
Route Properties	152	6	2	N/A		
Script Variable By Script	380	6	1	380	6	1
Script Variable Properties	667	9	2	667	9	2
Skillset Properties	493	18	3	490	16	3
Supervisor Properties	614	16	2	582	15	2
Telephone Display Properties	164	4	1	N/A		
User Access Privilege	380	16	1	380	16	1
Interval Historical Reports						
Activity Code by Agent	221	9	1	221	9	1
Activity Code By Application	253	10	1	253	10	1
Agent by Activity Code	253	10	1	253	10	1
Agent By Application Performance	193	9	1	189	8	1
Agent By Skillset Performance	199	11	1	195	10	1
Agent DN Performance	337	24	1	325	20	1
Agent Network/Agent NACD Activity	171	11	1	N/A		
Agent Performance	287	57	1	257	47	1
Agent Performance by Supervisor	253	10	1	387	45	1
Agent Short Calls	359	39	1	357	38	1
Agent Transferred/Conferenced Activity	205	30	1	201	29	1
Application By Activity Code	257	11	1	257	11	1
Application by Skillset	103	14	1	103	14	1
Application Call Treatment	77	17	1	77	17	1
Application Delay Before Abandon	173	69	1	173	69	1
Application Delay Before Answer	177	70	1	177	70	1

Table 9 Symposium Call Center Server standard reports (continued)

Title	M1/CSE 1000			DMS/MSL-100		
	Bytes per row	Columns	Views	Bytes per row	Columns	Views
Application Performance	61	12	1	61	12	1
CDN Statistics	57	8	1	59	9	1
DNIS Statistics	113	21	1	109	19	1
IVR Port Statistics	98	12	1	N/A		
IVR Queue Statistics	68	13	1	N/A		
Music/RAN Route Statistics	49	6	1	49	6	1
Not Ready Reason Code By Agent	223	9	1	N/A		
Route Performance	51	10	1	N/A		
Skillset by Application	103	14	1	103	14	1
Skillset Performance	99	13	1	99	13	1
Trunk Performance	65	11	1	N/A		
Daily Historical Reports						
Activity Code by Agent	216	8	1	216	8	1
Activity Code By Application	104	6	1	104	6	1
Agent Average Calls Per Hour	180	12	1	172	10	1
Agent Average Calls Per Hour Bottom 5	180	12	1	172	10	1
Agent Average Calls Per Hour Top 5	180	12	1	172	10	1
Agent by Activity Code	248	9	1	248	9	1
Agent By Application Performance	195	9	1	191	8	1
Agent By Skillset Performance	198	10	1	194	9	1
Agent DN Performance	356	23	1	340	19	1
Agent DN Performance Calls Answered Bott 5	356	23	1	340	19	1
Agent DN Performance Calls Answered Top 5	356	23	1	340	19	1
Agent Network/Agent NACD Activity	172	10	1	N/A		
Agent Performance	361	57	1	316	46	1

Table 9 Symposium Call Center Server standard reports (continued)

Title	M1/CSE 1000			DMS/MSL-100		
	Bytes per row	Columns	Views	Bytes per row	Columns	Views
Agent Performance by Supervisor	469	51	1	445	45	1
Agent Performance Calls Answered Bottom 5	461	49	1	445	45	1
Agent Performance Calls Answered Top 5	248	9	1	445	45	1
Agent Short Calls	416	38	1	412	37	1
Agent Transferred/Conferenced Activity	248	29	1	244	28	1
Application By Activity Code	252	10	1	252	10	1
Application by Skillset	107	14	1	107	14	1
Application Call Treatment	95	17	1	95	17	1
Application Delay Before Abandon	296	68	1	296	68	1
Application Delay Before Answer	298	69	1	298	69	1
Application Performance	66	11	1	66	11	1
CDN Statistics	60	7	1	64	8	1
DNIS Statistics	130	20	1	122	18	1
Estimated Revenue Per Agent	218	8	1	218	8	1
IVR Port Statistics	129	12	1	N/A		
IVR Queue Statistics	77	12	1	N/A		
Music/RAN Route Statistics	46	5	1	46	5	1
Not Ready Reason Code By Agent	218	8	1	N/A		
Route Performance	50	6	1	N/A		
Skillset by Application	107	14	1	107	14	1
Skillset Performance	98	12	1	98	12	1
Trunk Performance	71	11	1	N/A		
Weekly Historical Reports						
Activity Code by Agent	216	8	1	216	8	1
Activity Code By Application	104	6	1	104	6	1

Table 9 Symposium Call Center Server standard reports (continued)

Title	M1/CSE 1000			DMS/MSL-100		
	Bytes per row	Columns	Views	Bytes per row	Columns	Views
Agent Average Calls Per Hour	180	12	1	172	10	1
Agent Average Calls Per Hour Bottom 5	180	12	1	172	10	1
Agent Average Calls Per Hour Top 5	180	12	1	172	10	1
Agent by Activity Code	248	9	1	248	9	1
Agent By Application Performance	195	9	1	191	8	1
Agent By Skillset Performance	198	10	1	194	9	1
Agent DN Performance	356	23	1	340	19	1
Agent DN Performance Calls Answered Bott 5	356	23	1	340	19	1
Agent DN Performance Calls Answered Top 5	356	23	1	340	19	1
Agent Network/Agent NACD Activity	172	10	1	N/A		
Agent Performance	361	57	1	316	46	1
Agent Performance by Supervisor	469	51	1	445	45	1
Agent Performance Calls Answered Bottom 5	461	49	1	445	45	1
Agent Performance Calls Answered Top 5	248	9	1	445	45	1
Agent Short Calls	416	38	1	412	37	1
Agent Transferred/Conferenced Activity	248	29	1	244	28	1
Application By Activity Code	252	10	1	252	10	1
Application by Skillset	107	14	1	107	14	1
Application Call Treatment	95	17	1	95	17	1
Application Delay Before Abandon	296	68	1	296	68	1
Application Delay Before Answer	298	69	1	298	69	1
Application Performance	66	11	1	66	11	1
CDN Statistics	60	7	1	64	8	1

Table 9 Symposium Call Center Server standard reports (continued)

Title	M1/CSE 1000			DMS/MSL-100		
	Bytes per row	Columns	Views	Bytes per row	Columns	Views
DNIS Statistics	130	20	1	122	18	1
Estimated Revenue Per Agent	218	8	1	218	8	1
IVR Port Statistics	129	12	1	N/A		
IVR Queue Statistics	77	12	1	N/A		
Music/RAN Route Statistics	46	5	1	46	5	1
Not Ready Reason Code By Agent	218	8	1	N/A		
Route Performance	50	6	1	N/A		
Skillset by Application	107	14	1	107	14	1
Skillset Performance	98	12	1	98	12	1
Trunk Performance	71	11	1	N/A		
Monthly Historical Reports						
Activity Code by Agent	216	8	1	216	8	1
Activity Code By Application	104	6	1	104	6	1
Agent Average Calls Per Hour	180	12	1	172	10	1
Agent Average Calls Per Hour Bottom 5	180	12	1	172	10	1
Agent Average Calls Per Hour Top 5	180	12	1	172	10	1
Agent by Activity Code	248	9	1	248	9	1
Agent By Application Performance	195	9	1	191	8	1
Agent By Skillset Performance	198	10	1	194	9	1
Agent DN Performance	356	23	1	340	19	1
Agent DN Performance Calls Answered Bott 5	356	23	1	340	19	1
Agent DN Performance Calls Answered Top 5	356	23	1	340	19	1
Agent Network/Agent NACD Activity	172	10	1	N/A		
Agent Performance	361	57	1	316	46	1
Agent Performance by Supervisor	469	51	1	445	45	1

Table 9 Symposium Call Center Server standard reports (continued)

Title	M1/CSE 1000			DMS/MSL-100		
	Bytes per row	Columns	Views	Bytes per row	Columns	Views
Agent Performance Calls Answered Bottom 5	461	49	1	445	45	1
Agent Performance Calls Answered Top 5	248	9	1	445	45	1
Agent Short Calls	416	38	1	412	37	1
Agent Transferred/Conferenced Activity	248	29	1	244	28	1
Application By Activity Code	252	10	1	252	10	1
Application by Skillset	107	14	1	107	14	1
Application Call Treatment	95	17	1	95	17	1
Application Delay Before Abandon	296	68	1	296	68	1
Application Delay Before Answer	298	69	1	298	69	1
Application Performance	66	11	1	66	11	1
CDN Statistics	60	7	1	64	8	1
DNIS Statistics	130	20	1	122	18	1
Estimated Revenue Per Agent	218	8	1	218	8	1
IVR Port Statistics	129	12	1	N/A		
IVR Queue Statistics	77	12	1	N/A		
Music/RAN Route Statistics	46	5	1	46	5	1
Not Ready Reason Code By Agent	218	8	1	N/A		
Route Performance	50	6	1	N/A		
Skillset by Application	107	14	1	107	14	1
Skillset Performance	98	12	1	98	12	1
Trunk Performance	71	11	1	N/A		
Network Interval Historical Reports						
Network Application Performance	73	15	1	N/A		
Network DNIS Performance	117	23	1	N/A		
Network Incoming Calls	34	2	1	N/A		

Table 9 Symposium Call Center Server standard reports (continued)

Title	M1/CSE 1000			DMS/MSL-100		
	Bytes per row	Columns	Views	Bytes per row	Columns	Views
Network Outgoing Calls	105	8	1	N/A		
Network Route Performance	53	8	1	N/A		
Network Skillset Performance	135	16	1	N/A		
Network Daily Historical Reports						
Network Application Performance	80	14	1	N/A		
Network DNIS Statistics	138	22	1	N/A		
Network Incoming Calls	113	17	1	N/A		
Network Outgoing Calls	111	8	1	N/A		
Network Route Performance	54	7	1	N/A		
Network Skillset Performance	136	15	1	N/A		
Network Weekly Historical Reports						
Network Application Performance	80	14	1	N/A		
Network DNIS Performance	138	22	1	N/A		
Network Incoming Calls	113	17	1	N/A		
Network Outgoing Calls	111	8	1	N/A		
Network Route Performance	54	7	1	N/A		
Network Skillset Performance	136	15	1	N/A		
Network Monthly Historical Reports						
Network Application Performance	80	14	1	N/A		
Network DNIS Performance	138	22	1	N/A		
Network Incoming Calls	113	17	1	N/A		
Network Outgoing Calls	111	8	1	N/A		
Network Route Performance	54	7	1	N/A		
Network Skillset Performance	136	15	1	N/A		
Crosstab Reports						
Application Performance	49	7	1	49	7	1
CDN Statistics	57	8	1	57	8	1

Table 9 Symposium Call Center Server standard reports (continued)

Title	M1/CSE 1000			DMS/MSL-100		
	Bytes per row	Columns	Views	Bytes per row	Columns	Views
DNIS Statistics	77	7	1	77	7	1
Network Incoming Calls	45	6	1	N/A		
Network Outgoing Calls	45	6	1	N/A		
Route Performance	51	7	1	N/A		
Skillset Performance	85	10	1	83	9	1
Trunk Performance	53	8	1	N/A		
Other Reports						
Agent Login/Logout	220	11	1	220	11	1
Call By Call Statistics	420	12	2	420	12	2
IVR Port First Login/Last Logout	82	6	1	82	6	1
NCC Reports						
Nodal Interval Consolidated Historical Reports						
Nodal Cons Application Delay Before Abandon	173	69	1	N/A		
Nodal Cons Application Delay Before Answer	177	70	1	N/A		
Nodal Cons Application Performance	50	8	1	N/A		
Nodal Daily Consolidated Historical Reports						
Nodal Cons Application Delay Before Abandon	296	68	1	N/A		
Nodal Cons Application Delay Before Answer	298	69	1	N/A		
Nodal Cons Application Performance	62	9	1	N/A		
Nodal Weekly Consolidated Historical Reports						
Nodal Cons Application Delay Before Abandon	296	68	1	N/A		
Nodal Cons Application Delay Before Answer	298	69	1	N/A		

Table 9 Symposium Call Center Server standard reports (continued)

Title	M1/CSE 1000			DMS/MSL-100		
	Bytes per row	Columns	Views	Bytes per row	Columns	Views
Nodal Cons Application Performance	62	9	1	N/A		
Nodal Monthly Consolidated Historical Reports						
Nodal Cons Application Delay Before Abandon	296	68	1	N/A		
Nodal Cons Application Delay Before Answer	298	69	1	N/A		
Nodal Cons Application Performance	62	9	1	N/A		
Network Consolidated Interval Historical Reports						
Network Consolidated Application Performance	73	15	1	N/A		
Network Consolidated Application Performance	80	14	1	N/A		
Network Consolidated Daily Historical Reports						
Network Consolidated DNIS Statistics	117	23	1	N/A		
Network Consolidated DNIS Statistics	138	22	1	N/A		
Network Consolidated Incoming Calls	103	17	1	N/A		
Network Consolidated Incoming Calls	113	17	1	N/A		
Network Consolidated Outgoing Calls	105	8	1	N/A		
Network Consolidated Outgoing Calls	111	8	1	N/A		
Network Consolidated Route Performance	53	8	1	N/A		
Network Consolidated Route Performance	54	7	1	N/A		
Network Consolidated Skillset Performance	97	13	1	N/A		
Network Consolidated Skillset Performance	98	12	1	N/A		

Table 9 Symposium Call Center Server standard reports (continued)

Title	M1/CSE 1000			DMS/MSL-100		
	Bytes per row	Columns	Views	Bytes per row	Columns	Views
Network Consolidated Weekly Historical Reports						
Network Consolidated Application Performance	80	14	1	N/A		
Network Consolidated DNIS Statistics	138	22	1	N/A		
Network Consolidated Incoming Calls	113	17	1	N/A		
Network Consolidated Outgoing Calls	111	8	1	N/A		
Network Consolidated Route Performance	54	7	1	N/A		
Network Consolidated Skillset Performance	98	12	1	N/A		
Network Consolidated Monthly Historical Reports						
Network Consolidated Application Performance	80	14	1	N/A		
Network Consolidated DNIS Statistics	138	22	1	N/A		
Network Consolidated Incoming Calls	113	17	1	N/A		
Network Consolidated Outgoing Calls	111	8	1	N/A		
Network Consolidated Route Performance	54	7	1	N/A		
Network Consolidated Skillset Performance	98	12	1	N/A		
Other Reports						
Network Call By Call Statistics	318	13	1	N/A		

Appendix E

Ethernet delay factors versus bandwidth utilization

In this appendix

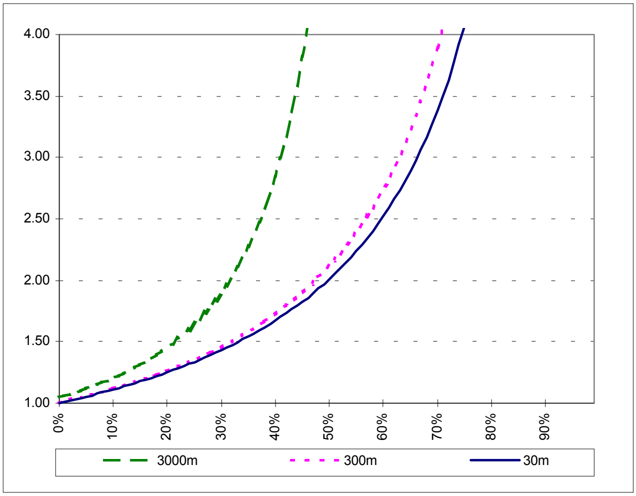
Ethernet delay factors versus utilization

Introduction

Figure 1 shows the relationship between the average delay factor and the LAN utilization for different wire lengths. For example, for a system located in a single room (wire length between components is under 30 meters), the delay factor will be 2 whenever the LAN utilization is 50 percent. That is, it takes the data packet twice as long to travel between the components as it would on an "idle" system. The delay factor X effectively reduces the LAN bandwidth by the factor of X. For example, for a delay factor of 2, the effective bandwidth of the Ethernet LAN would be 5 Mbps instead of 10 Mbps. Figure 1 shows the performance characteristics for Ethernet. Token Ring has similar performance characteristics for utilizations below 60 to 70 percent.

Plan CLAN and ELAN traffic so that the delay factor is never greater than 2. Use Figure 1 to determine the maximum allowable utilization given the distance between Symposium Call Center Server components. For example, if the distance between the Symposium Call Center Server components is expected to be 3000 meters, then the Private LAN utilization should not exceed 30 percent. If all of the Symposium Call Center Server components are placed in the same building and the wire length does not exceed 300 meters, then the maximum ELAN utilization can be as high as 45 percent. CLAN utilization is estimated based on the maximum distance between Symposium Call Center Server components as well as your own components.

Figure 1 Ethernet delay factors versus utilization percent



In the computations in this section, the total TCP/IP bandwidth, parameter *TCPIP_Bandwidth_MbitsSec*, has the value of 10.

Using the time delay factor formula

Introduction

The graphs shown in Figure 1 were produced using a formula for the average time delay factor of a packet traveling across a LAN using the CSMA/CD (better known as Ethernet) access method. The formula for average packet delay time was programmed in MathCAD (version 3.1) to produce those graphs and is given here as

$$\mathrm{Delay} = \frac{\rho \cdot \left[\frac{mb^2}{m^2} + (4e+2)a + 5a^2 + 4e(2e-1)a^2\right]}{2 \cdot (1 - \rho(1 + (2e+1) \cdot a))} + \left(1 + 2ea + \frac{a}{2}\right) - \frac{(1 - e^{-2a\rho}) \cdot \left[\left(\frac{2}{\rho} + 2 \cdot \frac{a}{e}\right) - 6a\right]}{2 \cdot [(Fpe^{-\rho a - 1} - 1) + e^{-2\rho a}]}$$

Note: The derivation of this formula can be found in *Telecommunication Networks* by Mischa Schwartz, Addison-Wesley, 1987.

Utilization ratio

The formula varies with the utilization ratio (given as *rho* in the above equation), which is a value between zero and one representing the proportion of bandwidth utilized on the Ethernet. This value changes depending on the number of client workstation nodes operating with one Ethernet LAN making transaction requests to any other node. A single utilization value is used for simplicity and is assumed to be known using a LAN traffic performance measurement.

Average packet time

The value *m* is the average packet time (that is, the average packet length in bits divided by the LAN bit signaling rate), and *e* is the value 2.7182 (natural logarithm base).

Average delay factor

The value of *Delay* above is an average delay factor that an average packet of time *m* is transacted across the LAN. For example, the value of *Delay* is 1 for no delay, such that the packet delay time is equal to the packet propagation time, and 2 if the delay time is double the packet propagation time.

Assumptions

In this formula, the following assumptions are made:

$$Fp = \frac{1}{1+\rho} \qquad mb = \sqrt{2}m \qquad a = \frac{t}{m}$$

The function *Fp* is derived from the packet size distribution. An assumption is made that the packet sizes are exponentially distributed which leads to the formulation that *Fp* varies with the bandwidth utilization as above. Here *mb* is the standard deviation of the average packet time *m* which is also in seconds. The value for *mb* above also follows from the exponential assumption.

The quantity *a* given above is a parameter, which establishes the throughput limit for CSMA/CD. This parameter has no unit and is the ratio of the maximum end-to-end propagation delay time *t* divided by the average packet time *m*, both in seconds. A value for *a* that exceeds a limit (about 0.01) implies that the packet collision resolution of CSMA/CD is becoming more difficult and will cause longer packet throughput delays particularly with small packets.

The average packet time *m* is determined as the average packet size in bits (at the hardware or 'wire' level) divided by the LAN signaling time. For example, a packet of 100 bytes would be approximately packaged at 10 bits/byte and signaled at 10 Mbps for a 10Base-T LAN with a packet time of 100 micro-seconds.

The maximum end-to-end propagation delay time *t* is determined as the maximum physical wire length of two nodes divided by the speed of light. For example, if the maximum wire length is 300 meters, the end-to-end propagation delay time is 1 micro-second.

The consequence of this LAN design choice would be that a=0.01, causing the packet throughput to be limited at a bandwidth utilization of 94 percent. This design also means that the average packet will be delayed by a factor of 2 at a bandwidth utilization of 50 percent (see Figure 2). This choice is still good, however, for longer wire lengths (up to 3000 meters) and smaller packet sizes. Beyond 3000 meters, the throughput limit with an Ethernet LAN is reduced, and longer transaction delays can be expected.

Appendix F

CPU utilization upper limits

In this appendix

Bottlenecks and reserve capacity

Upper limit for CPU utilization

Typically, 70 percent is chosen as the upper limit value for CPU utilization for the following reasons:

- minimizing the times when the CPU is the bottleneck
- ensuring that there is enough reserve CPU capacity to handle burstiness and unexpected loading

However, 50 percent utilization is used here for the following reasons:

- designer trace tools (which can take a considerable amount of CPU resources)
- ad hoc activities, such as validating large scripts, can consume a significant amount of CPU resources for an extended amount of time. Ad hoc activities include
  - activation of the master script
  - validation of a large script
  - supervisor reassignments
  - skillset reassignments
  - generation of large reports
  - extraction of large amounts of data from the database
  - simultaneous logon or logoff of a large number of agents

Defaulted calls during ad hoc activities

If you experience an unacceptable proportion of defaulted calls during the running of any ad hoc activity during a busy period (the number of calls received per hour is higher then the daily average), reschedule the activity. For example, you can reschedule the ad hoc activity to run during a period when the system is not as busy. Nortel Networks also recommends that scripts be activated one at a time during a busy period and that the activation cascading functionality (the ability to activate all scripts by just activating the master) only be used after a major upgrade.

Minimizing CPU bottlenecks

Standard queueing equation

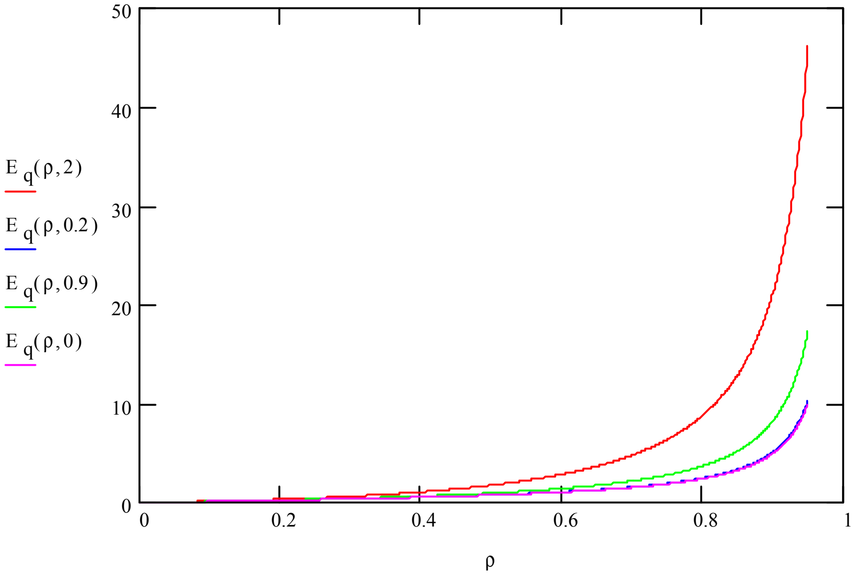
All tasks requesting CPU resources queue for service. The standard queueing equation used for determining the average number of tasks in the queue is the Khintchine and Polloczek result for the M/G/1 queue. This equation states that the expected number in the queue is a function of the server utilization and the coefficient of variation (COV) of the service time. (The COV is the ratio of the standard deviation to the mean.) More explicitly,

$$E_q(\rho, R) := \rho + \frac{\rho^2}{2\cdot(1-\rho)}\cdot\left(1+R^2\right)$$

where ρ is the server (CPU) utilization and R is the COV of the service time (CPU task time). Although in reality, tasks have different priorities, the equation still gives a good approximation to the number of tasks waiting for the CPU.

A plot of this curve for different values of R is shown in Figure 2.

Figure 2 Number of waiting tasks versus CPU utilization



As shown, there is a sharp bend in the curve at 80 to 90 percent depending on the COV. Nortel Networks recommends against operating in this part of the curve, since the system is highly sensitive to load fluctuations. A slight increase in load results in a disproportionately large increase in mean queue size, possibly resulting in buffer overflow and unacceptably long response times. It is desirable to operate in the flatter part of the curve, which is much less sensitive to load fluctuations keeping mean buffer sizes relatively constant. 70 percent is a safe upper bound for this region. However, 50 percent allows for a larger margin of safety.

Reserve capacity

As for “burstiness” and unexpected loading, a good rule of thumb is to have 25 to 30 percent of capacity in reserve.

Non-steady state activities

Introduction

A number of non-steady state processes can have a significant impact on the steady-state call processing activity of the server. This section provides restrictions and recommendations to minimize the impact of these functions on call processing.

General recommendations

Nortel Networks recommends not running two or more large non-steady state activities concurrently.

Daily, from 12:00 midnight to 12:30 a.m., HDM performs data consolidation for monthly, weekly, and daily data. CPU usage for this activity is high. Nortel Networks recommends that no non-steady state activities be run during this interval.

Non-steady state process

The major non-steady state processes and their restrictions are as follows:

- activation of the Master script
  - Do not activate the Master script during a busy period.
  - If the Master script is activated during a busy period, activate all primary and secondary scripts first.
  - If the server is not performing call processing, you can activate the Master script, and allow it to activate all primary and secondary scripts.
- validation of large scripts

  Do not validate the Master script or any large script during a busy period.
- supervisor reassignments

  The size of a supervisor reassignment has been restricted to 1000 entries. Nortel Networks recommends that multiple supervisor reassignments not be run concurrently.

- skillset reassignments

  The size of a skillset reassignment has been restricted to 1000 entries where the number of skillsets times the number of agents involved is less then 5000. Nortel Networks recommends that multiple skillset reassignments not be run concurrently.

- generation of large reports

  There are no restrictions on report generation but Nortel Networks recommends that large reports be generated one after the other, rather than concurrently.

- extraction of large amounts of data from the database

  There are no restrictions on data extraction, but Nortel Networks recommends that large data extractions be performed one after the other, rather than concurrently.

- en masse logon and logoff of agents

  There are no restrictions on agent logon/logoff, but Nortel Networks recommends that this activity be spread over a 5- to 15-minute period and not be during the peak busy hour.

- database backups

  Do not run database backups during a busy period.

- virus scans

  Do not run virus scans during a busy period.

HDX performance limitations

Maximum queue size

If the Provider application is running on a slow computer or running with other CPU-intensive applications, it may not be able to handle the HDX messages (Send Request) fast enough. As a result, a high volume of messages may become queued up in the HDX server. When the queue reaches its size limit, the HDX server terminates the Provider session. When this situation occurs, the Provider application receives a DXM_SERVER_SHUTDOWN message from the API.

As a result, the generation of a DXM_SERVER_SHUTDOWN message should be interpreted to mean either of the following:

- The session is terminated because the Provider application is too slow to respond.
- The communication is down because the HDX server is terminated.

If the message results for the first reason, either reduce the incoming Symposium Call Center Server call rate or run the Provider application alone on a faster computer.

Appendix G

Symposium Call Center Server detailed calculations

In this appendix

Overview

Introduction

This appendix supplies supplementary information required for the documentation of the detailed calculations presented throughout this document.

CSL calculations

Introduction

The Command and Status Link (CSL) facilitates communication between the Meridian 1 switch and Meridian Mail. This link is only utilized when voice services are required for a call. The bandwidth of the CSL link is 9.6 kbits/sec. The maximum utilization of CSL link is 70 percent. If all calls require voice service, the maximum CSL call rate is estimated to be 56 523 calls/hour.

CSL utilization

The following table shows the utilization of the CSL for the hybrid call complexity model:

Call Rate	CSL Utilization (%)
1000	**1.2%**
5000	**6.2%**
10 000	**12.4%**
15 000	**18.6%**
20 000	**24.8%**
25 000	**31.0%**
30 000	**37.2%**
35 000	**43.3%**

Link capacity calculation

The formulas in this section calculate CSL capacity, as well as the maximum rate of CSL-related (voice) calls supported. From the computations below, the Maximum CSL call rate is estimated to be 56 523 calls/hour.

The following table shows the variables and their values used in the CSL link calculations:

Variable	Definition	Value
CSL_Bandwidth_KBitsSec	CSL Link Bandwidth (Kbps)	9.6
CSL_Max_Utilization	CSL Link Maximum Utilization	0.7 (70%)
nGCB_Simultaneous	Average # simultaneous calls per port on GCB	See "Number and types of services per call" on page 346.

```
CSL_BW_Required_KbitsSec =
  (((PeakCallRate) / nGCB_Simultaneous) *
  CSL_Bytes_PerSession * AvgGCBCall * 8) / 1000) / 3600

CSL_Utilization =
  100% * CSL_BW_Required_KbitsSec / CSL_Bandwidth_KBitsSec

Max_CSL_Sessions_PerHour =
  (CSL_Bandwidth * CSL_Max_Utilization * 1000 * 3600) /
  (CSL_Bytes_PerSession * 8)
```

Size of CSL messages

The following table shows the high runner Command and Status Link (CSL) services (for example, setting up and taking down an IVR session), along with the total sizes of the messages associated with them. *Voice_Services* is the rate of voice services per hour. This value can be computed by determining the proportion of calls that require voice services:

CSL service	Variable name	Size (Bytes)
Setup Session	CSLSetupBytes	82
Release Session	CSLReleaseBytes	25
Total Session	CSL_Bytes_PerSession	107

Note: The sizes include the overhead of 7 bytes per message.

ACCESS link calculations

Size of messages on the ACCESS link

The following table shows ACCESS services, along with the total sizes of the messages associated with them. It is assumed that the number of digits collected is 9, the length of DN is 12 digits, and the number of voice segments played is 10. The following are parameter definitions:

- *VoiceMenuIVR* is the proportion of voice menu calls (*ACC_VoiceMenuServices*)
- *pControlledIVR* is the proportion of the regular controlled Voice calls (*ACC_ControlledServices*)

ACCESS Session Services	Size to VPS	Size from VPS	# used in controlled voice call services	# used in voice menu services
Call Setup (Voice Menu and Regular)	42	201	1	1
Play Segments	79	37	1	2
Collect Digits	7	15	0	9
Call Disconnect (Voice Menu)	27	75	0	1
ACCESS bytes per call (max[to_VPS, from_VPS])			238	485

Note: Message sizes include serial overhead. For Symposium Voice Services on CallPilot, add TCP/IP overhead of 88 bytes.

Appendix H

Symposium Call Center Server database views

In this appendix

Database views

Introduction

Symposium Call Center Server has a number of database views supplied as a part of the system. You can extract data from the database through these views. Table 10 shows the number of columns and the number of bytes per row for each view. You can use this information to help calculate the LAN and CPU reporting impact.

Table 10 Symposium Call Center Server views

View	M1/CSE 1000		DMS/MSL-100	
	Bytes per row	Columns	Bytes per row	Columns
Configuration views				
AccessRights	383	19	383	19
ActivityCode	92	3	62	2
Agent	671	23	650	21
Application	43	5	43	5
ApplicationByScript	594	10	594	10
ApplicationTemplate	92	4	92	4
ApplicationThresholdTemplate	126	6	126	6
CDN	201	5	201	5
CodeToMessageMap	114	3	114	3
DNIS	70	5	70	4
DNISThresholdTemplate	38	3	38	3
Formula	576	6	576	6
HistoricalStatCollection	18	18	16	16
HistoricalStatDuration	100	11	100	11
HistoricalStatStorage	92	4	92	4
IVRPort	198	8	198	8
IVRQueue	126	6	N/A	

Table 10 Symposium Call Center Server views (continued)

View	M1/CSE 1000		DMS/MSL-100	
	Bytes per row	Columns	Bytes per row	Columns
IVRThreholdTemplate	130	7	130	7
NCCConfig	12	3	N/A	
NCCNetworkSkillset	165	6	N/A	
NCCRanking	104	7	N/A	
NCCRemoteApplication	73	6	N/A	
NCCSite	229	7	N/A	
NetworkConfig	30	1	N/A	
NetworkRankingAssignment	349	12	N/A	
NetworkSkillsetStatus	68	5	N/A	
NetworkThresholdTemplate	122	5	N/A	
PhoneSetDisplay	164	4	N/A	
Ranking	104	7	N/A	
RealTimeColumn	124	7	124	7
RealTimeStatCollection	90	17	88	15
RealTimeTemplate	198	5	198	5
RemoteApplication	73	6	N/A	
Route	119	5	38	3
RouteThresholdTemplate	126	6	126	6
SCCSDBSpace	57	4	N/A	
ScheduledSkillsetAssignment	520	13	520	13
ScheduledSupervisorAssignment	486	11	486	11
Script	469	9	469	9
ScriptVariableProperties	477	6	477	6
ScriptVariables	380	6	380	6
Site	264	10	N/A	
Skillset	395	20	363	19
SkillsetByAgent	101	4	101	4
SkillsetByAssignment	520	13	520	13

Table 10 Symposium Call Center Server views (continued)

View	M1/CSE 1000		DMS/MSL-100	
	Bytes per row	Columns	Bytes per row	Columns
SkillsetThresholdTemplate	134	8	134	8
SummaryThresholdTemplate	126	6	126	6
Supervisor	619	16	587	15
SupervisorAgentAssignment	321	9	321	9
SupervisorByAssignment	486	11	486	11
SwitchPort	229	7	N/A	
TargetSwitchComm	76	6	N/A	
UserTemplate	126	10	120	8
UserThresholdTemplate	46	5	46	5
Views	91	4	91	4
Event Statistics Views				
eAgentLoginStat	220	11	220	11
eCallByCallStatYYYYMMDD	314	12	318	13
eIVRPortLoginStat	82	6	N/A	
eNetCallByCallStatYYYYMMDD	318	13	N/A	
Interval Statistics Views				
iActivityCodeStat	337	15	307	14
iAgentByApplicationStat	247	13	243	12
iAgentBySkillsetStat	253	15	249	14
iAgentPerformanceStat	529	72	487	60
iApplicationStat	443	174	435	171
iCDNStat	91	10	93	11
iDNISStat	167	26	147	23
iIVRPortStat	162	15	162	15
iIVRStat	108	18	108	18
iNetworkInCallStat	179	23	N/A	
iNetworkOutStat	175	21	N/A	

Table 10 Symposium Call Center Server views (continued)

View	M1/CSE 1000		DMS/MSL-100	
	Bytes per row	Columns	Bytes per row	Columns
iNetworkSkillsetStat	145	20	N/A	
iRANMusicRouteStat	83	8	83	8
iRouteStat	87	10	N/A	
iSkillsetStat	147	21	147	21
iTrunkStat	99	13	N/A	
Daily Statistics Views				
dActivityCodeStat	337	15	307	14
dAgentByApplicationStat	249	13	245	12
dAgentBySkillsetStat	257	15	253	14
dAgentPerformanceStat	603	72	555	60
dApplicationStat	739	174	727	171
dCDNStat	99	10	103	11
dDNISStat	193	26	169	23
dIVRPortStat	168	15	168	15
dIVRStat	128	18	128	18
dNetworkInCallStat	189	23	N/A	
dNetworkOutStat	181	21	N/A	
dNetworkSkillsetStat	145	20	N/A	
dRANMusicRouteStat	85	8	85	8
dRouteStat	93	10	N/A	
dSkillsetStat	161	21	161	21
dTrunkStat	105	13	N/A	
Weekly Statistics Views				
wActivityCodeStat	337	15	307	14
wAgentByApplicationStat	249	13	245	12
wAgentBySkillsetStat	257	15	253	14
wAgentPerformanceStat	603	72	555	60

Table 10 Symposium Call Center Server views (continued)

View	M1/CSE 1000		DMS/MSL-100	
	Bytes per row	Columns	Bytes per row	Columns
wApplicationStat	739	174	727	171
wCDNStat	99	10	103	11
wDNISStat	193	26	169	23
wIVRPortStat	168	15	168	15
wIVRStat	128	18	128	18
wNetworkInCallStat	189	23	N/A	
wNetworkOutStat	181	21	N/A	
wNetworkSkillsetStat	145	20	N/A	
wRANMusicRouteStat	85	8	85	8
wRouteStat	93	10	N/A	
wSkillsetStat	161	21	161	21
wTrunkStat	105	13	N/A	
Monthly Statistics Views				
mActivityCodeStat	337	15	307	14
mAgentByApplicationStat	249	13	245	12
mAgentBySkillsetStat	257	15	253	14
mAgentPerformanceStat	603	72	555	60
mApplicationStat	739	174	727	171
mCDNStat	99	10	103	11
mDNISStat	193	26	169	23
mIVRPortStat	168	15	168	15
mIVRStat	128	18	128	18
mNetworkInCallStat	189	23	N/A	
mNetworkOutStat	181	21	N/A	

Table 10 Symposium Call Center Server views (continued)

View	M1/CSE 1000		DMS/MSL-100	
	Bytes per row	Columns	Bytes per row	Columns
mNetworkSkillsetStat	145	20	N/A	
mRANMusicRouteStat	85	8	85	8
mRouteStat	93	10	N/A	
mSkillsetStat	161	21	161	21
mTrunkStat	105	13	N/A	

Appendix I

Abbreviations and acronyms

In this appendix

Abbreviations and acronyms

Abbreviation/ acronym	Expanded name
ACD	Automatic Call Distribution
AML	Application Module Link
API	Application Program Interface
BCP	Bulk Copy Procedure
CBC	Call by Call
CCS	Call Center Seconds
CDN	Controlled Directory Number
CDR	Call Detail Reporting
CED	Caller-Entered Data
CLAN	Customer Local Area Network
CPD	Calls Per Day
CPH	Calls Per Hour
CP MTBT	Mean Time Between Failures for Call Processing
CPU	Central Processing Unit
CSE	Succession Communication Server for Enterprise 1000
CSL	Command and Status Link
CSMA/CD	Carrier Sense Multiple Access/Collision Detection
CTI	Computer Telephony Interface
DAT	Digital Audio Tape

Abbreviation/ acronym	Expanded name
DMS	Digital Multiplexor Switch
DN	Directory Number
DNIS	Dialed Number Identification Service
DSP	Digital Signal Processing
DX	Data Exchange
EBC	Equivalent Basic Call
EI	Event Interface (Symposium Event Interface)
EIU	Ethernet Interface Unit
ELAN	Embedded Local Area Network
ERD	Entity Relationship Diagram
GCB	Give Controlled Broadcast
GCBC	Give Controlled Broadcast Continuous
GIVR	Give Interactive Voice Response
GOS	Grade of Service
GRTD	Graphical Real-time Display
HDC	Historical Data Collector
HDX	Host Data Exchange
ICCM	Integrated Call Center Manager
ICM	Intelligent Call Management
IP	Internet Protocol
ISDN	Integrated Services Digital Network

Abbreviation/ acronym	Expanded name
IVR	Interactive Voice Response
M1	Meridian 1
M1 IE	Meridian 1 Internet Enabled
MAC	Media Access Control
MAS	Meridian Application Server
MB	Megabyte
Mbps	Megabits per second
MHT	Mean Holding Time
MHz	Megahertz
MLINK	Meridian Link
MLS	Meridian Link Services
MLSM	Meridian Link Services Manager
MTBF	Mean Time Between Failures
MVP	Meridian Voice Processing
NACD	Network Automatic Call Distribution
NCBC	Network Call by Call
NCC	Network Control Center
NCP	Network Call Processing
NIC	Network Interface Card
NLI	Network Loop Interface
OA&M	Operation, Administration and Maintenance

Abbreviation/ acronym	Expanded name
ODBC	Open Database Connectivity
PBX	Private Branch Exchange
PD	Predictive Dialing
PP200	Pentium Pro 200
PSTN	Public Switch Telephone Network
QTNS	Queue To Network Skillset
RAM	Random Access Memory
RAN	Recorded Announcement
RAID	Redundant Array of Independent Disks
RSM	Real-time Statistical Multicast
RTD	Real-time Display
RT API	Real-time Application Program Interface
RTI	Same as RT API.
SCSI	Small Computer System Interface
SEI	Symposium Event Interface (Event Interface)
SMI	System Management Interface
SMP	System Management Platform
SQL	Structured Query Language
SVP	Symposium Voice Processing
TAPI	Telephony Application Program Interface
TCP/IP	Transmission Control Protocol/Internet Protocol

Abbreviation/ acronym	Expanded name
TN	Terminal Number
UART	Universal Asynchronous Receiver Transmittal
VPS	Voice Processing System
VSCDG	Collect Digit Voice Session
WAN	Wide Area Network

Glossary

A

accelerator key

A key on a phoneset that an agent can use to place a call quickly. When an agent presses an accelerator key, the system places the call to the configured number associated with the key. For example, if an agent presses the Emergency key, the system places a call to the agent's supervisor.

access class

A collection of access levels that defines the actions a member of the access class can perform within the system. For example, a member of the Administrator access class might be given a collection of Read/Write access levels.

access level

A level of access or permission given to a particular user for a particular application or function. For example, a user might be given View Only access to historical reports.

ACCESS link

A communication channel between Symposium Call Center Server and CallPilot or Meridian Mail.

ACCESS voice port

A voice port that is controlled by the ACCESS link.

ACD call

See Automatic call distribution call.

ACD-DN

See Automatic call distribution directory number.

ACD group

See Automatic call distribution group.

ACD routing table

See Automatic call distribution routing table.

ACD subgroup

See Automatic call distribution subgroup.

acquired resource

A resource configured on the switch that is under the control of Symposium Call Center Server. Resources must be configured with matching values on both the switch and Symposium Call Center Server.

activated script

A script that is processing calls or is ready to process calls. Before you can activate a script, you must first validate it.

activity code

A number that an agent enters on his or her phoneset during a call. Activity codes provide a way of tracking the time agents spend on various types of incoming calls. They are also known as Line of Business (LOB) codes. For example, the activity code 720 might be used to track sales calls. Agents can then enter 720 on their phonesets during sales calls, and this information can be generated in an Activity Code report.

administrator

A user who is responsible for setting up and maintaining Symposium Call Center Server.

agent

A user who is responsible for handling customer calls.

agent logon ID

A unique identification number assigned to a particular agent. The agent uses this number when logging on. The agent ID is not associated with any particular phoneset.

agent to skillset assignment

A matrix that, when you run it, sets the priority of one or more agents for a skillset. Agent to skillset assignments can be scheduled.

agent to supervisor assignment

A definition that, when you run it, assigns one or more agents to specific supervisors. Agent to supervisor assignments can be scheduled.

application

1. A logical entity that represents a Symposium Call Center Server script for reporting purposes. The Master script and each primary script have an associated application. The application has the same name as the script it represents. 2. A program that runs on a computer.

application program interface

A set of routines, protocols, and tools that programmers use to develop software applications. APIs simplify the development process by providing commonly used programming procedures.

associated supervisor

A supervisor who is available for an agent if the agent's reporting supervisor is unavailable. *See also* reporting supervisor.

Automatic call distribution

A means of automatically distributing an organization's incoming calls among a number of answering positions (ACD agents). Automatic call distribution is useful in operations where callers want a service rather than a specific person. Calls are serviced in the order they arrive and are distributed so that the workload at each answering position is approximately equal.

Automatic call distribution call

A call to an ACD-DN. ACD calls are distributed to agents in an ACD group based on the ACD routing table on the switch. *See also* Automatic call distribution directory number.

Automatic call distribution directory number

A primary or supplementary DN associated with an ACD group. Calls made to an automatic call distribution directory number are distributed to agents belonging to the group, based on the ACD routing table on the switch.

Automatic call distribution group

An entity defined on the switch for the purpose of call distribution. When a customer dials an ACD group, the call is routed to any agent who is a member of that group.

Automatic call distribution routing table

A table configured on the switch that contains a list of ACD-DNs used to define routes for incoming calls. This ensures that incoming calls not processed by Symposium Call Center Server will be queued to ACD groups and handled by available agents.

Automatic call distribution subgroup

An entity defined on the switch to assign supervisory responsibilities. Each subgroup has one supervisor phoneset and a number of agent phonesets associated with it. Agents can log on to any phoneset within their ACD subgroup. The supervisor must log on to the supervisor phoneset to monitor his or her assigned agents.

C

call age

The amount of time a call was waiting in the system before being answered by an agent.

call destination

The site to which an outgoing network call is sent. *See also* call source.

call intrinsic

A script element that stores call-related information assigned when a call enters Symposium Call Center Server. *See also* intrinsic, skillset intrinsic, time intrinsic, and traffic intrinsic.

call presentation class

A collection of preferences that determines how calls are presented to an agent. A call presentation class specifies whether a break time between calls is allowed, whether an agent can put DN calls on hold for incoming ACD calls, and whether an agent phoneset displays that the agent is reserved for a network call.

call priority

A numerical value assigned in a script that defines the relative importance of a call. If two calls are in the queue when an agent becomes available, and one call is queued with a higher priority than the other, the agent receives the higher priority call first. *See also* skillset priority.

call source

The site from which an incoming network call originates. *See also* call destination.

call treatment

A script element that enables you to provide handling to a call while it is waiting to be answered by a call center agent. For example, a caller can hear a recorded announcement or music while waiting for an agent.

call variable

A script variable that applies to a specific call. A call variable follows the call through the system and is passed from one script to another with the call. *See also* global variable, script variable.

Calling Line Identification

An optional service that identifies the telephone number of the caller. This information can then be used to route the call to the appropriate agent or skillset. The CLID can also be displayed on an agent's phoneset.

CallPilot

A multimedia messaging system you can use to manage many types of information, including voice messages, fax messages, e-mail messages, telephone calls (including conferencing), calendars, and directories.

CDN

See controlled directory number.

CLAN

See Customer local area network.

CLID

See Calling Line Identification.

client

The part of Symposium Call Center Server that runs on a personal computer or workstation and relies on the server to perform some operations. *See also* server.

command

A building block used with expressions, variables, and intrinsics to create scripts. Commands perform distinct functions, such as routing a call to a specific destination, playing music to a caller, or disconnecting a caller.

controlled directory number

A special directory number that allows calls arriving at the switch to be queued when the CDN is controlled by an application such as Symposium Call Center Server. When a call arrives at this number, the switch notifies the application and waits for routing instructions, which are performed by scripts in Symposium Call Center Server.

CSE 1000 switch

Succession Communication Server for Enterprise 1000 switch

Customer local area network

The LAN to which your corporate services and resources connect. The server in Symposium Call Center Server and client both connect to the CLAN. Third-party applications that interface with the server also connect to this LAN.

D

DBMS

Database Management System

deactivated script

A script that does not process any new calls. If a script is in use when it is deactivated, calls continue to be processed by the script until they are completed.

default activity code

The activity code that is assigned to a call if an agent does not enter an activity code manually, or when an agent presses the activity code button twice on his or her phoneset.

Each skillset has a defined default activity code.

default skillset

The skillset to which calls are queued if they have not been queued to a skillset or a specific agent by the end of a script.

desktop user

A configured user who can log on to Symposium Call Center Server from a client PC.

destination site

The site to which an outgoing network call is sent. *See also* source site.

DHCP

See dynamic host configuration protocol.

Dial-Up Networking

See Remote Access Services.

Dialed Number Identification Service

An optional service that allows Symposium Call Center Server to identify the phone number dialed by the incoming caller. An agent can receive calls from customers calling in on different DNISs and, if the DNIS is displayed on the phoneset, can prepare a response according to the DNIS.

Digital Multiplex Switch

A Nortel Networks switch for the central office market.

directory number

The number that identifies a phoneset on a switch. The directory number (DN) can be a local extension (local DN), a public network telephone number, or an automatic call distribution directory number (ACD-DN).

directory number call

A call that is presented to the DN key on an agent's phoneset.

display threshold

A threshold used in real-time displays to highlight a value below or above the normal range.

DMS

See Digital Multiplex Switch.

DN

See directory number.

DN call

See directory number call.

DNIS

See Dialed Number Identification Service.

dongle

The attachment plugged into the parallel port of a server connected to a DMS/MSL-100 switch that authenticates the serial number required at the time of server installation.

dynamic host configuration protocol

A protocol for dynamically assigning IP addresses to devices on a network.

dynamic link library

A library of executable functions or data that can be used by a Windows application. Typically, a DLL provides one or more particular functions and a program accesses the functions by creating either a static or dynamic link to the DLL. Several applications can use a DLL at the same time.

E

ELAN

See embedded local area network.

embedded local area network

A dedicated Ethernet TCP/IP LAN that connects the server in Symposium Call Center Server and the switch.

Emergency key

A key on an agent’s phoneset that, when pressed by an agent, automatically calls his or her supervisor to notify the supervisor of a problem with a caller.

event

1. An occurrence or action on Symposium Call Center Server, such as the sending or receiving of a message, the opening or closing of an application, or the reporting of an error. Some events are for information only, while others can indicate a problem. Events are categorized by severity: information, minor, major, and critical. 2. An action generated by a script command, such as queuing a call to a skillset or playing music.

expression

A building block used in scripts to test for conditions, perform calculations, or compare values within scripts. *See also* logical expression, mathematical expression, and relational expression.

F

filter timer

The length of time after the system unsuccessfully attempts to route calls to a destination site, before that site is filtered out of a routing table.

first-level threshold

The value that represents the lowest value of the normal range for a statistic in a threshold class. The system tracks how often the value for the statistic falls below this value.

G

global settings

Settings that apply to all skillsets or IVR ACD-DNs that are configured on your system.

global variable

A variable that contains values that can be used by any script on the system. You can only change the value of a global variable in the Script Variable Properties sheet. You cannot change it in a script. *See also* call variable, variable.

I

ICM

See Intelligent Call Manager.

Incalls key

The key on an agent phoneset to which incoming ACD and Symposium Call Center Server calls are presented.

Intelligent Call Manager

A high capacity call center TCP/IP interface to the switch that enables the exchange of messages between the switch and a remote host computer.

Interactive voice response

An application that allows telephone callers to interact with a host computer using prerecorded messages and prompts.

Interactive voice response ACD-DN

A directory number that routes a caller to a specific IVR application. An IVR ACD-DN must be acquired for non-integrated IVR systems.

Interactive voice response event

A voice port logon or logoff. An IVR event is pegged in the database when a call acquires or de-acquires a voice port.

Internet Protocol address

An identifier for a computer or device on a TCP/IP network. Networks use the TCP/IP protocol to route messages based on the IP address of the destination. For customers using NSBR, site IP addresses must be unique and correct. The format of an IP address is a 32-bit numeric address written as four values separated by periods. Each value can be 0 to 255. For example, 1.160.10.240 could be an IP address.

intrinsic

A word or phrase used in a script to gain access to system information about skillsets, agents, time, and call traffic that can then be used in formulas and decision-making statements. *See also* call intrinsic, skillset intrinsic, time intrinsic, and traffic intrinsic.

IP address

See Internet Protocol address.

IVR

See Interactive voice response.

IVR ACD-DN

See Interactive voice response ACD-DN.

IVR event

See Interactive voice response event.

IVR port

See voice port.

L

LAN

See Local area network.

Line of Business code

See activity code.

LOB code

See activity code.

Local area network

A computer network that spans a relatively small area. Most LANs connect workstations and personal computers and are confined to a single building or group of buildings.

local call

A call that originates at the local site. *See also* network call.

local skillset

A skillset that can be used at the local site only. *See also* network skillset, skillset.

logical expression

A symbol used in scripts to test for different conditions. Logical expressions are AND, OR, and NOT. *See also* expression*,* mathematical expression, and relational expression.

M

M1

Meridian 1 switch

M1 IE

Meridian 1 Internet Enabled switch

Management Information Base

A data structure that describes the collection of all possible objects in a network. Each managed node maintains one or more variables (objects) that describe its state. Symposium Call Center Server Management Information Bases (MIBs) contribute to the overall network MIB by

- identifying Nortel Networks/Meridian/Symposium Call Center Server nodes within the network
- identifying significant events (SNMP traps), such as alarms reporting
- specifying formats of alarms

Master script

The first script executed when a call arrives at Symposium Call Center Server. A default Master script is provided with Symposium Call Center Server, but it can be customized by an authorized user. It can be deactivated but not deleted. *See also* network script, primary script, script, secondary script.

mathematical expression

An expression used in scripts to add, subtract, multiply, and divide values. Mathematical expressions are addition (+), subtraction (-), division (/), and multiplication (*). *See also* expression, logical expression, and relational expression.

Meridian Link Services

A communications facility that provides an interface between the switch and a third-party host application.

Meridian Mail

A Nortel Networks product that provides voice messaging and other voice and fax services.

Meridian MAX
A Nortel Networks product that provides call processing based on ACD routing.

MIB
See Management Information Base.

MLS
See Meridian Link Services.

MM
See Meridian Mail.

music route
A resource installed on the switch that provides music to callers while they wait for an agent.

N

NACD call
A call that arrives at the server from a network ACD-DN.

NCC
See Network Control Center.

network call
A call that originates at another site in the network. *See also* local call.

Network Control Center
The server on a Symposium Call Center Server system where NSBR is configured and where communication between servers is managed.

network script
The script that is executed to handle error conditions for Symposium Call Center Server calls forwarded from one site to another, for customers using NSBR. The network script is a system-defined script provided with Symposium Call Center Server, but it can be customized by an authorized user. It can be deactivated but not deleted. *See also* Master script, primary script, script, secondary script.

Network Skill-Based Routing

An optional feature with Symposium Call Center Server that provides skill-based routing to multiple networked sites.

network skillset

A skillset that is common to every site on the network. Network skillsets must be created at the Network Control Center (NCC).

night mode

A skillset state in which the server does not queue incoming calls to the skillset, and in which all queued calls are given night treatment. A skillset goes into night mode automatically when the last agent logs off, or the administrator can put it into night mode manually. *See also* out-of-service mode, transition mode.

NPA

See Number Plan Area.

NSBR

See Network Skill-Based Routing.

Number Plan Area

Area code

O

object linking and embedding

A compound document standard that enables you to create objects with one application and then link or embed them in a second application.

ODBC

See Open Database Connectivity.

OEM

Original equipment manufacturer

OLE

See object linking and embedding.

Open Database Connectivity
A Microsoft-defined database application program interface (API) standard.

out-of-service mode
A skillset state in which the skillset does not take calls. A skillset is out of service if there are no agents logged on or if the supervisor puts the skillset into out-of-service mode manually. *See also* night mode, transition mode.

out-of-service skillset
A skillset that is not taking any new calls. While a skillset is out of service, incoming calls cannot be queued to the skillset. *See also* local skillset, network skillset, skillset.

P

PBX
See private branch exchange.

pegging
The action of incrementing statistical counters to track and report on system events.

pegging threshold
A threshold used to define a cut-off value for statistics, such as short call and service level. Pegging thresholds are used in reports.

PEP
See Performance Enhancement Package.

Performance Enhancement Package
A Symposium Call Center Server supplementary software application that enhances the functionality of previously released software by improving performance, adding functionality, or correcting a problem discovered since the original release.

personal directory number
A DN on which an agent can be reached directly, usually for private calls.

phoneset

The physical device, connected to the switch, to which calls are presented. Each agent and supervisor must have a phoneset.

phoneset display

The display area on an agent's phoneset where information about incoming calls can be communicated.

Position ID

A unique identifier for a phoneset, used by the switch to route calls to the phoneset. Referred to as Telephony/Port Address in Symposium Call Center Server.

primary ACD-DN

A directory number that callers can dial to reach an ACD group.

primary script

A script that is executed or referenced by the Master script. A primary script can route calls to skillsets, or it can transfer routing control to a secondary script. *See also* Master script, network script, script, secondary script.

private branch exchange

A telephone switch, typically used by a business to service its internal telephone needs. A PBX usually offers more advanced features than are generally available on the public network.

R

RAN

recorded announcement

RAN route

See recorded announcement route.

RAS

See Remote Access Services.

recorded announcement route

A resource installed on the switch that offers a recorded announcement to callers.

relational expression

An expression used in scripts to test for different conditions. Relational expressions are less than (<), greater than (>), less than or equal to (< =), greater than or equal to (> =), and not equal to (< >). *See also* expression, logical expression, mathematical expression.

Remote Access Services

A feature built into Windows NT and Windows 95 that enables users to log on to an NT-based LAN using a modem, X.25 connection, or WAN link. This feature is also known as Dial-Up Networking.

reporting supervisor

The supervisor who has primary responsibility for an agent. When an agent presses the Emergency key on the phoneset, the emergency call is presented to the agent's reporting supervisor. *See also* associated supervisor.

round robin routing table

A routing table that queues the first call to the first three sites in the routing table, then the second three sites, then the third three sites, and so on, until an agent is reserved at one of the sites. *See also* sequential routing table.

route

A group of trunks. Each trunk carries either incoming or outgoing calls to the switch. *See also* music route, RAN route.

routing table

A table that defines how calls are routed to the sites on the network. *See also* round robin routing table, sequential routing table.

S

sample script

A script that is installed with the Symposium Call Center Server client. Sample scripts are stored as text files in a special folder on the client. The contents of these scripts can be imported or copied into user scripts to create scripts for typical call center scenarios.

SCM

See Service Control Manager.

script

A set of instructions that relates to a particular type of call, caller, or set of conditions, such as time of day or day of week. *See also* Master script, network script, primary script, secondary script.

script variable

See variable.

second-level threshold

The value used in display thresholds that represents the highest value of the normal range for a given statistic. The system tracks how often the value for the statistic falls outside this value.

secondary directory number

A DN defined on the agent's phoneset as a Centrex line for incoming and outgoing non-ACD calls.

secondary script

Any script (other than a Master, network, or primary script) that is referenced from a primary script or any other secondary script. There is no pegging of statistics for actions occurring during a secondary script. *See also* Master script, network script, primary script, script.

sequential routing table

A routing table method that always queues a call to the first three active sites in the routing table. *See also* round robin routing table.

server

A computer or device on a network that manages network resources. Examples of servers include file servers, print servers, network servers, and database servers. Symposium Call Center Server is used to configure the operations of the call center. *See also* client.

service

A process that adheres to a Windows NT structure and requirements. A service provides system functionality.

Service Control Manager

A Windows NT process that manages the different services on the PC.

service level

The percentage of incoming calls answered within a configured number of seconds.

service level threshold

A parameter that defines the number of seconds within which incoming calls should be answered.

Simple Network Management Protocol

A systematic way of monitoring and managing a computer network. The SNMP model consists of four components:

- managed nodes, which are any device, such as hosts, routers, and printers, capable of communicating status to the outside world via an SNMP management process called an SNMP Agent
- management stations, which are computers running special network management software that interact with the Agents for status
- management information, which is conveyed through exact specifications and format of status specified by the MIB
- Management Protocol or SNMP, which sends messages called protocol data units (PDUs)

site

1. A system using Symposium Call Center Server that can be accessed using SMI. 2. A system using Symposium Call Center Server and participating in Network Skill-Based Routing.

skillset

A group of capabilities or knowledge required to answer a specific type of call.

See also local skillset, network skillset.

skillset intrinsic

A script element that inserts information about a skillset in a script. Skillset intrinsics return values such as skillsets, integers, and agent IDs. These values are then used in queuing commands. *See also* call intrinsic, intrinsic, time intrinsic, and traffic intrinsic.

skillset priority

An attribute of a skillset assignment that determines the order in which calls from different skillsets are presented to an agent. When an agent becomes available, calls might be waiting for several of the skillsets to which the agent belongs. The server presents the call queued for the skillset for which the agent has the highest priority.

source site

The site from which an incoming network call originates. *See also* destination site.

standby

In skillset assignments, a property that grants an agent membership in a skillset, but makes the agent inactive for that skillset.

supervisor

A user who manages a group of agents. *See also* associated supervisor and reporting supervisor.

supplementary ACD-DN

A DN associated with a primary DN. Any calls to the supplementary DN are automatically routed to the primary DN. A supplementary DN can be a toll-free (1-800) number.

switch

The hardware that receives incoming calls and routes them to their destination.

switch resource

A device that is configured on the switch. For example, a CDN is configured on the switch, and then is used as a resource with Symposium Call Center Server. *See also* acquired resource.

Symposium Call Center Server call

A call to a CDN that is controlled by Symposium Call Center Server. The call is presented to the Incalls key on an agent's phoneset.

system-defined scripts

The Master_Script and the Network_Script (if NSBR is enabled). These scripts can be customized or deactivated by a user, but cannot be deleted. These scripts are This script is the first scripts executed for every local or network call arriving at the call center.

T

target site

See destination site.

TCP/IP

See Transmission Control Protocol/Internet Protocol.

telephony

The science of translating sound into electrical signals, transmitting them, and then converting them back to sound. The term is used frequently to refer to computer hardware and software that perform functions traditionally performed by telephone equipment.

threshold

A value for a statistic at which system handling of the statistic changes.

threshold class

A set of options that specifies how statistics are treated in reports and real-time displays. *See also* display threshold, pegging threshold.

time intrinsic

A script element that stores information about system time, including time of day, day of week, and week of year. *See also* call intrinsic, intrinsic, skillset intrinsic, traffic intrinsic.

Token Ring

A PC network protocol developed by IBM. A Token Ring network is a type of computer network in which all the computers are arranged schematically in a circle.

traffic intrinsic

An intrinsic that inserts information about system-level traffic in a script. *See also* call intrinsic, intrinsic, skillset intrinsic, time intrinsic.

transition mode

A skillset state in which the server presents already queued calls to a skillset. New calls queued to the skillset are given out-of-service treatment. *See also* night mode, out-of-service mode.

Transmission Control Protocol/Internet Protocol

The communication protocol used to connect devices on the Internet. TCP/IP is the standard protocol for transmitting data over networks.

treatment

See call treatment.

trunk

A communications link between a PBX and the public central office, or between PBXs. Various trunk types provide services such as Direct Inward Dialing (DID trunks), ISDN, and Central Office connectivity.

U

user-created script

A script that is created by an authorized user on the Symposium Call Center Server system. Primary and secondary scripts are user-created scripts.

user-defined script

A script that is modified by an authorized user on the Symposium Call Center Server system.

utility

A program that performs a specific task, usually related to managing system resources. Operating systems contain a number of utilities for managing disk drives, printers, and other devices.

V

validation

The process of checking a script to ensure that all the syntax and semantics are correct. A script must be validated before it can be activated.

variable

A placeholder for values calculated within a script, such as CLID. Variables are defined in the Script Variable Properties sheet and can be used in multiple scripts to determine treatment and routing of calls entering Symposium Call Center Server. *See also* call variable, global variable.

voice port

A connection from a telephony port on the switch to a port on the IVR system.

W

WAN

See also Wide area network.

Wide area network

A computer network that spans a relatively large geographical area. Typically, a WAN consists of two or more local area networks (LANs). The largest WAN in existence is the Internet.

workload scenarios

Sets of configuration values defined for typical patterns of system operations. Five typical workload scenarios (entry, small, medium, large, and upper end) are used in the Capacity Assessment Tool for capacity analysis for Symposium Call Center Server.

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Reader Response Form

Nortel Networks Symposium Call Center Server
Product release 4.2
Planning and Engineering Guide

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