# Nortel Networks Symposium Call Center Server

Planning and Engineering Guide

Product release 4.0        Standard 1.0        November 2000

**NØRTEL NETWORKS™**

# Nortel Networks Symposium Call Center Server
## Planning and Engineering Guide

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# Publication history

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# Chapter 1

# Introduction

## In this chapter

# Overview

## Welcome

Nortel Networks is pleased to announce the 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 the 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 manage the configuration of your Symposium Call Center Server.

For information on using or administering other tools and features of the Symposium Call Center Server, refer to the appropriate document. To find out which document you need, see "Related documents" on page 20.

This chapter describes the major components of the Symposium Call Center Server architecture. Each system type—Meridian 1 and DMS/MSL-100— is illustrated in the following sections. For Meridian 1 systems with the optional Network Skill-Based Routing (NSBR) feature, the major components in a Network Control Center (NCC) setup are illustrated.

## 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*.

# Section A:   Getting started

## In this section

# Symposium Call Center Server components

## Introduction

The Symposium Call Center Server consists of three key components: telephony equipment, server, and client. The telephony component is made up of the phonesets and the Meridian 1 or DMS/MSL-100 family of switches. The server component comprises the Symposium Call Center Server and network. The client software is installed on the supervisor workstations, and accesses the server over the customer's LAN.

### Server component

The server component consists of these main elements:

- a PC-based server operating under Windows NT

- an Embedded LAN (ELAN), which connects Nortel Networks equipment: the Meridian 1 or DMS/MSL-100 switch, the Symposium Call Center Server, and an optional Administration client PC running the System Management Interface (SMI) software. 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. Symposium Call Center Server requires an Meridian 1 or a DMS/ MSL-100 switch.

- pcAnywhere on the server for remote support access

### Client component

The client component consists of customer-supplied PCs, operating under Windows 95, Windows 98, Windows NT Workstation, or Windows 2000 Professional. These client PCs are connected by the Customer LAN (CLAN).

## Meridian 1 server architecture

The major components of the Symposium Call Center Server nodal architecture when connected to a Meridian 1 switch are shown in the following illustration:
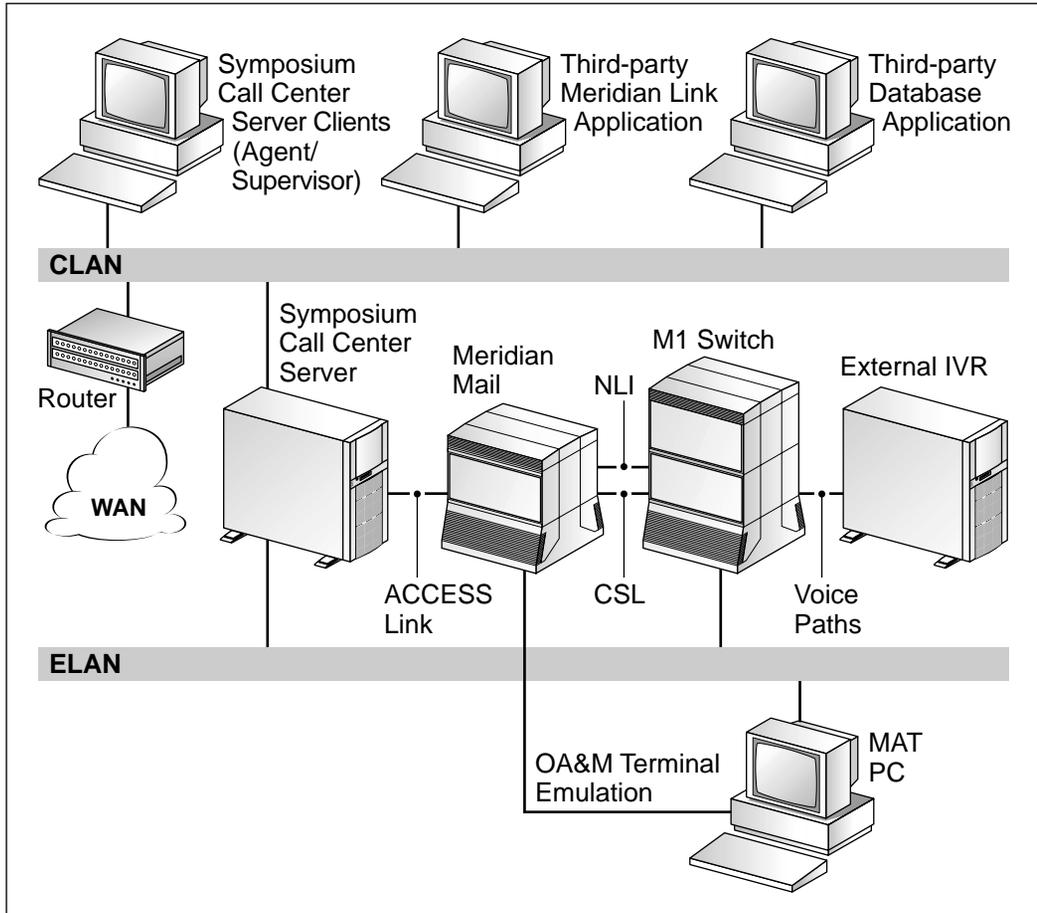


G101588

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

These components can be broken into processor-based and network-based components.

### Processor-based components

- Symposium Call Center Server and client PCs

- third-party application platforms on the Customer LAN (CLAN)

- Meridian Mail

- Meridian 1 (M1) switch

- System Management Platform (SMP)

- Operations Administration and Maintenance (OA&M) terminals

### Network-based components

- Embedded LAN (ELAN)

- Customer LAN (CLAN)

- Wide Area Network (WAN)

- Meridian Mail 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 Centre (NCC). All Symposium Call Center Servers 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:**

- In Release 4.0, the networking of calls is supported for the Meridian 1 switch only.

- If the NCC is located at the same site as a Symposium Call Center Server, Nortel Networks recommends that an IP router be used. 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:
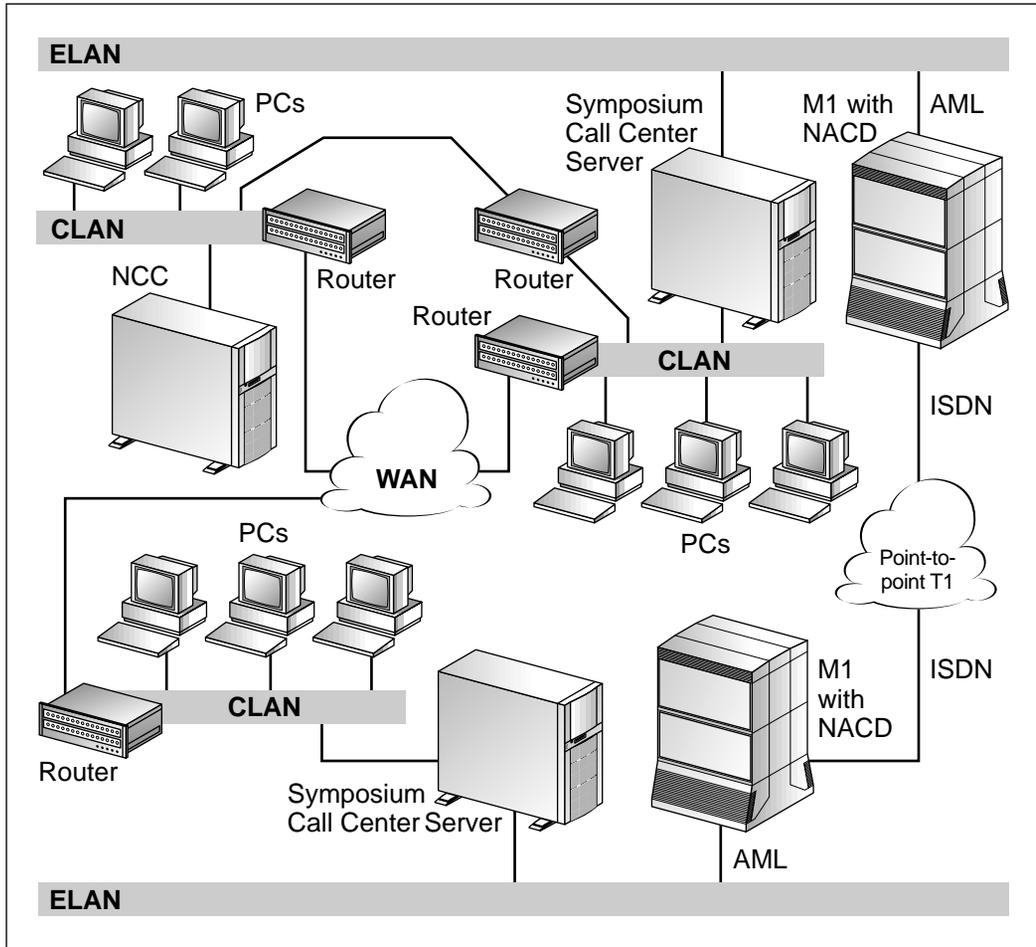


G101587

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

These components can be broken into processor-based and network-based components.

### Processor-based components

- Symposium Call Center Server and client PCs
- Meridian 1 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

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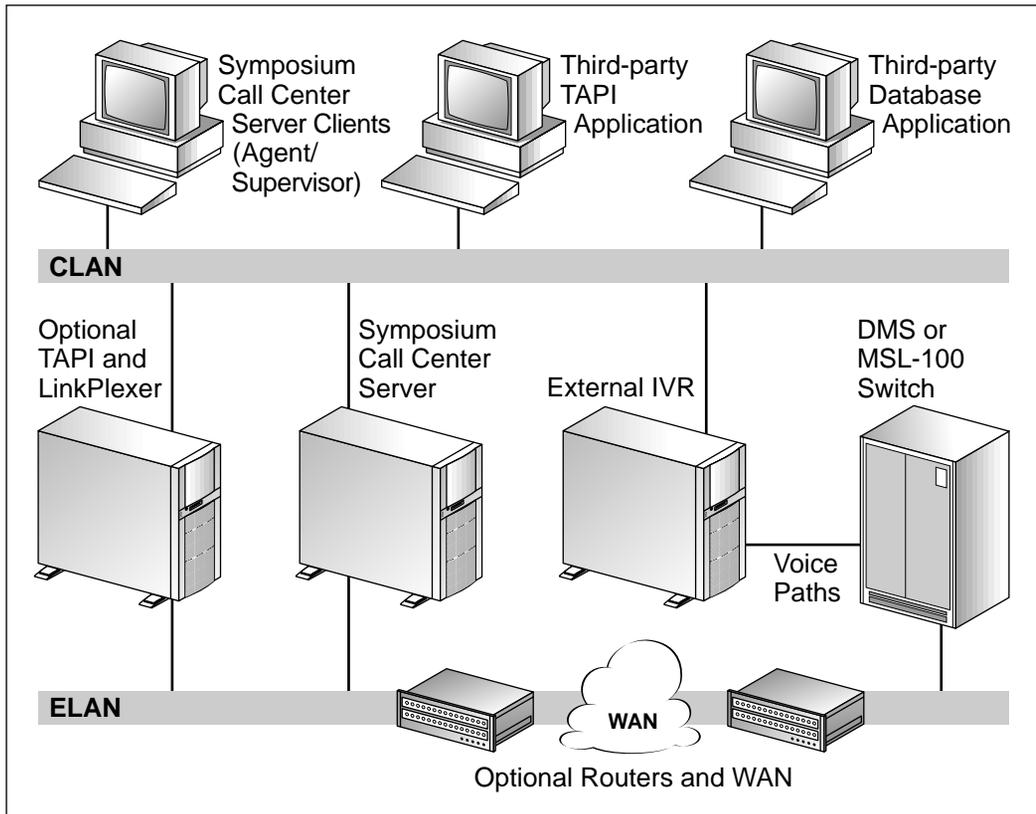


G101586

**Notes:**

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

You can break down these components into processor-based and network-based components.

### Processor-based components

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

## LinkPlexer

You can use the linkPlexer optionally with the DMS or MSL-100 switch.

## LinkPlexer system

The customer must be provided with the engineering guidelines of the LinkPlexer system to properly configure the LinkPlexer system and the DMS or MSL-100. LinkPlexer allows Symposium Call Center Server and the External IVR system to control the same DN associations on the DMS or MSL-100. The LinkPlexer system is not always required since some external IVR systems can use the MLS feature of Symposium Call Center Server. There is limited CTI support in Symposium Call Center Server Release 4.0. IVR systems requiring CTI support can only use the following commands:

■    login

■    logout

■    ready

■    not ready

■    initiate transfer

■    complete transfer

The last two commands pertain to digital transfer.

## DMS/MSL-100 External IVR fast transfer impact

If the IVR system uses the MSL 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 MSL 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 detailed formulas method

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

## Formulas method

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

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

# What's new

## Introduction

The following sections list enhancements to the Symposium Call Center Server Release 4.0 and Release 3.0, and changes to the models in this guide.

## What's new in Release 4.0

### New features in Symposium Call Center Server Release 4.0

- Real-time Statistic Multicast (RSM)

### Changes to platform requirements for Release 4.0

- Platform Vendor Independence (PVI). Only Intel processors are referenced for comparative processor capacity.

## What's new in Release 3.0

### New features in Symposium Call Center Server Release 3.0

- Network Skill-Based Routing (Meridian 1 switch only)
- Symposium Event Interface (SEI)
- DMS/MSL-100 features (such as call complexity models, external IVR, and so on)

### Changes to platform requirements for Release 3.0

- 256 Mbytes of RAM is required on all platforms.
- The size of the Windows NT swap file must be at least 268 Mbytes.
- The Standard configurations of the 701t and 702t are no longer supported.
- Network Skill-Based Routing is not supported on the 1000t platform.
- Maximum CPU utilization is 50 percent.

### Changes to switch requirements for Release 3.0

The Meridian 1 version of Symposium Call Center Server requires Meridian 1 Release 24 or 25.

### Changes to the models

The following new models have been added:

- Meridian Link Services (now includes outbound calls, transferring and conferencing via MLS, as well as other CTI applications)

- new Inbound Call Complexity parameters (for example, queue to agent)

- Outbound Call Complexity

- transferring and conferencing via phonesets

- data extraction via ODBC interface

- Graphical Real-time Display

- WAN calculations (including consolidated reporting for networking)

The following changes have been made to existing models:

- Peak call rates are used for CPU and LAN calculations (that is, call rate during the busiest hour).

- Calls per day are used for disk space calculations.

### Resource usage impact analysis

- The product has been changed for Meridian 1. As of NS030121SU06S, network call processing and Network Control Center traffic are routed over the CLAN rather than the ELAN. You no longer need routers to separate the ELANs at each site.

- Symposium Call Center Server CPU is highly correlated with the peak call rate, the number of RTD clients, screens per client, and refresh rate.

- For large sites, a 10 Mbps CLAN might not be sufficient, based on calculations from major contributors to CLAN utilization, namely RTD/RTI/GRTD, SEI, and MLS in certain scenarios (for example, outbound with predictive dialer).

- Network Control Center computations are based on network CBC data collection.

- Fewer restrictions apply to non-steady state activities (see AppendixE, "CPU utilization upper limits").

# 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 the Symposium Call Center Server:

- Symposium Call Center Server
- Meridian 1 switch
- X11
- DMS family of switches or the MSL-100 switch
- Meridian Mail

## PC experience or knowledge

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

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

## Other experience or knowledge

Other types of experience or knowledge that might be useful include

- networking
- troubleshooting

- configuring Windows NT
- queuing theory (voice port calculations)

# Related documents

## Introduction

This section lists the documents in which you can find additional information related to the 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* or *Base Configuration Guide* for your hardware platform |
| ■ installing your server software | *Nortel Networks Symposium Call Center Server Software 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 the Symposium Call Center Server and the Meridian 1 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 switch configuration | *Nortel Networks Symposium Call Center Server, M1, 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 the 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 Call Center Administrator's Guide* |
| ■ setting up real-time displays<br>■ managing reports | *Nortel Networks Symposium Call Center Server Call Center Supervisor's Guide* |
| ■ accessing the database<br>■ 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* |

## Other documents

In addition to the Symposium Call Center Server documentation, the following sets of documents are supplied with a Symposium Call Center Server system, where applicable:

- ■ Intel installation and user guide
- ■ RAID controller guide (if installed)
- ■ Ethernet and (if used) Token Ring network card guides
- ■ modem guide

**Note:** If you have obtained Crystal Reports 6.0 or 7.0 to create customized reports, you also need the Crystal Reports documentation.

# Section B:   Server hardware requirements

## In this section

# Platform Vendor Independence

## Introduction

This 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 NT Server 4.0, using Microsoft-certified drivers for all components.

The minimum requirements are as follows:

| Component | Minimum Requirement |
|---|---|
| CPU | Intel Pentium II |
| CPU Clock Speed | 300 MHz |
| RAM Memory | 256 Mbytes |
| Hard Drive Capacity | See "Disk space," on page 25 |
| Hard Drive Speed | 7200 RPM |

CPU capacity will be rated using the Intel CPU as a reference. The Symposium Call Center Server performance model makes use of the Intel iCOMP CPU processing scale. This scale has been validated in the past on the MAS hardware platforms by direct measurement. When possible, the validation of iCOMP will be performed on Hewlett-Packard (HP) hardware platforms. 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. If time and resources permit, reference measurements will be taken on other manufacturer's equipment (HP, Compaq, Dell, and IBM).

## CPU capacity

The PVI CPU capacity will be characterized by the Intel iCOMP 2.0 index value. The Intel iCOMP scale has been found to be a reliable index for CPU performance characterization as validated over Symposium Call Center Server Release 1.5 and Release 3.0. Intel has introduced a new index, iCOMP 3.0, starting with the Pentium III 450 MHz processor and above. iCOMP 2.0 values for these processors will be extrapolated from the iCOMP 3.0 so that the whole range of PVI supported platforms can be ranked under one homogeneous scale.

The minimum CPU requirement for the PVI platform has an iCOMP 2.0 index of 332, which is the rating of the PII300 MHz processor.

## Disk space

Minimum Symposium Call Center Server Disk space is 18 Gbytes. (A system with at least 10 Gbytes is required to support the Call Detail Reporting feature or the Networking feature. Minimum disk speed is 7200 RPM).

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

### Additional DB partitions
- Disk partition letters: G:-Z:
- Minimum partition size: 1 Gbyte

- All additional DB partition sizes should be on 1 Gbyte increments
- File system type: NTFS

## Reliability

It is not possible to give specific Mean Time Between Failures (MTBF) for generic hardware platform. The user will have to obtain these values from their respective hardware suppliers/manufacturers.

## Additional information

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

# Meridian Application Server platforms

## Platform types

The Symposium Call Center Server application is built upon the Meridian
Application Server (MAS) hardware platform. Five platforms in two series (700
and 1000) are used: MAS 701t, MAS 702t, MAS 1000t, MAS 1001t, and MAS
1003t. The following table lists the available server hardware configurations:

| # | Configuration | MAS base | CPU | Memory (Mbytes) | Disk (Gbytes) | Symbol | Tape | CD-ROM |
|---|---------------|----------|-----|-----------------|---------------|--------|------|--------|
| 1 | 1000t Base 256/10 | 1000t | P166 | 256 | 10 | P166/256/10 | 4/8 Gbyte DAT | 4X |
| 4 | 701t Base 256/10 | 701t | PP200 | 256 | 10 | PP200/256/10 | 4/8 Gbyte DAT | 4X |
| 5 | 701t RAID 256/10 | 701t | PP200 | 256 | 2 x 20 | PP200/256/20 | 4/8 Gbyte DAT | 4X |
| 6 | 1001t Base 256/18 | 1001t | PII300 | 256 | 18 | PII300/256/18 | 16/32 Gbyte SCSI | 24X |
| 7 | 1001t RAID 256/18 | 1001t | PII300 | 256 | 2 x 18 | PII300/256/36 | 16/32 Gbyte SCSI | 24X |
| 8 | 702t Base 256/4 | 702t | PII350 | 256 | 4 | PII350/256/4 | 4/8 Gbyte DAT | 24X |
| 9 | 702t RAID 256/4 | 702t | PII350 | 256 | 2 x 4 | PII350/256/8 | 4/8 Gbyte DAT | 24X |
| 10 | 702t Base 256/12 | 702t | PII450 | 256 | 12 | PII450/256/12 | 16/32 GB SCSI | 24X |
| 11 | 702t RAID 256/12 | 702t | PII450 | 256 | 2 x 12 | PII450/256/24 | 16/32 Gbyte SCSI | 24X |

| # | Configuration | MAS base | CPU | Memory (Mbytes) | Disk (Gbytes) | Symbol | Tape | CD-ROM |
|---|---|---|---|---|---|---|---|---|
| 12 | 702t Base 256/4 | 702t | PII450 | 256 | 4 | PII450/256/4 | 4/8 Gbyte DAT | 24X |
| 13 | 702t RAID 256/4 | 702t | PII450 | 256 | 2 x 4 | PII450/256/8 | 4/8 Gbyte DAT | 24X |
| 14 | 702t Base 256/4 | 702t | PII450 | 256 | 12 | PII450/256/4 | 16/32 Gbyte SCSI | 24X |
| 15 | 702t RAID 256/4 | 702t | PII450 | 256 | 2 x 12 | PII450/256/8 | 16/32 Gbyte SCSI | 24X |
| 16 | 1003t RAID 256/22 | 1003t | 2PIII500 | 256 | 2 x 22 | 2PIII500/256/44 | 16/32 Gbyte SCSI | 32X |

**Platforms supported for the Meridian 1 switch**

The MAS platforms supported by a stand-alone server (that is, without the NSBR feature) are the 701t and 702t (Enhanced Configuration only), 1000t, 1001t, and 1003t. The MAS platforms supported by a Symposium Call Center Server with the optional NSBR feature enabled are the 701t and 702t (Enhanced Configuration only), 1001t, and 1003t. The MAS platforms supported by the NCC are the 1001t and 1003t.

**Platforms supported for the DMS/MSL-100 switch**

Currently, the DMS/MSL-100 only supports the 702t RAID configuration with 12 Gbytes of disk space (configuration 15) and the 1003t with 22 Gbytes of disk space (configuration 16).

## Server CPU

The following table shows the processors used by the Symposium Call Center Server, and the performance of each processor relative to the Intel Pentium Pro 200:

| Processor | Platform | PP200 Relative | iComp |
|-----------|----------|----------------|-------|
| P166 (Pentium, 166 MHz) | 1000t | 1.74 | 127 |
| PP200 (Pentium Pro, 200 MHz) | 701t | 1.00 | 220 |
| PII300 (Pentium II, 300 MHz) | 1001t | 0.66 | 332 |
| PII350 (Pentium II, 350 MHz) | 702t | 0.57 | 386 |
| PII450 (Pentium II, 450 MHz) | 702t | 0.46 | 483 |
| 2PIII500 (Dual Pentium III, 500 MHz) | 1003t | 0.23 | 966 |

**Notes:**

- iComp is an industry standard for CPU rating and evaluation. The numbers in this table are based on extrapolations using the iComp2.0 Index values.
- For optimum performance, CPU utilization should not exceed 50 percent for periods of 15 to 20 minutes. CPU utilization can exceed this limit by up to 100 percent for relatively short periods.

## Server Mean Time Between Failures (MTBF) Ratings

Each Symposium Call Center Server has a different MTBF rating, which is based on the MTBF rating for each of its subcomponents. The MTBF ratings for each server configuration are given for two different scenarios: MTBF for call processing, and MTBF for any failure.

### MTBF for call processing (CP MTBF)

Only critical components that affect call processing are included. Components such as keyboards, monitors, and modems are not included.

### MTBF for any failure (Total MTBF)

All components in the platform are considered.

| # | Configuration | CP MTBF (years) | Total MTBF (years) |
|---|---------------|-----------------|--------------------|
| 1 | 1000t Base 256/10 | 1.18 | 0.65 |
| 2 | 701t Base 256/2 | 1.66 | 0.77 |
| 3 | 701 RAID 256/2 | 2.33 | 0.89 |
| 4 | 701t Base 256/10 | 1.0 | 0.59 |
| 5 | 701t RAID 256/10 | 2.33 | 0.89 |
| 6 | 1001t Base 256/18 | 0.72 | 0.48 |
| 7 | 1001t RAID 256/18 | 2.42 | 0.92 |
| 8 | 702t Base 256/4 (PII350) | 1.6 | 0.77 |
| 9 | 702t RAID 256/4 (PII350) | 2.21 | 0.88 |
| 10 | 702t Base 256/12 (PII350) | 0.98 | 0.59 |
| 11 | 702t RAID 256/12 (PII350) | 2.21 | 0.88 |
| 12 | 702t Base 256/4 (PII350) | 1.6 | 0.77 |
| 13 | 702t RAID 256/4 (PII350) | 2.21 | 0.88 |
| 14 | 702t Base 256/12 (PII450) | 0.98 | 0.59 |
| 15 | 702t RAID 256/12 (PII450) | 2.21 | 0.88 |
| 10 | 1003t RAID 256/22 | 3.57 | 1.04 |

## Paging file

Windows NT uses a process called *demand paging* to exchange data between RAM and paging files. When Windows NT Server 4.0 is installed, the Setup program creates a default virtual memory paging file, Pagefile.sys, and places this file on the boot partition on which the operating system is installed. Under these circumstances and if the *write debugging information to* option is selected from System Startup/Recovery, the page file also allows Windows NT to create a crash dump file (Memory.dmp) in the case of a catastrophic failure (should a Kernel STOP error occur).

**Note:** This is not valid for systems converting from Release 1.5 to Release 4.0, where the page file actually has to be moved off the boot partion.

For Symposium Call Center Server Release 4.0, a default swapfile size of 268 Mbytes (256 + 12, where 256 is the number of Mbytes of physical RAM) is used. After Windows NT Server 4.0 is installed, the settings for the page file should be changed accordingly. Both the minimum and maximum size should be set to 268 Mbytes. However, for a few very large configurations (in the case of some customers using the 1003t platform), this setting may not sufficient. In these cases, Nortel Networks recommends an increase of both the initial and the maximum size to 378 Mbytes.

# Chapter 2

# Using the CapTool method

## In this chapter

# Overview

## Introduction

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

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

| For | see |
| --- | --- |
| Meridian 1 systems | Chapter 3, "Meridian 1 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 | |

**Note:** During an upgrade, all of your Capacity Assessment files are retained.

### 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 Programs → Capacity Tool → Uninstaller.

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

**2** Click Yes.

**Result:** The Remove Programs from Your Computer dialog box appears. When the Uninstall is complete, the message `Uninstall successfully completed` appears at the bottom of the dialog box.

**3**    Click OK.

## To install CapTool

**1**    Insert the disk (found at the back of the *Symposium Call Center Server Planning and Engineering Guide*) containing the CapTool application into your floppy drive.

**2**    From the Windows Start menu, choose Run.

**3**    In the Open box, type **A:\Setup** (assuming your floppy drive is drive A).

**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 field.

**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.

# 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 does not specify capacity requirements of the Meridian 1 or DMS/MSL-100 switches. For such information, you must refer to the documentation that accompanies the respective switch.

## Hardware requirements

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

## 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.

## 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 the Symposium Call Center Server *only*. You must adjust your configuration to accommodate anything else that your CLAN is used for beyond the Symposium Call Center Server.

# 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 switch

### CapTool main window for the NCC

NCCMedium.dat - CapTool

File   Edit   View   Help

## Network Control Center Server R4 (M1 version)

Comment: [                                                              ]          [ Calculate ]

Required Capacity:

Networking

| | | |
|---|---|---|
| Network calls per day: | 192000 cpd | Calls actually routed in network: 80.00 % |
| Network calls during busy hour: | 16000 cph | Number of network skillsets entered per call: 2.00 |
| Number of network nodes: | 4 | Network CDR data collected at all nodes: 50.00 % |
| Calls request routing to other nodes (for all nodes): | 10.00 % | |
| Preferred platform: | Any | |

Assessment Results:

Total required CLAN bandwidth:   0.00 Mbps        Required HW config: 1001t PII300/18

Required disk space:   2.48 GB

CPU utilization:   0.17 %

NUM

## CapTool main window for a DMS/MSL-100 switch

DMSMedium.dat - CapTool

File   Edit   View   Help

# Symposium Call Center Server R4 (DMS/MSL version)

Comment: [                                                    ]   [ Calculate ]

Required Capacity:

| HDX | Call Complexity | MLS Services | Reporting/Data Extraction |
| General | Relations | Call Resources | Database | RT Display | GRTD/RT API |

The Call Center supports

| | | | |
|---|---|---|---|
| Skillsets: | 50 | Configured agents: | 500 |
| Activity codes: | 250 | Logged on agents: | 200 |
| Applications: | 10 | Logged on supervisors: | 20 |
| Scripts: | 25 | Calls during busy hour: | 4000 cph |
| Calls per day: | 48000 cpd | | |
| Preferred platform: | Any | | |

Assessment Results:

| | | | |
|---|---|---|---|
| Total required CLAN bandwidth: | 0.17 Mbps | Required disk space: | 7.69 GB |
| Total required ELAN bandwidth: | 0.03 Mbps | CPU utilization: | 11.96 % |
| Required CDNs: | 6 | Required HW config: | 1003t 2PIII500/22 |

NUM

## 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.

Symposium Call Center Server R4 (DMS/MSL version)

Comment: [                                                              ]

## 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 these property pages listed below, you enter values into the fields.

- General
- Relations
- Call Resources
- Networking (Meridian 1 only)
- Database
- Real-time Display
- GRTD/Real-time API
- HDX/Event Interface
- Call Complexity
- Voice Services (Meridian 1 only)
- MLS Services
- Reporting

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

| For | see |
| --- | --- |
| Meridian 1 systems | Chapter 3, "Meridian 1 Symposium Call Center Server and NCC requirements." |

| For | see |
|---|---|
| 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 49.

### Meridian 1 Assessment Results



### Network Control Center Assessment Results

### DMS/MSL-100 Assessment Results

| Assessment Results: | | |
|---|---|---|
| Total required CLAN bandwidth: | 0.17 Mbps | Required disk space: 7.69 GB |
| Total required ELAN bandwidth: | 0.03 Mbps | CPU utilization: 11.96 % |
| Required CDNs: | 6 | Required HW config: 1003t 2PIII500/22 |

# 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, select the type of system you want to engineer (M1 server, DMS/MSL-100 server, or NCC).
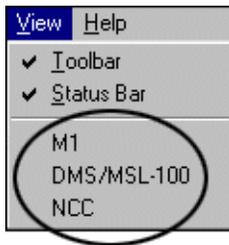


**2**   From the File menu, select New.

**3**     From the sub-menu, select a workload scenario (Entry, Small, Medium, Large, or UpperEnd).
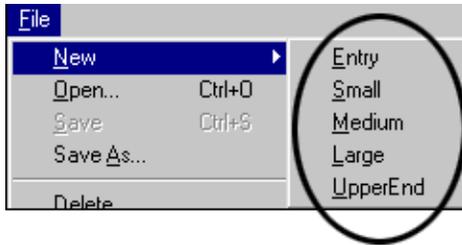


**Note:** For a detailed description of workload scenario properties, see "Workload types" on page 295.

**4**     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 3.

**5**     Choose File → Save As.

**6**     Type a file name in the File Name field.

**7**     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 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 45, or "To create a new file" on page 45).

**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 46, or "To print a file" on page 46).

**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 the Calculate button, 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 3 on page 46. For a list of these values, see "Workload types" on page 295.

# 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, 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 50.

### Assessment Results fields for Meridian 1 server analysis

### Assessment Results area for NCC analysis

| Assessment Results: | | |
|---|---|---|
| Total required CLAN bandwidth: | 0.00 Mbps | Required HW config: 1001t PII300/18 |
| Required disk space: | 2.48 GB | |
| CPU utilization: | 0.17 % | |

### Assessment Results area for DMS/MSL-100 analysis

| Assessment Results: | | |
|---|---|---|
| Total required CLAN bandwidth: | 0.17 Mbps | Required disk space: 7.69 GB |
| Total required ELAN bandwidth: | 0.03 Mbps | CPU utilization: 11.96 % |
| Required CDNs: | 6 | Required HW config: 1003t 2PIII500/22 |

## 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 Symposium Call Center Server. |
| | **Note**: The results of the Capacity Assessment Tool analysis describe the requirements of the Symposium Call Center Server *only*. You must adjust your configuration to accommodate anything else that your CLAN is used for beyond the Symposium Call Center Server. |

| Field | Description |
| --- | --- |
| Total required ELAN bandwidth (Mbps) | The total required bandwidth (expressed in megabits per second) of the Embedded LAN section connected to the Symposium Call Center Server. |
| Required disk space (Gbytes) | The disk space, expressed in Gbytes, required on the server to adequately handle all data communication requirements. |
| CPU utilization (%) | The percentage of CPU usage required to process system data communication requirements.<br><br>**Note:** This should be less than or equal to 50 percent. |
| Required ACCESS voice ports | (Meridian 1 only) The number of Meridian Mail voice ports required to be handled directly by the server using ACCESS link. |
| Required Non-ACCESS voice ports | (Meridian 1 only) The number of Meridian Mail voice ports required to be handled by the server without using 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 only) Press this button to open the WAN details window shown at the end of this table. |

To calculate the required WAN bandwidth, click Required WAN bandwidth details. Press this button to open the WAN details window. 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.

**WAN Details**                                              ? ✕

| Node name | From Node (Mbps) | To Node (Mbps) |
|-----------|------------------|----------------|
| node1 | 0.056 | 0.056 |
| node2 | 0.056 | 0.056 |
| node3 | 0.056 | 0.056 |
| NCC | 0.056 | 0.056 |

Total WAN bandwidth:  0.4480  Mbps

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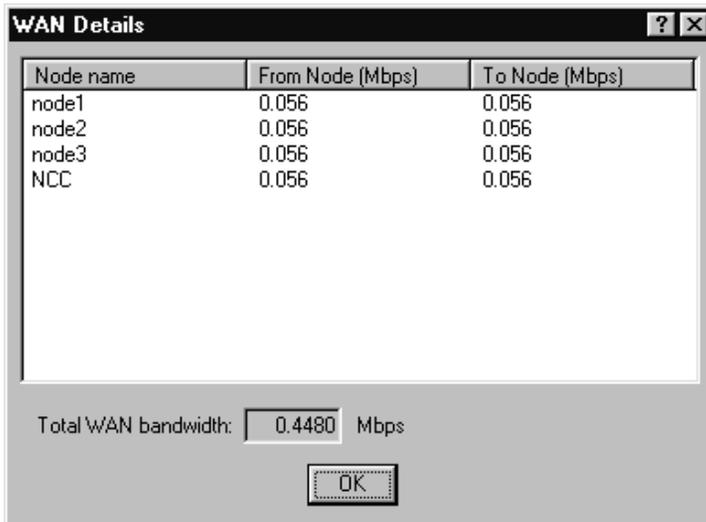
The WAN Details dialog box displays CLAN capacities and total WAN bandwidth for the NCC server in Mbps. This is the NCC bandwidth requirement.

# Chapter 3

# Meridian 1 Symposium Call Center Server and NCC requirements

## In this chapter

# Overview

## Introduction

This chapter describes the fields displayed on the property pages for a Meridian 1 Symposium Call Center Server or NCC system.

## Parameter

The Parameter column in the tables starting on page 59 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 July, BestAir plans to increase the number of agents in its call center from 450 to 550 to handle the extra calls.

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. BestAir might need to upgrade some equipment to handle the extra call traffic.

The following illustration shows the 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 number of agents logged on
- the total number of agents
- the number of supervisors logged on

The following illustration shows 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

However, the existing hardware configuration can support the additional load.

# General

## Introduction

The General 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 switch:



## General page field descriptions

| Field | Valid range | Description | Parameter |
|-------|-------------|-------------|-----------|
| Skillsets | 1–350 Default 50 | The number of skillsets defined. | nSkillsets |
| Activity codes | 0–5000 Default 250 | The number of activity codes defined. | nActCodes |
| Applications | 5–500 Default 10 | The number of primary scripts (applications) defined. | nApplications |

| Field | Valid range | Description | Parameter |
|---|---|---|---|
| Scripts | 1–1500 Default 25 | The number of scripts defined. | nScripts |
| Configured agents | 1–3000 Default 500 | The total number of agents defined. | nTAgents |
| Logged on agents | 0–1000 (dual CPU) 1–600 (other platforms) Default 200 | The maximum number of agents logged on at any one time. | nAgents |
| Logged on supervisors | 0–100 Default 20 | The number of supervisors logged on. | nSupervisors |
| Inbound calls per day (cpd) | 0–600 000 Default 48 000 | The expected average number of inbound calls per day. | 24 * DailyCallRate |
| Inbound calls during busy hour (cph) | 0–25 000 Default 4000 | The expected average number of inbound calls originating locally during a busy hour. | PeakCallRate |
| Outbound calls per day (cpd) | 0–600 000 Default 12 000 | The expected average number of outbound calls per day. | 24 * DailyOutCallRate |
| Outbound calls during busy hour (cph) | 0–25 000 Default 1 000 | The expected average number of outbound calls during a busy hour. | PeakOutCallRate |
| Preferred platform | Any | The user-selected platform that CapTool uses for the workload to make the assessment on. | Any |

# Relations

## Introduction

The Relations 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 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 Default 2 | The average number of supervisors to which an agent reports. | aSup_Agent |
| Skillsets/ Supervisor | 1–350 Default 10 | The average number of skillsets served by the supervisor's agents. | aSkill_Supv |

| Field | Valid range | Description | Parameter |
|---|---|---|---|
| Local Applications/ Local Skillset | 1–500 Default 4 | The average number of local applications per local skillset. | aAppl_Skill |
| Remote Applications/ Network Skillset | 1–500 Default 12 | The average number of remote applications per network skillset per node. | aAppl_NetSkill |
| Nodes/Network Skillset | 1–30 Default 3 | The average number of nodes per network skillset. | aNodes_NetSkill |
| Trunks/Trunk Route | 1–3000 Default 10 | The average number of trunks per trunk route. | aTrunk_Routes |
| Local Applications/ Agent in 15', Day, Week, Month | 1–500 Default 12 | The average number of 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 Default 1 | The average number of 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 Default 10 | 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 page allows you to enter information about usage of switch resources. The following illustration shows the Call Resources property page for the Meridian 1 switch:



## Call Resources field descriptions

| Field | Valid range | Description | Parameter |
|---|---|---|---|
| IVR queues | 1–150 Default 10 | The number of Interactive Voice Response (IVR) queues configured. | nIVRQ |
| IVR ports | 1–500 Default 48 | The number of Interactive Voice Response (IVR) ports configured. | nIVRPorts |
| Trunks | 1–3000 Default 300 | The number of trunks in the system. | nTrunks |

| Field | Valid range | Description | Parameter |
| --- | --- | --- | --- |
| Configured routes | 1–513 Default 128 | The number of routes configured. This number cannot exceed 513. | nRoutes |
| CDNs | 1–240 Default 15 | The number of Controlled Directory Numbers (CDNs) in the system. | nCDN |
| DNISs | 1–10 000 Default 500 | The number of Dialed Number Identification Services (DNISs) defined in the system. | nDNIS |
| DNISs used (15' interval) (%) | 0–100 Default 75 | The percentage of Dialed Number Identification Services (DNISs) used during a single data collection interval. | nDNISInterval |

# Networking (Symposium Call Center Server)

## Introduction

The Networking page allows you to input values relating to global and nodal networking parameters. This page also contains a button that allows entry of network traffic details to other nodes. The following illustrations show the Networking property page and the windows that are accessed from the button:



## Networking field descriptions

| Field | Valid range | Description | Parameters |
|---|---|---|---|
| **Global parameters** | | | |
| Network calls per day (cpd) | 0–900 000 Default 24 000 | The average number of calls coming in to the network during a day. | 24 * DailyNetwork CallRate |

| Field | Valid range | Description | Parameters |
|---|---|---|---|
| Network calls during busy hour (cph) | 0–375 000 Default 24 000 | The average number of calls coming in to the network during a busy hour. | PeakNetwork CallRate |
| 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 |
| Routing table updates interval (mins) | 1–9999 Default 10 | The frequency, in minutes, of routing table updates. | NCC_Period_ Min |
| Number of network nodes | 1–30 Default 6 | 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 Default 100 | The percentage of network Call Detail Reporting (CDR) data that is collected at all nodes in the network. | pCBCNetwork |
| Number of network skillsets | 0–50 Default 50 | 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. | aQTNSPerNetw Call |

| Field | Valid range | Description | Parameters |
|---|---|---|---|
| **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 |
| 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 Default 17 | The percentage of calls 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 ... | Button | Press this button to enter the traffic from this node to other nodes in the network. The traffic is assumed to be distributed equally by default. | |
| Nodal Mode Network Mode | Button | Press this button to reset parameters to zero for nodal statistics or the system defaults for network statistics. **Note:** The button label will display either Nodal mode or Network mode depending on which statistics are currently displayed. | |

When you press Traffic details to other nodes, the Traffic details window appears. This window lists all the nodes on the network. Highlight a node and click Modify to adjust traffic values for that node.
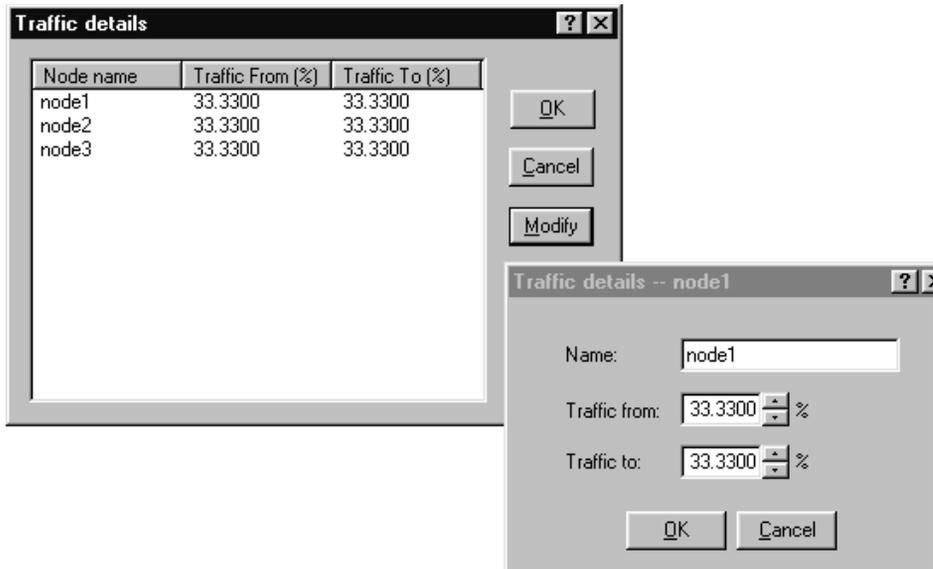
To enter values in this screen, click the Modify button. The Traffic details input dialog box appears, allowing you to adjust values in the Traffic from and Traffic to areas relating to the specified node. For example, in the above illustration, node 1 is highlighted in the Traffic details window. When you click Modify, a dialog box for node 1 appears. In this dialog box, you can click the thumbwheels to increase or decrease values, or you can enter a new value into the field.

## Description of Traffic details fields

| 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 |

# Networking (NCC)

## Introduction

The Networking page for 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) | 0–375 000 Default 24 000 | The average number of calls entering the network during a busy hour. | PeakNetwork CallRate |

| Field | Valid range | Description | Parameters |
|-------|-------------|-------------|------------|
| 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 |
| 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 | 0–50 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 page allows you to input values used in calculating database storage requirements. The following illustration shows the Database property page for the Meridian 1 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 |

| Field | Valid range | Description | Parameter |
|---|---|---|---|
| Historical weekly data (weeks) | 1–999 Default 26 | The number of weeks that historical weekly statistics are stored. | nWWeek |
| 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 |

# Real-time Display

## Introduction

The Real-time Display page allows you to define resource requirements for real-time display screens. The following illustration shows the Real-time Display property page for the Meridian 1 switch:



## Real-time Display field descriptions

| Field | Valid range | Description | Parameter |
|---|---|---|---|
| Agent | 0–3000 Default 10 | The number of rows displayed on each agent Real-time Display (RTD) screen. | nRTDAgRows |
| Application | 0–5000 Default 10 | The number of rows displayed on each application Real-time Display (RTD) screen. | nRTDAppRows |
| Call Center | 0–1 Default 1 | The number of rows displayed on the Call Center RTD screen. | nRTDCCRows |

| Field | Valid range | Description | Parameter |
|---|---|---|---|
| Skillset | 0–350 Default 10 | The number of rows displayed on each skillset RTD screen. | 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 (other than Agent display). | RTDScrUpdate Intvl |
| RSM Enable | Check (Yes)/ Unchecked (No) | Check this box to generate real-time statistics. This option is checked by default. | |
| RSM Details | Button | Press this button to choose the real-time statistics on which you want to collect information. | |

# GRTD/Real-time API

## Introduction

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



## GRTD/Real-time API field descriptions

| Field | Valid range | Description | Parameters |
|---|---|---|---|
| Agent (rows of GRTD/RT API stats) | 0–3000 Default 200 | The number of rows in the Agent GRTD and RT API statistics. **Note**: Row values are the same for GRTD and RT API sections. | nGRTDAgRows/ nRTIAgRows |

| Field | Valid range | Description | Parameters |
|---|---|---|---|
| Application (rows of GRTD/RT API stats) | 0–500 Default 10 | The number of rows in the GRTD and RT API Application statistics.<br><br>**Note**: Row values are the same for GRTD and RT API sections. | nGRTDApp Rows/<br>nRTIAppRows |
| Call Center (rows of GRTD/RT API stats) | 0–1 Default 1 | The number of rows in the GRTD and RT API Call Center statistics.<br><br>**Note**: Row values are the same for GRTD and RT API sections. | nGRTDCCRows/<br>nRTICCRows |
| Skillset (rows of GRTD/RT API stats) | 0–350 Default 50 | The number of rows in the GRTD and RT API Skillset statistics.<br><br>**Note**: Row values are the same for GRTD and RT API sections. | nGRTDSkill Rows/<br>nRTISkillRows |
| IVR (rows of RT API stats) | 0–96 Default 10 | The number of rows in the RT API Interactive Voice Response (IVR) statistics. | nRTIIVRRows |
| Route (rows of RT API stats) | 0–530 Default 128 | The number of rows in the RT API Route statistics. | 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 page allows you to define resource requirements for the Host Data Exchange and Symposium Event Interface (SEI) interfaces. The following illustration shows the HDX/SEI property page for the Meridian 1 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 |
| 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 |

| Field | Valid range | Description | Parameter |
|---|---|---|---|
| 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 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 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 switch:

**Symposium Call Center Server R4 (M1 version)**

Comment: [                                                    ]                [Calculate]

Required Capacity:

| General | Relations | Call Resources | Networking | Database | RT Display | GRTD/RT API |
|---|---|---|---|---|---|---|
| HDX/SEI | Call Complexity | Voice Services | MLS Services | Reporting/Data Extraction | | |

Treatments per Inbound call:

| | | | | | |
|---|---|---|---|---|---|
| Skillsets queued: | 2.00 | Give RAN: | 1.00 | Controlled Broadcasts in Continuous: | 0.00 |
| Network skillsets queued: | 0.00 | Give Music: | 0.00 | HDX Send Info: | 0.00 |
| Agents queued: | 0.00 | If Then Else: | 2.00 | HDX Request/Get Response: | 0.00 |
| Collect Digits: | 0.00 | Intrinsic References: | 3.00 | Call transferred: | 0.00 % |
| Give IVR: | 1.00 | Controlled Broadcasts (Start/Stop): | 0.00 | Calls conferenced: | 0.00 % |

Treatments per Outbound call:

| | | | |
|---|---|---|---|
| Call transferred: | 0.00 % | Attempts per successful outbound call: | 4.00 |
| Calls conferenced: | 0.00 % | Unsuccessful calls not establishing a connection: | 100.00 % |

## 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 0 | The average number of network skillsets entered by an inbound call. | aQTNSPerNetw Call |

| Field | Valid range | Description | Parameter |
|-------|-------------|-------------|-----------|
| Agents queued | 0–99 Default 0 | The average number of agent queues entered by an inbound call. | aQTAPerCall |
| 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 1 | The average number of Give Recorded Announcement (RAN) instances per inbound call. | aGRANPerCall |
| Give Music | 0–99 Default 0 | The average number of Give Music sessions per inbound call. | aGMUSPerCall |
| If Then Else | 0–99 Default 2 | The average number of "If Then Else" call treatments per inbound call. | aIFTHPerCall |
| Intrinsic References | 0–99 Default 3 | The average number of references to intrinsics per inbound call. | aINTRPerCall |
| Controlled Broadcasts (Start/Stop) | 0–99 Default 0 | 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 0 | The average number of Host Data Exchange (HDX) Send Info treatments per inbound call. | aHDXSIPerCall |
| HDX Request/ Get Response | 0–99 Default 0 | The average number of HDX Request/ Get Response treatments per inbound call. | aHDXRGPerCall |

| Field | Valid range | Description | Parameter |
|---|---|---|---|
| Call transferred (%) | 0–100 Default 0 | The percentage of inbound calls that are transferred to another agent or CDN. | pTransferIn |
| Calls conferenced (%) | 0–100 Default 0 | The percentage of inbound 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.<br>**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). | pUCallsNCon |

# Voice Services

## Introduction

The Voice Services 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 switch:

```
Symposium Call Center Server R4 (M1 version)

Comment: [                                                    ]        [ Calculate ]

Required Capacity:

[ General ] [ Relations ] [ Call Resources ] [ Networking ] [ Database ] [ RT Display ] [ GRTD/RT API ]
[ HDX/SEI ] [ Call Complexity ] [ Voice Services ] [ MLS Services ] [ Reporting/Data Extraction ]

─ Give Control Broadcast (Start/Stop) ──────────────────────────────
   Expected duration of announcement:                        [ 45 ]  seconds
   Number of distinct announcements active simultaneously:   [  2 ]
   Wait timer value:                                         [ 10 ]  seconds

─ Give Control Broadcast (Continuous) ──────────────────────────────
   Expected duration of announcement:                        [ 45 ]  seconds
   Number of distinct announcements active simultaneously:   [  2 ]

Expected duration of a Collect Digits voice session:         [ 45 ]  seconds
Expected duration of the Give IVR treatment:                 [ 45 ]  seconds
```

## 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 |

| Field | Valid range | Description | Parameter |
|-------|-------------|-------------|-----------|
| 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 |
| 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 |

# MLS Services

## Introduction

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



## MLS field descriptions

| Field | Valid range | Description | Parameter |
|---|---|---|---|
| **Number of MLS messages per** | | | |
| Call transfer | 1–99 calls Default 11 | The average number of MLS messages per call transfer. | aMMSGPerTx |
| Call conference | 1–99 calls Default 11 | The average number of MLS messages per call conference. | aMMSGPerConf |

| Field | Valid range | Description | Parameter |
|---|---|---|---|
| Inbound call (excluding screen pops) | 0–99 calls Default 0 | The average number of MLS messages per inbound call, excluding screen pops. | aMMSGPerCall |
| Outbound call | 0–99 calls Default 14 | The average number of MLS messages per outbound call, including screen pops. | aMMSGPerOut Call |
| Unsuccessful call | 0–99 Default 0 | 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 |
| MLS message size | 1–999 Default 30 | The average size of MLS messages in bytes. This figure does not include overhead. | aMMSG_Size |
| Trans. calls completed using MLS (of all transferred calls) | 0–100 Default 0 | 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 Default 0 | The proportion of conferenced calls completed by an MLS application such as Symposium Agent. | pConf_MLS |

# Reporting/Data Extraction

## Introduction

The Reporting 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. |
| Local/Remote | Local/ Remote | **Note:** 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 if 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 report type that you want to add (Reporting or Data Extraction).

**2**    Click Add Local.

    **Result:** The Local Reporting 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 window appears.
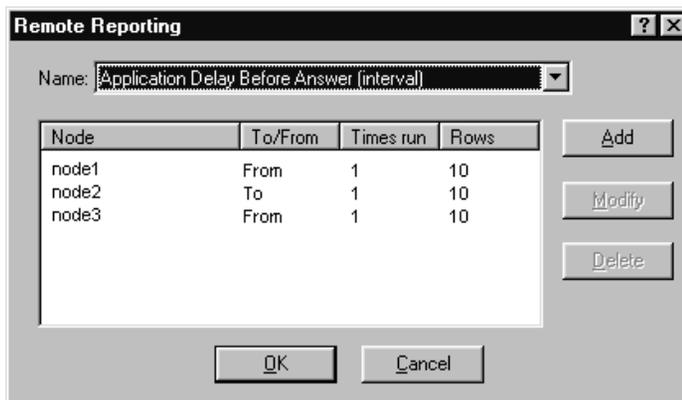


3   Select a view from the Name drop-down list.

4   Click the Node column label.

**5**   Click Add.

   **Result:** The Remote Reporting details dialog box appears.

```
┌─────────────────────────────────────────────────┐
│ Remote Reporting details                  ? X   │
├─────────────────────────────────────────────────┤
│  Nodes:              [node1              ▼]      │
│                                                  │
│  ⦿ To this node        ○ From this node          │
│                                                  │
│  Rows:                        [        0 ▲▼]     │
│                                                  │
│  Times run during reporting period: [  0 ▲▼]     │
│                                                  │
│           [   OK   ]      [  Cancel  ]           │
└─────────────────────────────────────────────────┘
```
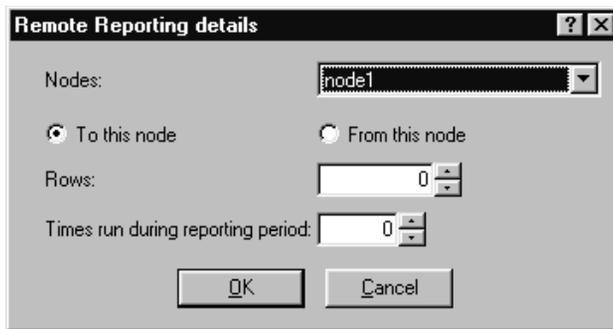
**6**   In the Nodes box, select the server on which the report is to be generated or from which the data is to be extracted.

**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 94.) 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.
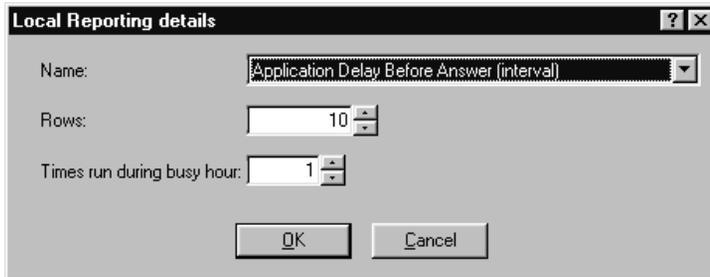
| Local Reporting details | ? X |
| --- | --- |
| Name: | Application Delay Before Answer (interval) ▼ |
| Rows: | 10 ⬍ |
| Times run during busy hour: | 1 ⬍ |
| | OK    Cancel |

**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 window or Remote View/Data Extraction
   details dialog box appears.
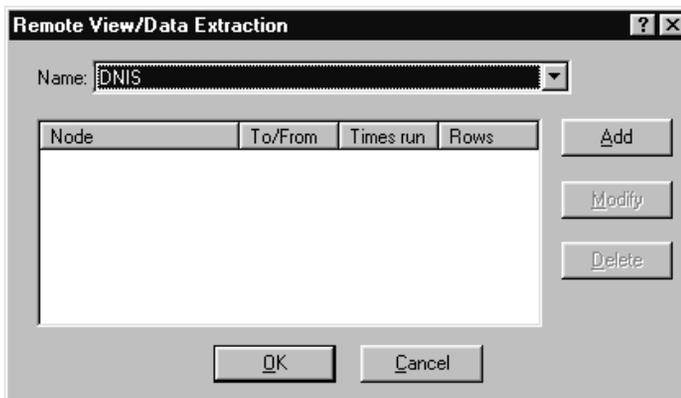
| Remote View/Data Extraction | | | | ? X |
| --- | --- | --- | --- | --- |
| Name: DNIS ▼ | | | | |
| Node | To/From | Times run | Rows | Add |
| | | | | Modify |
| | | | | Delete |
| | OK    Cancel | | | |

**3** To add a node, follow these steps:

    **a.** Click Add.

        **Result:** The Remote Reporting details dialog box appears.
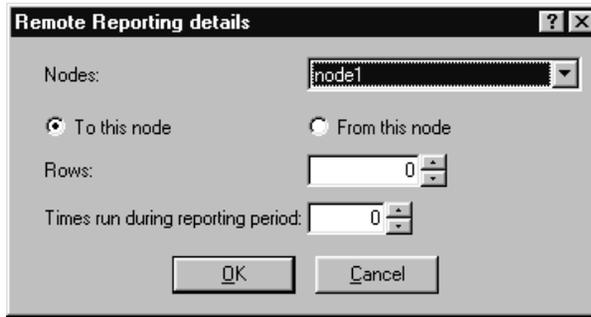


    **b.** In the Nodes box, select the server on which the report is to be generated or from which the data is to be extracted.

    **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 94.) 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 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.
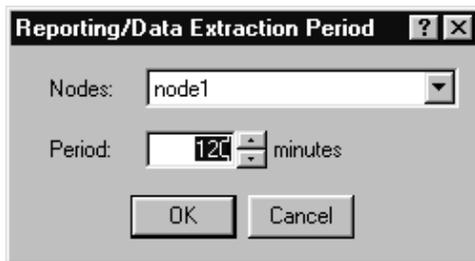


**2**   In the Node box, select the node for which you want to define the data extraction period.

**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 system.

## Parameter

The Parameter column in the tables starting on page 101 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 July, BestAir plans to increase the number of agents in its call center from 450 to 550 to handle the extra calls.

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. BestAir might need to upgrade some equipment to handle the extra call traffic.

The following illustration shows the 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 number of agents logged on
- the total number of agents
- the number of supervisors logged on

The following illustration shows 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

However, the existing hardware configuration can support the additional load.

# General

## Introduction

The General 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 Default 50 | The number of skillsets defined. | nSkillsets |
| Activity codes | 0–1000 Default 250 | The number of activity codes defined. | nActCodes |

| Field | Valid range | Description | Parameter |
|---|---|---|---|
| Applications | 5–500 Default 10 | The number of primary scripts (applications) defined. | nApplications |
| Scripts | 1–1500 Default 25 | The number of scripts defined. | nScripts |
| Configured agents | 1–3000 Default 500 | The total number of agents defined. | nTAgents |
| Logged on agents | 0–1000 (dual CPU) 1–600 (other platforms) Default 200 | The maximum number of agents logged on at any one time. | nAgents |
| Logged on supervisors | 0–100 Default 20 | The number of supervisors logged on. | nSupervisors |
| Calls per day (cpd) | 0–600 000 Default 48 000 | The expected average number of inbound calls per day. | 0–600 000 Default 48 000 |
| Calls during busy hour | 0–25 000 Default 4000 | The expected average number of inbound calls originating locally during a busy hour. | PeakCallRate |
| Preferred platform | Any | The user-selected platform that CapTool uses for the workload to make the assessment on. | Any |

# Relations

## Introduction

The Relations 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 Default 2 | The average number of supervisors to which an agent reports. | aSup_Agent |
| Skillsets/ Supervisor | 1–350 Default 10 | The average number of skillsets served by the supervisor's agents. | aSkill_Supv |

---

| Field | Valid range | Description | Parameter |
|---|---|---|---|
| Local Applications/ Local Skillset | 1–500 Default 4 | The average number of local applications per local skillset. | aAppl_Skill |
| Local Applications/ Agent in 15', Day, Week, Month | 1–500 Default 12 | The average number of 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 Default 1 | The average number of 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 Default 10 | 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 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 Default 48 | The number of IVR ports configured. | nIVRPorts |
| CDNs | 1–240 Default 15 | The number of CDNs in the system. | nCDN |
| DNISs | 1–10 000 Default 500 | The number of DNISs defined in the system. | nDNIS |

| Field | Valid range | Description | Parameter |
|-------|-------------|-------------|-----------|
| DNISs used (15' interval) (%) | 0–100 Default 75 | The percentage of DNISs used during a single data collection interval. | nDNISInterval |

# Database

## Introduction

The Database 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 | 1–999 Default 21 | The number of days that historical interval statistics are stored. | nDInterval |
| Historical daily data | 1–999 Default 31 | The number of days that historical daily statistics are stored. | nDDay |
| Historical weekly data | 1–999 Default 26 | The number of weeks that historical weekly statistics are stored. | nWWeek |

| Field | Valid range | Description | Parameter |
|---|---|---|---|
| Historical monthly data | 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 | 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 | 1–999 Default 3 | The number of days that Agent Event statistics are stored. | nDAgentStat |
| IVR statistics | 1–999 Default 3 | The number of days that IVR Event statistics are stored. | nDIVRStat |

# Real-time Display

## Introduction

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



## Real-time Display field descriptions

| Field | Valid range | Description | Parameter |
|-------|-------------|-------------|-----------|
| Agent | 0–3000 Default 10 | The number of rows displayed on each agent Real-time Display (RTD) screen. | nRTDAgRows |
| Application | 0–5000 Default 10 | The number of rows displayed on each application RTD screen. | nRTDAppRows |
| Call Center | 0–1 Default 1 | The number of rows displayed on the Call Center RTD screen. | nRTDCCRows |

| Field | Valid range | Description | Parameter |
|-------|-------------|-------------|-----------|
| Skillset | 0–350 Default 10 | The number of rows displayed on each skillset RTD screen. | 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 (other than Agent display). | RTDScrUpdate Intvl |
| RSM Enable | Check (Yes)/ Unchecked (No) | Check this box to generate real-time statistics. This option is checked by default. | |
| RSM Details | Button | Press this button to choose the real-time statistics on which you want to collect information. | |

# GRTD/Real-time API

## Introduction

The GRTD/Real-time API page allows you to define resource requirements for graphical real-time display (GRTD) and the real-time application program interface (API). The following illustration shows the GRTD/Real-time 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) | 0–3000 Default 200 | The number of rows in the Agent GRTD and RT API statistics.<br><br>**Note**: Row values are the same for GRTD and RT API sections. | nGRTDAgRows/ nRTIAgRows |

| Field | Valid range | Description | Parameters |
|---|---|---|---|
| Application (rows of GRTD/RT API stats) | 0–500 Default 10 | The number of rows in the GRTD and RT API Application statistics. **Note**: Row values are the same for GRTD and RT API sections. | nGRTDApp Rows/ nRTIAppRows |
| Call Center (rows of GRTD/RT API stats) | 0–1 Default 1 | The number of rows in the GRTD and RT API Call Center statistics. **Note**: Row values are the same for GRTD and RT API sections. | nGRTDCCRows/ nRTICCRows |
| Skillset (rows of GRTD/RT API stats) | 0–350 Default 50 | The number of rows in the GRTD and RT API Skillset statistics. **Note**: Row values are the same for GRTD and RT API sections. | 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 page allows you to define resource requirements for the Host Data Exchange 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 |
| 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 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<br><br>Default 2.2 | The average number of skillsets entered by an inbound call. | aQTSPerCall |
| Agents queued | 0–99<br><br>Default 0.1 | The average number of agent queues entered by an inbound call. | aQTAPerCall |

| Field | Valid range | Description | Parameter |
|---|---|---|---|
| Give RAN | 0–99<br><br>Default 0.5 | The average number of Give Recorded Announcement (RAN) instances per inbound call. | aGRANPerCall |
| Give Music | 0–99<br>Default 1.5 | The average number of Give Music sessions per inbound call. | aGMUSPerCall |
| If Then Else | 0–99<br>Default 4 | The average number of "If Then Else" call treatments per inbound call. | aIFTHPerCall |
| External IVR used | None<br><br>CLAN (Default)<br><br>ELAN | A drop-down menu that indicates if the external IVR system (if present) is connected to the CLAN or the ELAN. If None appears, then that means no IVR is present. | |
| Intrinsic References | 0–99<br>Default 5 | The average number of references to intrinsics per inbound call. | aINTRPerCall |
| HDX Send Info | 0–99<br><br>Default 1 | The average number of Host Data Exchange (HDX) Send Info treatments per inbound call. | aHDXSIPerCall |
| HDX Request/ Get Response | 0–99<br>Default 0 | The average number of HDX Request/ Get Response treatments per inbound call. | aHDXRGPerCall |
| Call transferred (%) | 0–100<br><br>Default 10 | The percentage of inbound calls that are transferred to another agent or CDN. | pTransferIn |
| Calls Conferenced (%) | 0–100<br><br>Default 15 | The percentage of inbound calls that are conferenced with another agent or with a supervisor. | pConferencedIn |

# MLS Services

## Introduction

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



## MLS field descriptions

| Field | Valid range | Description | Parameter |
|-------|-------------|-------------|-----------|
| **Number of MLS messages per** | | | |
| Call transfer | 1–99 calls Default 11 | The average number of MLS messages per call transfer. | aMMSGPerTx |
| Call conference | 1–99 calls Default 11 | The average number of MLS messages per call conference. | aMMSGPerConf |

| Field | Valid range | Description | Parameter |
|---|---|---|---|
| Inbound call (excluding screen pops) | 0–99 calls Default 0 | The average number of MLS messages per inbound call, excluding screen pops. | aMMSGPerCall |
| 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 Default 0 | 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 Default 0 | The proportion of conferenced calls completed by an MLS application such as Symposium Agent. | pConf_MLS |
| MLS message size | 1–999 Default 30 | The average size of MLS messages in bytes. This figure does not include overhead. | aMMSG_Size |

# Reporting/Data Extraction

## Introduction

The Reporting 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 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. |
| | | **Note:** In this release, only local reporting is available. |
| **Data Extraction** | | |
| Name | Text | The name of the view from which data is to be extracted. |
| Local/Remote | Local/ Remote | Shows if 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 report type that you want to add (Reporting or Data Extraction).

**2** Click Add Local.

**Result:** The Local reporting 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.
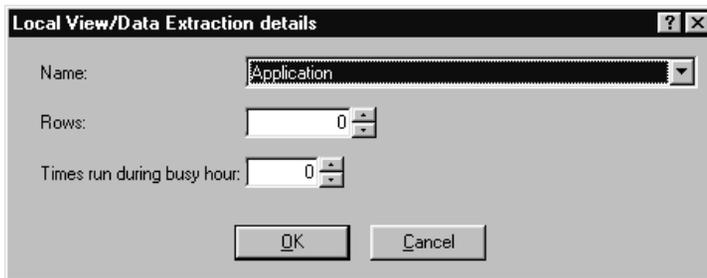


**3**    Make the desired changes.

**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

## Meridian 1 switch

| Step | |
|------|---|
| Record your workload parameters. See page 126. | |
| Determine the expected call rate for networking. See page 145. | |
| Calculate server disk utilization. See page 151. | |
| Calculate server CPU utilization. See page 158. | |
| Calculate ELAN utilization. See page 179. | |
| Calculate CLAN utilization. See page 202. | |
| Calculate online backup elapsed time. See page 240. | |
| Calculate WAN utilization. See page 227. | |
| If you are using Meridian Mail, determine the number of Meridian Mail voice ports required. Refer to Chapter 7, "Planning Meridian Mail requirements (Meridian 1 only)." | |
| If you have purchased the optional Network Skill-Based Routing feature, engineer the NCC. Refer to Chapter 6, "Engineering the NCC server." | |

## DMS/MSL-100 switch

| Step | |
|---|---|
| Record your workload parameters. See page 126. | |
| Calculate server disk utilization. See page 151. | |
| Calculate server CPU utilization. See page 158. | |
| Calculate ELAN utilization. See page 190. | |
| Calculate CLAN utilization. See page 202. | |
| Calculate online backup elapsed time. See page 240. | |
| Calculate WAN utilization. See page 239. | |

# 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:** Refer to "Call complexity" on page 305 for a description of the call complexity models used in this chapter.

## 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 in the system.

- Names starting with letter "b" define a boolean; for example, bCollectCBC defines whether or not call-by-call (CBC) statistics are collected.

- Names starting with the letter "p" define a proportion which is usually expressed as a percentage (%). For example, pNetOut defines the proportion of outbound network calls.

- 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 skillset/agent 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, the value for aSkill_Agent is 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 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 = 1/2 PeakCallRate. | Both | Disk Space |
| PeakOutCallRate | The expected number of outbound calls originating locally during a busy hour (used for CPU utilization calculations). | Meridian 1 | CPU, LAN, WAN |
| DailyOutCallRate | The expected daily average number of outbound calls per hour (used for disk space calculations). Default = 1/2 PeakOutCallRate. | Meridian 1 | Disk Space |
| PeakNetworkCallRate | The expected number of calls originating in the network during a busy hour (used for CPU utilization calculations). Default = PeakCallRate * nNetNodes. | Meridian 1 | CPU, LAN, WAN |
| DailyNetworkCall Rate | The expected daily average number of calls per hour in the network (used for disk space calculations). Default = DailyCallRate * nNetNodes. | Meridian 1 | Disk Space |

| Parameter | Description | Switch | Resource impact |
|-----------|-------------|--------|-----------------|
| **General parameters** | | | |
| nAgents | Number of agents logged on simultaneously. Maximum = 1000. | Both | CPU, LAN, Disk Space |
| nTAgents | Total number of agents defined in the system. | Both | LAN, Disk Space |
| nSupervisors | Number of logged on supervisors. Defaults = 10 percent of the number of agents. | Both | CPU, LAN, Disk Space |
| 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 |
| nApplications | Number of applications—the number of "exit" points from the Master_Script. The typical number of applications ranges 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. Typically, nActCodes = nSkillsets * 5. Maximum = 5000 (Meridian 1) and 1000 (DMS/MSL-100). | Both | Disk Space |

| Parameter | Description | Switch | Resource impact |
|---|---|---|---|
| bCollectCBC | Defines whether CBC statistics are collected. | Both | CPU, LAN, Disk Space, |
| bExternal_IVR | Defines whether or not an external IVR system is connected to the DMS/MSL-100 system. | DMS/MSL-100 | CPU, LAN, Disk Space, WAN |
| **Call resources** | | | |
| nCDN | Number of CDNs in the system. Typically nCDN=nApplications*1.5 (see Chapter 9 for the DMS/MSL-100). Maximum = 240. | Both | CPU, LAN, Disk Space |
| nRMRoutes | Number of RAN or music routes included in nRoutes. | Both | CPU, LAN, Disk Space |
| nDNIS | Number of DNIS defined in the system. Maximum = 10 000. | Both | CPU, LAN, Disk Space |
| pDNISInterval | Proportion of DNISs used during a single data collection interval. Value depends on the system use. Defaults 75 percent for small systems and 60 percent for larger ones. | Both | Disk Space |
| nIVRPorts | Number of IVR ports. Typical value = 48 in small systems and 500 in larger ones.<br><br>**Note:** The maximum number of IVR ports supported by Symposium Call Center Server was increased to 500 with PEP NS030121SU06S. | 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 |

| Parameter | Description | Switch | Resource impact |
|-----------|-------------|--------|-----------------|
| nIVRQ | Number of IVR queues configured. Default = 10. Maximum = 150. | Meridian 1 | CPU, LAN, Disk Space, |
| nRoutes | Number of routes configured. Default=128 for small systems (<200 agents) and 250 for larger ones (>500 agents). Maximum = 513. | Meridian 1 | CPU, LAN, Disk Space |
| nTrunks | Number of trunks in the system. Usually the number of trunks is 1.5*nAgents (max=3000). Maximum = 3000. | Meridian 1 | 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. | 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. | Meridian 1 | Disk Space |
| aNodes_NetSkill | Average number of nodes per network skillset. | Meridian 1 | Disk Space |
| aTrunk_Routes | Average number of trunks per trunk route. | Meridian 1 | Disk Space |
| **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 |

| Parameter | Description | Switch | Resource impact |
|---|---|---|---|
| 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 |
| 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 |

| Parameter | Description | Switch | Resource impact |
|-----------|-------------|--------|-----------------|
| **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 |
| 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 (Meridian 1 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. | Meridian 1 | CPU, LAN, Disk Space, WAN |
| pCBCNetwork | Proportion of network CBC data that is collected at all nodes in the network. Default = 100 percent. | Meridian 1 | CPU, LAN, WAN |

| Parameter | Description | Switch | Resource impact |
|---|---|---|---|
| pNetOutNetw | Proportion of calls arriving at all nodes in the network that are queued to a network skillset. Default = 10 percent. | Meridian 1 | CPU, LAN, WAN |
| pActualNetworking Netw | Proportion of all calls queued to network skillsets within the network that are actually routed to another node in the network. Default = 80 percent. | Meridian 1 | CPU, LAN, WAN |
| aQTNSPerNetwCall | Average number of network skillset queues entered per call. Default = 2. Maximum = 30/nNetwBestNodes. | Meridian 1 | CPU, LAN, Disk Space, WAN |
| nNetSkillsets | Number of network skillsets (that is, skillsets existing on multiple sites in the network). Maximum = 50. | Meridian 1 | Disk Space |
| NCC_Period_Min | Routing table update interval. Default = 5 minutes. | Meridian 1 | 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.) | Meridian 1 | 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. | Meridian 1 | CPU, LAN, Disk Space, WAN |
| pNetOut | Proportion of calls arriving at the local node that are queued to a network skillset. Default = 10 percent. | Meridian 1 | CPU, LAN, Disk Space, WAN |

| Parameter | Description | Switch | Resource impact |
|-----------|-------------|--------|-----------------|
| pNetOutOtherNode | Proportion of networked calls originating at this node that are routed to a particular other node in the network. The default is 100 percent * 1 / (nNetNodes −1).<br><br>**Note:** Calculate this parameter for each node in the network to which this node routes calls. | Meridian 1 | WAN |
| pActualNetworking | Proportion of all calls queued to network skillsets by this node that are actually routed to another node in the network. Default = 80 percent. | Meridian 1 | 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. | Meridian 1 | CPU, LAN, Disk Space, WAN |
| pNetInOtherNode | Proportion of incoming networked calls originating at a particular node in the network.<br>Default = 100 percent * 1 / (nNetNodes −1).<br><br>**Note:** Calculate this parameter for each node in the network that routes calls to this node. | Meridian 1 | WAN |
| aQTNSPerCall | Average number of network skillsets queues entered per network-out call. Default = 2. Maximum = 30 /nBestNodes. | Meridian 1 | CPU, LAN, Disk Space, WAN |

| Parameter | Description | Switch | Resource impact |
|-----------|-------------|--------|-----------------|
| nBestNodes | Average number of nodes queued for a QTNS command executed at the local node. Default = 3. Max = min (20, nNetNnodes − 1). | Meridian 1 | CPU, LAN, Disk Space, WAN |
| **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 is 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 |
| nScriptVarsPerScripts | Number of script variables per script. | Both | Disk Space |

| Parameter | Description | Switch | Resource impact |
|-----------|-------------|--------|-----------------|
| 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 telset fields on the agent's phoneset display. Default = 11 fields x 4 types (44) for Meridian 1, 0 for DMS/MSL-100. | 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 |
| nRTDCCRows | Number of rows per nodal RTD screen (1). | Both | CPU, LAN |
| nRTDSkillRows | Number of rows per skillset RTD screen, average number of skillsets per supervisor (aSkill_Supv). | Both | CPU, LAN |
| nRTDIVRRows | Number of rows per IVR RTD screen. | Meridian 1 | CPU, LAN |
| nRTDRouteRows | Number of rows per route RTD screen. | Meridian 1 | CPU, LAN |

| Parameter | Description | Switch | Resource impact |
|---|---|---|---|
| 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 and Graphical Real-time Display 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 sStats (nApplications). | Both | CPU, LAN |
| nRTICCRows | Number of rows per RT API Nodal statistics (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 |
| nRTIIVRRows | Number of rows per RT API IVR statistics (nIVRQ). | Meridian 1 | CPU, LAN |
| nRTIRouteRows | Number of rows per RT API Route statistics (nRoutes). | Meridian 1 | CPU, LAN |
| **Graphical Real-time Display** | | | |
| GRTDUpdateIntvl | Weighted average of the update (refresh) interval of all GRTD applications (minimum and typical values are 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 (1). | Both | CPU, LAN |

| Parameter | Description | Switch | Resource impact |
|---|---|---|---|
| nGRTDSkillRows | Number of rows of skillset statistics (nSkillsets). | Both | CPU, LAN |
| nGRTDClients | Number of GRTD clients. | Both | CPU, LAN |
| **RSM** | | | |
| RDTUpdateIntvl | Update (refresh) interval for the RSM Data Transmission Component. | Both | CPU, LAN |
| nRSMAgRows | Number of rows of Agent Stats (nAgents). | Both | CPU, LAN |
| nRSMAppRows | Number of rows of Application Stats (nApplication). | Both | CPU, LAN |
| nRSMCCRows | Number of rows of Call Center stats (1). | Both | CPU, LAN |
| nRSMSkillRows | Number of rows of Skillset Stats (nSkillsets). | Both | CPU, LAN |
| nRSMIVRRows | Number of rows per RT API IVR stats (nIVRQ). | Meridian 1 | CPU, LAN |
| nRSMRouteRows | Number of rows per RT API Route Stats (nRoutes). | Meridian 1 | 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 |

| Parameter | Description | Switch | Resource impact |
|---|---|---|---|
| **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 |
| **Event interface (Meridian 1 only, if present)** | | | |
| aEIUpdateIntvl | Average update (refresh) interval of all Event Interface applications. Range = 1/2 second – 5 seconds. Default = 1/2 second. | Meridian 1 | CPU, LAN |
| pEventsCall | Proportion of the number of events sent to client applications per call. Default = 80 percent. **Note:** The number of events sent to a client is application-specific. | Meridian 1 | CPU, LAN |
| nSEIClients | Number of SEI API clients. Maximum = 3. | Meridian 1 | CPU, LAN |
| **Voice Services (Meridian 1 only)** | | | |
| nGCB_Duration | Duration (in seconds) of a Give Controlled Broadcast in Start/Stop mode. | Meridian 1 | Voice Ports |
| nGCBC_Duration | Duration (in seconds) of a Give Controlled Broadcast in Continuous mode. | Meridian 1 | Voice Ports |
| nVSCDG_Duration | Duration (in seconds) of a Collect Digits voice session. | Meridian 1 | Voice Ports |
| nGIVR_Duration | Duration of the Give IVR treatment. | Meridian 1 | Voice Ports |
| nGCB_Simultaneous | Number of distinct Give Controlled Broadcast sessions played simultaneously in Start/Stop mode. | Meridian 1 | Voice Ports |
| nGCBC_ Simultaneous | Number of distinct Give Controlled Broadcast played simultaneously in Continuous mode. | Meridian 1 | Voice Ports |

| Parameter | Description | Switch | Resource impact |
|-----------|-------------|--------|-----------------|
| nGCB_WTimer | The length (in seconds) of the Broadcast Port Wait Timer. | Meridian 1 | Voice Ports |
| **Inbound call complexity model** | | | |
| 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 |
| 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 |

| Parameter | Description | Switch | Resource impact |
|---|---|---|---|
| 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,<br><br>`Give Controlled Broadcast Announcement YYYY`<br><br>`    Play Prompt Voice Segment X` | Meridian 1 | CPU, LAN, Disk Space, Voice Ports |
| aGCBCPerCall | Average number of controlled broadcasts in Continuous mode per inbound call. For example,<br><br>`Give Controlled Broadcast Announcement YYYY`<br><br>`    Play Prompt Voice Segment X continuous` | Meridian 1 | CPU, LAN, Disk Space, Voice Ports |

| Parameter | Description | Switch | Resource impact |
|---|---|---|---|
| aVSCDGPerCall | Average number of collect digit services per inbound call. 2 digits each time (including voice session and play prompt). For example,<br><br>`Open Voice Session VVVV`<br>`   Play Prompt Voice`<br>`   Segment SSSS`<br>`   COLLECT 2  DIGITS INTO`<br>`   ZZZZ`<br>`End Voice Session` | Meridian 1 | CPU, LAN, Disk Space, Voice Ports |
| aGIVRPerCall | Average number of Give IVR treatments per inbound call:<br>`GIVE IVR NNNN`<br>`With Treatment TTTT` | Meridian 1 | CPU, LAN, Disk Space, Voice Ports |
| **Outbound call complexity model** | | | |
| aAttPerOutCall | Average number of unsuccessful call attempts per successful outbound call. A successful outbound call is one that reaches a live person. | Meridian 1 | CPU, LAN |
| pUCallsNCon | Proportion of unsuccessful calls not establishing a PSTN connection.<br><br>**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 only)" on page 309 for more details. | Meridian 1 | CPU, LAN |
| aMSPPerOutCall | Average number of screen pops per outbound call. | Meridian 1 | CPU, LAN |

| Parameter | Description | Switch | Resource impact |
|-----------|-------------|--------|-----------------|
| aMMSGPerOutCall | Average number of MLS messages per outbound call (excluding screen pops). | Meridian 1 | CPU, LAN |
| aMMSGPerConUCall | Average number of MLS messages per unsuccessful call that results in a successful PSTN connection. | Meridian 1 | CPU, LAN |
| aMMSGPerNCon | Average number of MLS messages per unsuccessful call that results in an unsuccessful PSTN connection. | Meridian 1 | CPU, LAN |
| pTransferOut | Proportion of inbound calls that are transferred to another agent or DN. | Both | CPU, LAN |
| pConferenceOut | Proportion of inbound 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). | Meridian 1 | CPU, LAN |
| pTrnf_MLS | Proportion of transferred calls completed by an MLS application (for example, Symposium Agent). | Meridian 1 | CPU, LAN |
| aMMSGPerTx | Average number of MLS messages per call transfer. | Meridian 1 | 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) | Meridian 1 | CPU, LAN |

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

# Determine the expected call rate for network calls (Meridian 1 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 simply 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 a request and the cancellation of a request. |

## Call rate computations

Each of the call types described above is associated with a different call rate. 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 / 100 * pActualNetworkingNetw / 100 | # calls handled at a different node then the originator (network calls) |
| n/a | nwReqNetwPeakCall Rate | aQTNSPerNetwCall * nNetwRequestsSent * PeakNetworkCallRate * pNetOutNetw / 100 | # networking requests |
| n/a | nwRejNetwPeakCall Rate | nwReqNetwPeakCallRate **–** nwAccNetwPeakCallRate | # requests that are rejected/cancelled |
| Call: Local**—** Network | nwOAccPeakCallRate | PeakCallRate * pNetOut / 100 * pActualNetworking / 100 | # local calls handled remotely (network out calls) |
| Call: Local**—** Local | LocalPeakCallRate | PeakCallRate **–** nwOAccPeakCallRate | # local calls handled locally |
| Call: Network**—** Local | nwIAccPeakCallRate | nwAccNetwPeakCallRate * pNetIn/100 | # remote calls handled locally (network in calls) |

| Call type | Parameter name | Call rate formula | Description |
|---|---|---|---|
| n/a | nwOReqPeakCallRate | aQTNSPerCall * nRequestsSent * PeakCallRate * pNetOut / 100 | # Outgoing networking requests |
| n/a | nwIReqPeakCallRate | nwReqNetwPeakCallRate * pNetIn / 100 | # Incoming networking requests |
| Request: Local—Network | nwORejPeakCallRate | nwOReqPeakCallRate − nwOAccPeakCallRate | # outgoing requests that are rejected/ cancelled |
| Request: Network—Local | nwIRejPeakCallRate | nwIReqPeakCallRate − nwIAccPeakCallRate | # incoming requests that are rejected/ cancelled |
| n/a | AgentPeakCallRate | LocalPeakCallRate + nwIAccPeakCallRate | # calls handled by agents on the local node |
| n/a | nwAccNetwDailyCallRate | DailyNetworkCallRate * pNetOutNetw / 100 * pActualNetworkingNetw / 100 | # calls handled at a different node then the originator (network calls) |
| n/a | nwReqNetwDailyCallRate | aQTNSPerNetwCall * nNetwRequestsSent * DailyNetworkCallRate * pNetOutNetw / 100 | # networking requests |
| n/a | nwRejNetwDailyCallRate | nwReqNetwDailyCallRate − nwAccNetwDailyCallRate | # requests that are rejected/cancelled |
| Call: Local—Network | nwOAccDailyCallRate | DailyCallRate * pNetOut / 100 * pActualNetworking / 100 | # local calls handled remotely (network out calls) |
| Call: Local—Local | LocalDailyCallRate | DailyCallRate − nwOAccDailyCallRate | # local calls handled locally |
| Call: Network—Local | nwIAccDailyCallRate | nwAccNetwDailyCallRate * pNetIn / 100 | # remote calls handled locally (network in calls) |

| Call type | Parameter name | Call rate formula | Description |
|-----------|----------------|-------------------|-------------|
| n/a | nwOReqDailyCallRate | aQTNSPerCall * nRequestsSent * DailyCallRate * pNetOut / 100 | # Outgoing networking requests |
| n/a | nwIReqDailyCallRate | nwReqNetwDailyCallRate * pNetIn/100 | # Incoming networking requests |
| Request: Local—Network | nwORejDailyCallRate | nwOReqDailyCallRate − nwOAccDailyCallRate | # outgoing requests that are rejected/cancelled |
| Request: Network—Local | nwIRejDailyCallRate | nwIReqDailyCallRate − nwIAccDailyCallRate | # incoming requests that are rejected/cancelled |
| 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:

| nwIReqCallRate | | CallRate | | |
|---|---|---|---|---|
| nwIRejCallRate | nwIAccCallRate | LocalCallRate | nwOReqCallRate | |
| | | | nwOAccCallRate | nwORejCallRate |
| | AgentCallRate | | | |

## Networking parameters

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

Node A:
Calls arriving at the node: 10 000
Calls networked in: 4 000
Calls networked out: 2 000

Node C:
Calls arriving at the node: 15 000
Calls networked in: 4 000
Calls networked out: 2 000

Network Call Rate
= 10 000 + 20 000 + 15 000
= 45 000 CPH

**Node A** ——— **Node C**
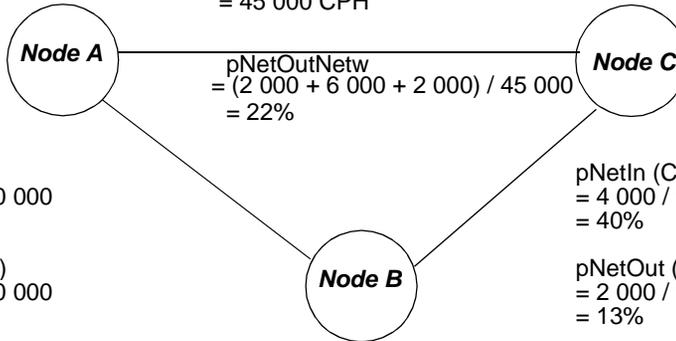
pNetOutNetw
= (2 000 + 6 000 + 2 000) / 45 000
= 22%

pNetIn (A)
= 4 000 / 10 000
= 40%

pNetIn (C)
= 4 000 / 10 000
= 40%

**Node B**

pNetOut (A)
= 2 000 / 10 000
= 20%

pNetOut (C)
= 2 000 / 15 000
= 13%

pNetInOtherNode (A from B)
= 50% (6 000) / 4 000
= 75%

pNetInOtherNode (C from A)
= 50% (2 000) / 4 000
= 25%

Node B:
Call arriving at the node: 20 000
Calls networked in: 2 000
Calls networked out: 6 000

pNetInOtherNode (A from C)
= 50% (2 000) / 4 000
= 25%

pNetInOtherNode (C from B)
= 50% (6 000) / 4 000
= 75%

pNetIn (B)
= 2 000 / 10 000
= 20%

pNetOutOtherNode (default)
= 100% / (3 - 1)
= 50%

pNetOut (B)
= 6 000 / 20 000
= 30%

pNetOutOtherNode (default)
= 100% / (3 - 1)
= 50%

pNetInOtherNode (B from A)
= 50% (2 000) / 2 000
= 50%

pNetInOtherNode (B from C)
= 50% (2 000) / 2 000
= 50%

pNetOutOtherNode (default)
= 100% / (3 - 1)
= 50%

**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

- the size of Symposium Call Center Server and MAS executable files
- Master and User database size
- the size of database tables, and the size of the largest table
- 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 B, "Database table sizes," on page 327.

The following sections provide formulas for calculating disk space requirements.

## 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 by the customer (for example, the total number of agents and activity codes). Configurations table size computations use a number of additional parameters shown in the table in "Record your workload parameters" on page 126. 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 of the four. If CBC recording is turned on, it 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

**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 (such as 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

> **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

Symposium Call Center Server and MAS executable sizes as well as Master and User database sizes are estimated based on the designer input:

**WINNT_Kb** = 150,000

**WINNT_Swap_files_Kb** = 274,000

**SCCS_files_Kb** = 700,000

**MAS_files_Kb** = 103,000

**Sybase_DB_Kb** = 74,000

**MAS_DB_Kb** = 230,000

**C_Drive_Space** = 100,000  (for all platforms except 1003t)

**C_Drive_Space** = 2,048,000  (for 1003t and 2 Gbyte PVI platforms

)**C_Drive_Space** = 4,096,000  (for all others and 4 Gbyte PVI platforms

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

```
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%)
```

The total disk space required is computed as

```
Overhead_SpaceKb =
  SUMOF(
    WINNT_Kb
    WINNT_Swap_files_Kb
    SCCS_files_Kb
    MAS_files_Kb
    MAS_DB_Kb
    Sybase_DB_Kb
    C_Drive_Space
  )
```

For a system with a 2-Gbyte hard drive

```
CBC_DB_SpaceKb = 6 Mbytes
```

For other systems

```
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)

TotalDiskSpaceRequiredMb =
  ((CBC_DB_SpaceKb + Blue_DB_SpaceKb) /
  Max_Disk_Utilization + Overhead_SpaceKb) / 1000
```

## 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 only)
- database access
- real-time displays
- real-time API
- RSM data collection and transmission
- event interface
- interval reporting
- networking impact

Each of these components is described in the following sections.

## Detailed CPU requirement computations

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

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

where

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

so that $\Sigma U_i$ represents the sum of the CPU utilizations over all of the components listed in the following table.

The following table lists the utilization components:

| 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 | $U_{MLINK\_SP\_OUT}$ |
| 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 | $U_{MLINK\_TX\_OUT}$ |

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

| Description | Utilization component ($U_i$) |
|---|---|
| Real-time Statistical Multicast Background | $U_{BRM}$ |
| Real-time Statistical Multicast | $U_{RSM}$ |

**Note:** Utilization component is based on the PP200 CPU.

### CPU measurements

The following table shows the CPU utilization for each component, based on the PP200 CPU. To change to a different processor, multiply the value by the PP200 relative factor as provided in "Server CPU" on page 29. For example, to map to a Pentium 166, multiply the values by 1.74.

| Parameter | Value | Notes |
|---|---|---|
| $U_{BG}$ | 2.3 % | Overall background cpu (%) on PP200 |
| BCC_Cost | 0.037 CpuSec | Basic call (on local node for local call) |
| BCC_Netw_Cost | 0.037 CpuSec | Basic call (on local node for outcall) |
| QTS_Cost | 0.0059 CpuSec | Queue to Skillset |
| QTNS_Cost | 0.0065 CpuSec | Queue to network skillset |
| QTA_Cost | 0.0012 CpuSec | Queue to Agent |
| TRN_Cost | 0.030 CpuSec | Transfer Call |
| CONF_Cost | 0.030 CpuSec | Conference Call |
| GCB_Cost | 0.070 CpuSec | Give controlled broadcast (Start/Stop) |
| GCBC_Cost | 0.070 CpuSec | Give controlled Broadcast (Continuous) |
| VSCDG_Cost | 0.121 CpuSec | Voice Session with Play Prompt and Collect Digits |
| GIVR_Cost | 0.031 CpuSec | Give IVR |
| IVR_Cost | 0.044 CpuSec | Process External IVR messages |

| Parameter | Value | Notes |
|---|---|---|
| IFTHEN_Cost | 0.0014 CpuSec | If-Then-Else, the cost is small, close to that of INTR_Cost |
| INTR_Cost | 0.0014 CpuSec | Intrinsic reference |
| GRAN_Cost | 0.00065 CpuSec | Give RAN |
| GMUS_Cost | 0.0024 CpuSec | Give Music |
| HDXSI_Cost | 0.0012 CpuSec | Data Exchange—Send Information |
| HDXRG_Cost | 0.0023 CpuSec | Data Exchange—Send Request / Get Response |
| MLINK_Msg_Cost | 0.079 CpuSec | MLS Message |
| MSP_Cost | 0.0052 CpuSec | MLS Screen Pop Cost |
| BCP_Insert_Cost | 0.00048 CpuSec | Cost of a single bulk copy procedure (BCP) insert (Sybase) |
| Remote_BCP_Insert_ Cost | 0.00018 CpuSec | Cost of a single Remote BCP insert (Sybase) |
| Cons_Insert_Cost | 0.0062 CpuSec | Cost of a single consolidation (Sybase) |
| RTDCell_Cost | 0.0000809 CpuSec | Cell update cost on RTD |
| RTICell_Cost | 0.0000809 CpuSec | Cell update cost on RTI per client |
| RDCCell_Incr | 0.0000000002 CpuSec | The slope of the RDCCell_Cost function |
| RDC_Const | 0.00003 CpuSec | The constant of linearity for the RDCCell_Cost function |
| RDTCell_Cost | 0.00000194 CpuSec | The CPU time in seconds required per RSM call sent |
| $U_{BRT}$ | 6.1% | Base RTD/RTI CPU (%) on PP200 |

| Parameter | Value | Notes |
|---|---|---|
| BaseRow_Cost | 0.099 ms | Base cost for a row selected |
| ColRow_Cost | 0.012 ms | Cost per column per row selected |
| MultiRow_Cost | 2.05 ms | Cost per row selected with >1 view |
| SEIEvent_Cost | 0.0076 CpuSec | Event Monitoring cost on SEI |
| SEIMessage_Cost | 0.0015 CpuSec | Notification Message cost on SEI |
| $U_{BEI}$ | 1.8 % | Base Event Interface CPU (%) on PP200 |
| DBBackupDAT_cost | 1104 CpuSec | Cost to perform an online database backup per Gbytes of data with a DAT drive |
| DBBackupMLR_cost | 552 CpuSec | Cost to perform an online database backup per Gbytes of data with a MLR drive |
| IREJ_Cost | 0.031 CpuSec | Network call rejected/cancelled locally. The cost of request and cancellation only. |
| IACC_Cost | 0.076 CpuSec | Network call accepted locally. The cost of the messaging as well as the basic call processing on the local node. |
| OREJ_Cost | 0.0078 CpuSec | Local request cancelled/rejected elsewhere. Cost of request and rejection only. |
| OACC_Cost | 0.024 CpuSec | Local call accepted elsewhere. The cost of Basic Call (similar to BCC), as well as the cost of the accepted request. |

**Note:** CpuSecs specified are PP200 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 $U_{BG} = 2.3\%$ on a PP200 platform.

## Base call processing

The base call processing CPU requirement is the amount of CPU resource required for the 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 PP200 is

```
UBaseCP =
  U_BG + (
  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:

```
Uᵢ = Sᵢ * Nᵢ * PeakCallRate / 3600
```

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

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/100 * (1 − pTrnf_MLS/100) |
| CNF_IN | CNF_Cost | pConferenceIn/100 * (1 − pConf_MLS/100) |
| MLINK_SP_IN | MSP_Cost | aMSPPerCall |

| i (service) | $S_i$ (Cost) | $N_i$ (Frequency) |
|---|---|---|
| MLINK_IN | MLINK_Msg_Cost | aMMSGPerCall |
| MLINK_CONF_IN | MLINK_Msg_Cost | aMMSGPerConf * pConferenceIn / 100 * pConf_MLS / 100 |
| MLINK_TX_IN | MLINK_Msg_Cost | aMMSGPerTx * pTransferIn / 100 * pTrnf_MLS / 100 |

### 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 0.0055. From "Call complexity" on page 305, $N_i$ is 1.2 for the Meridian 1.
Thus, $U_{MSP}$ = 1.0%

## Outbound call services (Meridian 1 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

Recall that an 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:

$U_o$ = $S_o$ * $N_o$ * 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 / 100 * (1 − pTrnf_MLS / 100) |
| CNF_OUT | CNF_Cost | pConferenceOut / 100 * (1 − pConf_MLS / 100) |
| MLINK_OUT | MLINK_Msg_Cost | aMMSGPerOutCall + aAttPerOutCall * (1 − pUCallsNCon / 100) * aMMSGPerConUCall + aAttPerOutCall * pUCallsNCon/100 * aMMSGPerNCon |
| MLINK_SP_OUT | MSP_Cost | aMSPPerOutCall |
| MLINK_CONF_OUT | MLINK_Msg_Cost | aMMSGPerConf * pConferenceOut / 100 * pConf_MLS / 100 |
| MLINK_TX_OUT | MLINK_Msg_Cost | aMMSGPerTx * pTransferOut / 100 * pTrnf_MLS / 100 |

## Database operations

Database operational requirements describe the database access (insert) capabilities for the 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 PP200. These values are given in the table in "Detailed CPU requirement computations" on page 158.

**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 B, "Database table sizes," on page 327.

### 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 must be consolidated, including all interval tables. 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 consolidation 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

## 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 "Symposium Call Center Server database views" on page 380. The CPU requirements for data extraction depend on the complexity of the query, the number of rows selected and the number of columns selected from the views. 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 PP200 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:

```
TotalDailyDataCPU_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 background

CPU requirements for real-time data can be broken into three functional groups: those for the real-time displays (RTD), those for the Real-time API (RTI), and those for Real-time Statistical Multicast (RSM). The real-time displays refer to the RTDs on the client PCs. The API refers to the real-time data being sent to customer applications. RSM is the Real-time Statistical Multicast feature which

sends out the same information as RTD API yet using multicast technology. If either one or both is operating, a background CPU cost is incurred. This cost has been derived from measurements and is given as $U_{BRT}$ in "CPU measurements" on page 161. 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 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

$$\mathbf{U_{RTD}} = U_{Client} * N_{Clients}$$

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

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

where

- screen refers to one of the displays, such as Agents, Applications, or Skillsets
- $I_{Screen}$ is the requested refresh interval for a single screen (AgScrUpdateIntvl, RTDScrUpdateIntvl)
- $N_{Rows}$ 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 204.
- $RTDCell\_Cost$ is the CPU time in seconds required per displayed cell (CpuSec_Cell_Refresh). This value is given in "CPU measurements" on page 161.
- $U_{Screen}$ is the CPU utilization per client per display type
- $U_{Client}$ is the CPU utilization per client
- $N_{Clients}$ is the number of clients (same as number of supervisors)
- $U_{RTD}$ 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 Pentium Pro 200 is

$$\mathbf{U_{RTI}} = \texttt{nRTIClients* RTICell\_Cost} * \Sigma (\mathbb{N}_i / \mathbb{I}_i)$$

where

- $\mathbb{N}_i$ 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 161.
- $\mathbb{I}_i$ 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 PP200 is

$$\mathbf{U_{GRTD}} = \texttt{nGRTDClients* RTICell\_Cost} * \Sigma (\mathbb{N}_i / \mathbb{I}_i)$$

where

- $\mathbb{N}_i$ 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 161.
- $\mathbb{I}_i$ is the refresh interval for statistic i (RTIUpdateIntvl)

## Real-time Statistics Multicast (RSM)

The CPU cost due to 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 (RSM RDC)

The CPU contribution due to the base cost, that is, the Real_Time Statistical Multicast Data Collection (RDC) on the PP200 (not including the background cost) is:

**RDCCell_Cost** = RDCCell_Incr * $\Sigma$(nRSMStr_RDCi * $N_i/I_{RDC\_i}$)+ RDC_Const

$\mathbf{U_{RDT}}$ **=** RDCCell_Cost * $\Sigma$(nRSMStr_RDCi * $N_i/I_{RDC\_i}$)

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

- *RDCCell_Cost* is the CPU time in seconds required per cell sent

- *RDC_Const* is the constant of linearity for the RDCCell_Cost function

- *RDCCell_Incr* is the slope of the RDCCell_Cost function

- $I_{RDC}$ is the refresh interval for statistic i (RDCUpdateIntvl)

- *nRSMStr_RDCi* s the number of streams being kept by the SDP/RDC engine of the statistic i. This number can be 0, 1, or 2.

### Real-time Statistics Multicast Data Transmission (RSM RDT)

The CPU contribution due only to the multicasting activity, that is, the Real_Time Statistical Multicast Data Transmission (RDT) on the PP200 (not including the background cost) is:

$\mathbf{U_{RDT}}$ **=** RDTCell_Cost * $\Sigma$(nRSMStr_i * $N_i/I_{RSM\_i}$)

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

- *RDTCell_Cost* is the CPU time in seconds required per cell sent

- $I_{RSM\_i}$ is the refresh interval for statistic i (RDTUpdateIntvl)

- *nRSMStr_i* s the number of streams being sent of the statistic i. This number can be 0, 1, or 2.

# Event Interface background

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

```
U_BEI = U_BEI if SEI is operating
      = 0 otherwise
```

## Event Interface

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

```
U_SEI =
  nSEIClients * (pEventsCall * SEIEvent_Cost * aNEvents/
  3600 + SEIMessage_Cost/aEIUpdateIntvl)
```

where

- SEIEvent_Cost is the CPU time in seconds required per event monitored This value appears in "CPU measurements" on page 161.

- SEIMessage_Cost is the CPU time in seconds required per message sent This value appears in "CPU measurements" on page 161.

- 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 B, "Database table sizes," on page 327.

# 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 C, "Symposium Call Center Server standard reports," on page 347.

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 formulas describe the estimation of the impact of single-view reports in terms of the number of milliseconds of PP200 CPU required to generate the report. Before applying these formulas, you must know the number of rows to be generated by the report (ReportRows):

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

**Note:** These formulas 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 349.

### Multiple-view reports

For multiple-views report, the impact depends on the actual 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
```

For interval reports, the CPU utilization is

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

To determine the impact of the 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 the 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 cancelled 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
```

## 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)

## Introduction

The ELAN is an Ethernet link between the Meridian 1 switch and the Symposium Call Center Server. ELAN bandwith is 10 Mbps (TCPIP_Bandwidth_MBitsSec = 10).

Network call processing (NCP) and NCC traffic are no longer routed over the ELAN. This change affects the computations for ELAN requirements, as described in the following sections.

## ELAN traffic

The ELAN carries the following traffic:

- Call Processing AML (AML_Utilization)
- Meridian Link Services (MLink_Utilization)

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:** NCC traffic can be routed over the CLAN. In this document, it is assumed NCC traffic is routed over the ELAN. Use detailed computations to determine the NCC traffic portion.

## Maximum acceptable utilization

The utilization of the ELAN is dependent mainly on

- call rate
- call complexity
- frequency of MLS services

The maximum acceptable utilization of the ELAN depends on the amount of traffic on the LAN, the length of the cable, and on 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 ten percent. For more information on utilization, refer to Appendix D, "Ethernet delay factors versus bandwidth utilization," on page 361.

## Detailed ELAN requirements computations

ELAN bandwidth is 10 Mbps (TCPIP_Bandwidth_MBitsSec = 10). The standard upper limit for Ethernet LAN utilization is 30 percent. Based on informal recommendations from development and other experienced technical support personnel, the ELAN utilization should not exceed 10 percent for the Meridian 1. The ELAN utilization depends on the call rate, call complexity, and the frequency of MLS services. The Embedded LAN carries

- Call Processing AML (AML_Utilization)
- Call Processing ICM (ICM_Utilization)
- Extended IVR traffic (IVR_Utilization)
- Meridian Link traffic (MLink_Utilization)

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

For the Meridian 1 switch, ELAN utilization is computed as

```
EmbeddedLan_Utilization =
   AML_Utilization + MLink_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 six percent.

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

# Call processing traffic impact on ELAN

Call processing application module link (AML) provides the connection between Meridian 1 and the Symposium Call Center Server for call processing-related traffic over the ELAN.

## AML cost for basic local calls

The following table shows 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 |
| 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 | 2,155 | |
| 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 | |

| AML service | Bytes transferred | #Messages |
|---|---|---|
| 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 to Meridian 1 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 Serives | BCC_AMLBytes | 2,155 | 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 |
| 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 size of 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/100 * (1 − pTrnf_MLS/100)

**ELAN_Cf_Bytes** =
  Conf_AMLBytes * pConferenceIn/100 * (1 − pConf_MLS/100)

**ELAN_Tx_Messages** =
  Trn_AMLMessages * pTransferIn/100 * (1 − pTrnf_MLS/100)

```
ELAN_Cf_Messages =
  Conf_AMLMessages * pConferenceIn/100 *
  (1 − pConf_MLS/100)

ELAN_TxOut_Bytes =
  Trn_AMLBytes * pTransferOut/100 * (1 − pTrnf_MLS/100)

ELAN_CfOut_Bytes =
  Conf_AMLBytes * pConferenceOut/100 * (1 − pConf_MLS/100)

ELAN_TxOut_Messages =
  Trn_AMLMessages * pTransferOut/100 * (1 − pTrnf_MLS/100)

ELAN_CfOut_Messages =
  Conf_AMLMessages * pConferenceOut/100 *
  (1 − pConf_MLS/100)
```

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
```

## MLS traffic on the ELAN

Meridian Link Services (MLS) provides the connection between Meridian 1 or DMS/MSL-100 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 uses the ELAN between the switch and the Symposium Call Center Server and then the CLAN between the Symposium Call Center Server and third-party devices.

MLS traffic can be subdivided into traffic resulting from inbound calls and the 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/100 * pTrnf_MLS/100
    aMMSGPerConf * pConferenceIn/100 * pConf_MLS/100
  ) * PeakCallRate * (aMMSG_Size + 88) * 8 / (3600 *
  1000000)
```

The inbound MLS utilization is defined as

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

### Outbound call traffic

For the outbound call contribution, the ELAN 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 / 100)
    aMMSGPerNCon * aAttPerOutCall * pUCallsNCon / 100
    aMMSGPerTx * pTransferOut/100 * pTrnf_MLS/100
    aMMSGPerConf * pConferenceOut/100 * pConf_MLS/100
  ) * PeakOutCallRate * (aMMSG_Size + 88) * 8 /
  (3600 * 1000000)
```

The outbound MLS utilization is defined as

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

# Calculate ELAN utilization (DMS/MSL-100)

## Introduction

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

ELAN bandwith is 10 Mbps (TCPIP_Bandwidth_MBitsSec = 10).

## ELAN traffic

The ELAN carries the following traffic:

- Call Processing ICM (ICM_Utilization)
- External IVR (IVR_Utilization)
- Meridian Link Services (MLink_Utilization)

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

## Maximum acceptable utilization

The utilization of the ELAN is dependent mainly on

- call rate
- call complexity
- frequency of MLS services

The maximum acceptable utilization of the ELAN depends on the amount of traffic on the LAN, the length of the cable, and on 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 30 percent. For more information on utilization, refer to Appendix D, "Ethernet delay factors versus bandwidth utilization," on page 361.

# Detailed ELAN requirements computations

ELAN utilization is computed as

```
EmbeddedLan_Utilization =
   ICM_Utilization + IVR_Utilization + MLink_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 six 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 Symposium Call Center Server to the DMS/MSL-100 (inbound) and the traffic from the DMS/MSL-100 to the 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

Call Processing Intelligent Call Manager (ICM) provides the connection between the DMS/MSL-100 and the 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 to 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 the 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 to 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/100
        * ( 1 - pTrnf_MLS/100)
    Conf_Out_ICMBytes * pConferenceIn/100
        * ( 1 - pConf_MLS/100)
  )
```

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/100
        * ( 1 - pTrnf_MLS/100)
    Conf_Out_ICMMessages * pConferenceIn/100
        * ( 1 - pConf_MLS/100)
    )
```

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
```

## MLS traffic on the ELAN

Meridian Link Services (MLS) provides the connection between Meridian 1 or DMS/MSL-100 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 uses the ELAN between the switch and the Symposium Call Center Server and then the CLAN between the Symposium Call Center Server and third-party devices.

MLS traffic can be subdivided into traffic resulting from inbound calls and the 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/100 * pTrnf_MLS/100
    aMMSGPerConf * pConferenceIn/100 * pConf_MLS/100
  ) * PeakCallRate * (aMMSG_Size + 88) * 8 / (3600 *
    1000000)
```

The inbound MLS utilization is defined as

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

### Outbound call traffic

For the outbound call contribution, the ELAN 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 / 100)
    aMMSGPerNCon * aAttPerOutCall * pUCallsNCon / 100
    aMMSGPerTx * pTransferOut/100 * pTrnf_MLS/100
    aMMSGPerConf * pConferenceOut/100 * pConf_MLS/100
  ) * PeakOutCallRate * (aMMSG_Size + 88) * 8 /
    (3600 * 1000000)
```

The outbound MLS utilization is defined as

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

# External IVR traffic impact on the ELAN

Most traffic related to IVR on the ELAN is sent to the 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 the Symposium Call Center Server for each call handled by the IVR system. There is also the possibility of the IVR caller-entered data (CED) message being sent from the IVR system to the Symposium Call Center Server directly over the ELAN. This depends on whether the IVR system is connected to the ELAN or the CLAN.

| 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.

The messages defined in this table show only the messages sent from ICM to Symposium Call Center Server. The table 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

The CED messages are sent directly between the external IVR system and Symposium Call Center Server. It is assumed that this traffic is identical for all IVR systems. The messages described in the following table are sent between the IVR system and the 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 ELAN and CLAN computations. For more information, refer to "MLS traffic on the ELAN" on page 187 and "MLS traffic impact on the CLAN" on page 216.

# Calculate CLAN utilization

## Introduction

The CLAN is an Ethernet or a Token Ring link between the Symposium Call Center Server and the Symposium Call Center Server clients. 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 (RTDisp_Utilization)
- real-time data API (RTI_Utilization)
- Graphical Real-time Display (GRTD) traffic
- Real-time Statistics Multicast (RSM) traffic
- Event Interface (SEI_Utilization)
- MLS (MLink_Utilization)
- Host Data Exchange (HDX_Utilization)
- reporting-related traffic (Reporting_Utilization)
- external IVR traffic (CLAN_IVR_Utilization
- network call processing traffic (NCP_Utilization)
- Network Control Center traffic (NCCUpd_Utilization)
- network CBC traffic to the NCC (NCBC_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. It is recommended 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 is ten percent. For more information, refer to Appendix D, "Ethernet delay factors versus bandwidth utilization," on page 361.

## Detailed CLAN requirements computations

```
CustomerLan_Utilization =
  SUMOF(
    RTDisp_Utilization
    RTI_Utilization
    GRTD_Utilization
    RSM_Utilization
    SEI_Utilization
    MLink_Utilization
    HDX_Utilization
    CLAN_IVR_Utilization
    Data_Extraction_Utilization
    Reporting_Utilization
    NCP_Utilization
    NCCUpd_Utilization
    NCBC_Utilization
  )
```

The maximum acceptable utilization of the CLAN depends on the amount of traffic on the LAN, the length of the wire, 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 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 [10000 feet] apart). For more information, see Appendix D, "Ethernet delay factors versus bandwidth utilization" on page 361.

**Note:** Information in the following subsections, "Network agent requests impact on the CLAN" and "Networking NCC updates impact on the CLAN," was taken directly from the section "Calculate ELAN Utilization."

## Real-time display traffic on the CLAN

Real-time display traffic provides the communications between the Symposium Call Center Server and the Symposium Call Center Server Client workstations 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 supervisors

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 supervisor screen. The amount of information per screen depends on the number of rows and the size of each row.

**Note**: A supervisor 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 (Meridian 1 only) | 36 | 36 |
| Route Statistics (Meridian 1 only) | 12 | 12 |

Notice the different record sizes for networking compared to no networking: when there is no networking, fewer fields are shown. Also, IVR and Route statistics are only available for the Meridian 1 switch type.

### 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), and 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 supervisor workstation. 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=
  (nSupervisors * (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, and RTDScrUpdateIntvl is defined by AgScrUpdateIntvl for agent screen and RTDScrUpdateIntvl for all other screens.

If an agent screen contains all of the columns as suggested in "Row size" on page 205, then the formula above should be used. 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 its state twice for every interruption during the shift (for example, Ready/NotReady), twice for every call handled, and the 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=
  (nSupervisors * (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 supervisors, the number of RTD screens per supervisor, and the real-time display refresh interval. The number of screens per supervisor is four. Therefore, the number of messages transferred per second can be estimated as

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

The average size of message 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 two seconds. Agents, therefore, must change state every two seconds and as a result all rows are updated 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 (Meridian 1 only) | 36 | 36 |
| Route Statistics (Meridian 1 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 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
  ((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 size of message 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 the 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 two seconds. Agents therefore change state every two seconds with the result that all rows are updated 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 size of message 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 for the networking and non-networking cases are given in the following table:

| RSM statistic | Number of bytes sent per packet |
|---|---|
| UDP Header | 72 |
| RSM Header | 68 (Constant) |
| Agent Statistics | 56 (per agent) |

| RSM statistic | Number of bytes sent per packet |
|---|---|
| RSM Packet Size | 64 Kbytes/packet (maximum) |
| Application Statistics | 84 (per application) |
| Skillset Statistics | 116 (per skillset) |
| Nodal Statistics | 28 (Constant) |
| IVR Statistics (Meridian 1 only) | 32 (per IVR Port) |
| Route Statistics (Meridian 1 only) | 10 (per route) |

**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 switch type.

Each statistic can be sent as *time in state* or *moving window* information. 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_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 each refresh interval is:

```
nRSMPkts = Sum of (nRSMStr_i) for all i
```

The RSM traffic in Mbps is calculated as

```
RSM_BW_Required_MbitsSec =
```

SUMOF (

(

$Packet\_length_{Agt}$ * nRSMStr_Agt / $I_{RSM\_Agt}$

$Packet\_length_{App}$ * nRSMStr_App / $I_{RSM\_App}$

$Packet\_length_{Skl}$ * nRSMStr_Skill / $I_{RSM\_Skl}$

$Packet\_length_{Nod}$ * nRSMStr_Nod / $I_{RSM\_Nod}$

$Packet\_length_{IVR}$ * nRSMStr_IVR / $I_{RSM\_IVR}$

$Packet\_length_{Rte}$ * nRSMStr_Rte / $I_{RSM\_Rte}$

)

* 8/1000000

)

The LAN utilization due to the RSM then is calculated as

```
RSM_Utilization =
  100% * RSM_BW_Required_MbitsSec /
  TCPIP_Bandwidth_MBitsSec
```

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. The maximum number of RSM Meridian 1 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
```

The average message size can be computed as follows:

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

## Event Interface traffic on the CLAN (Meridian 1 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 five 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 B, "Database table sizes," on page 327.

```
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
```

## 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 the information during the execution of a script whenever Send Request, Get Response, and Send Info script instructions are used. Host Data Exchange is not used for any of the predefined workloads (see "Workload types" on page 295) and 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 126 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 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
```

## MLS traffic impact on the CLAN

MLS traffic impact on the CLAN is identical to the MLS traffic analysis made for the ELAN. See "MLS traffic on the ELAN" on page 187 for detailed computations.

## 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 200.

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
```

## Data extraction traffic on the CLAN

Symposium Call Center Server data extraction results in the transfer of data between the 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) which must be known in advance. The amount of information per row for each of the views (DataRowBytes) is shown in Appendix B, "Database table sizes," on page 327.

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
```

Total bandwidth required for Symposium Call Center Server reporting 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 Symposium Call Center Server and the client 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
    Cons_CBC_Reporting_BW_Required_MbitsSec
  ) / TCPIP_Bandwidth_MBitsSec * 100%
```

### Local historical reporting traffic

Local reporting traffic consists of configuration, historical statistics, and call detail reporting 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), which must be known in advance. The amount of information per row for each of the standard reports (ReportRowBytes) is shown in Appendix C, "List of standard reports."

**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
```

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

```
Local_Historical_Reporting_BW_Required_MbitsSec =
  SUMOF_ALL (ReportTraffic_Mbits) / 3600
```

### 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 152. 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 only)

Consolidated Historical Statistics reports can be generated from any PC in the network which 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. As such, 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 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)

This information must be known in advance. The amount of information per row for each of the standard reports (ReportRowBytes) is shown in Appendix C, "Symposium Call Center Server standard reports," on page 347.

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
```

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 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 and the number of reports per hour (ReportsPerHour) for this node which must be known in advance. The amount of information per row for each of the standard reports (ReportRowBytes) is shown in Appendix C, "List of standard reports."

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
```

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 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. It is recommended that the client PC that generates the report is on the same CLAN as the node that the report is based on; 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 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 219. 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_RNCC_Data * 8 * 1.4 / (3600 * 1000)
```

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

The consolidated network CBC report is limited to one hour of data for any single invocation of the report. But 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 is the value Nodal_CBC_Reporting_Data for the node selected in the report (not necessarily the current node).

**Note:** Since the reporting of local CBC data is already accounted for in section "Local CBC reporting traffic" on page 219, 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 only): Method 2

The amount of data due to network CBC consolidated reporting can be estimated using the method in "Report selected from local node (Meridian 1 only)" on page 222. 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), which must be known in advance. The amount of information per row (ReportRowBytes) for each of the standard reports is shown in Appendix C, "Symposium Call Center Server standard reports," on page 347.

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
```

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
```

## Network agent requests impact on the CLAN

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 protocol 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 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 is therefore 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
```

## Networking NCC updates impact on the CLAN

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 five minutes). The impact of such updates is expected to be negligible. Therefore, NCCUpd_Utilization = 0.

# Calculate WAN requirements (Meridian 1)

## 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 embedded WAN. 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

To analyze network call processing (NCP) traffic, all activity during the peak busy hour of incoming calls is considered. To analyze reporting traffic, the period of highest reporting activity is considered. These two times are usually mutually exclusive. Customers are advised not to run their large reporting activities during the peak busy hour.

To engineer sufficient WAN capacity to handle system needs, the WAN must be engineered 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 for all system configuration. In a shared WAN environment, it is possible that not even the network administrators have enough control over the network traffic to prevent a large file transfer from impacting other traffic and guaranteeing 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 ten 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 225. As such, it has been concluded that the maximum acceptable latency time to transmit a single message from node to node through the ELAN over a WAN connection is four seconds.

## WAN traffic between the local node and another node

The traffic between any two nodes consists of the NCP traffic. The WAN traffic between the local node and some other particular 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 consist of both Consolidated Historical Statistics reporting traffic and Consolidated Network CBC reporting traffic. This section is only concerned with the traffic to a particular node rather than the traffic to all other nodes.

### Network call processing traffic

The traffic on the WAN between the CLANs of two nodes consists of network call processing traffic. The total network call processing WAN bandwidth required from the node is computed as

```
N2NE_BW_From = SUMOF(
  nwIAccPeakCallRate * nwAccTo_Bytes * pNetInOtherNode/100
  nwIRejPeakCallRate * nwRejTo_Bytes * pNetInOtherNode/100
  nwOAccPeakCallRate * nwAccFrom_Bytes * pNetOutOtherNode/
  100
  nwORejPeakCallRate * nwRejFrom_Bytes * pNetOutOtherNode/
  100
  ) * 8 * 1.3 / (3600 * 1000000)
```

### Consolidated historical and network CBC reporting traffic

Traffic is computed for every historical report, CBC report, or data extraction generated by a client PC located on the CLAN of the remote node, and selected from the local node.

Traffic is computed for each report that is generated from the local node for a client on the remote node based on 40 percent protocol overhead as follows:

```
CONS_Traffic_Node_Mbits =
  DataRowsPerNode * DataRowBytes * 8 * #_Times_Run * 1.4 /
  1000000
```

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 capacity

The required WAN capacity is based on the maximum allowable duration for running all of the reports included in Appendix C, "Symposium Call Center Server standard reports," on page 347. 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 + N2NE_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 consist of both Consolidated Historical Statistics reporting traffic and Consolidated Network CBC reporting traffic. This section is only concerned with the traffic from a particular node rather than the traffic from all other nodes.

### Network call processing traffic

The traffic on the WAN between the CLANs of two nodes consists of network
call processing traffic. The total network call processing WAN bandwidth
required from the node is computed as

```
N2NE_BW_To = SUMOF(
  nwIAccPeakCallRate * nwAccFrom_Bytes * pNetInOtherNode/
  100
  nwIRejPeakCallRate * nwRejFrom_Bytes * pNetInOtherNode/
  100
  nwOAccPeakCallRate * nwAccTo_Bytes * pNetOutOtherNode/
  100
  nwORejPeakCallRate * nwRejTo_Bytes * pNetOutOtherNode/
  100
  ) * 8 * 1.3 / (3600 * 1000000)
```

### Consolidated historical and network CBC reporting traffic

Traffic is computed for every historical report, CBC report, or data extraction
generated by a client PC located on the CLAN of the local node, and selected
from the remote node.

Traffic is computed for each report that is generated from a remote node for a
client on the local node based on 40 percent protocol overhead as follows:

```
CONS_Traffic_Node_Mbits =
  DataRowsPerNode * DataRowBytes * 8 * #_Times_Run * 1.4 /
  1000000
```

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 capacity

The required WAN capacity is based on the maximum allowable duration for running all the reports included in the above section. 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 + N2NE_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 to the CLAN on the local node from the CLAN on the other 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.

For many customers, the NCC might 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 it is recommended that the CLANs be separated by a router.

For computing 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 describes what tables are involved in this process and what data 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. As such, 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 based on 30 percent protocol overhead for Bulk Copy Procedure (BCP). As such, 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 WAN capacity 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))
```

A WAN connection from the NCC to the local node must be able to handle this amount of traffic.

## 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 table from "Computing the number of rows per table" on page 343. 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 one 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

For every historical report, CBC report, or data extraction generated by a client PC located on the CLAN of the NCC and selected from this node, 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 on the NCC based on 40 percent protocol overhead as

```
NCC_Cons_Traffic_Mbits =
  DataRowsPerNode * DataRowBytes * 8 * #_Times_Run * 1.4 /
  1000000
```

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 "List of standard reports" on page 349. 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 |

|                    | **pCBCNetwork** | | | | |
| ------------------ | --- | --- | --- | --- | ---- |
| **# Nodes in network** | **20%** | **40%** | **60%** | **80%** | **100%** |
| 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 remote agent requests and responses described in "Network Agent Requests Impact on the CLAN" on page 224. The CLAN traffic consists of the

- remote agent requests and responses—described in "Network Agent Requests Impact on the CLAN" on page 224
- network call event information that is recorded on the NCC—described in "Consolidated historical and network CBC reporting traffic" on page 229
- reporting traffic—described in "Consolidated historical and network CBC reporting traffic" on page 229

If there is a router on each LAN, 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
```

# Calculate WAN requirements (DMS/MSL-100)

## Introduction

The WAN is used to carry the ELAN and CLAN traffic between the customer site and the carrier site (usually the telephone company site). Discussion of the WAN connecting a DMS/MSL-100 switch is beyond the scope of this manual. For more information, refer to the *DMS-100 ICM Router Guide*.

## WAN traffic for ELAN

The total amount of ELAN traffic on the WAN can be calculated as

```
DMS_ELAN_WAN_Required_MbitsSec =
  MAX(0.056, SUMOF(
    MLinkIn_BW_Required_MbitsSec
    ICM_In_BW_Required_MbitsSec
    ICM_Out_BW_Required_MbitsSec
    IVR_BW_Required_MbitsSec
    ELAN_CED_BW_Required_MbitsSec
  ))
```

This is the amount of traffic that the WAN and router must be able to handle.

## WAN traffic for CLAN

The total amount of CLAN traffic on the WAN can be calculated as

```
DMS_CLAN_WAN_Required_MbitsSec =
  CLAN_CED_BW_Required_MbitsSec
```

This is the amount of traffic that the WAN and router must be able to handle.

# Online database backup elapsed time

## Introduction

The 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 elasped time

The elapsed time of the online database backup can be computed as

```
Available_CPU =
  100% - U_Total

DB_CPU_Cost =
  DBBackupDAT_cost (if a Seagate DAT tape drive is used)
  DBBackupMLR_cost (if a Tandberg MLR tape drive is used)

BackupElpasedTime_Hours =
  TotalBackupSizeKb / 1,000,000 * DB_CPU_Cost * 1.5
  / (3600 * Available_CPU/100%)
```

**Note:** TotalBackupSizeKb is obtained in "Backup size computations" on page 157.

# 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, ELAN, CLAN, and WAN resources required for the NCC.

# NCC server hardware platforms

## Introduction

The following table shows the currently available Symposium Call Center Server Network Control Center (NCC) server configurations:

| # | Configuration | MAS base | CPU | Memory (Mbytes) | Disk (Gbytes) | Symbol | Tape | CD-ROM |
|---|---------------|----------|-----|-----------------|---------------|--------|------|--------|
| 1 | 1001t Base 256/18 | 1001t | PII300 | 256 | 18 | PII399/256/18 | 16/32 Gbytes SCSI | 24X |
| 2 | 1001t Raid 256/18 | 1001t | PII300 | 256 | 2 x 36 | PII300/256/36 | 16/32 Gbytes SCSI | 24X |
| 3 | 1003t Raid 256/22 | 1003t | PIII500 | 256 | 2 x 22 | 2PPIII500/256/44 | 16/32 Gbytes SCSI | 32X |

**Note:** For RAID disk systems, actual usable disk space is half the total physical disk capacity.

# 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 126. The common parameters for the NCC have the same values as those given in "Common parameters" on page 299, 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" on page 224 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 or not 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 256. 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
- call event recording
- call event 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 requirements 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 158:

$$\text{NCC\_U}_{\textbf{Total}} = \Sigma U_i$$

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 Pentium Pro 200 (PP200) processor:

### CPU measurements summary (based on PP200)

| Parameter | Value | Units | Notes |
|---|---|---|---|
| $U_{BG}$ | 0.01 | % (=1%) | Overall background CPU (%) on PP200 |
| NBCP_RInsert_Cost | 0.00019 | CpuSec | Cost of a single BCP remote insert (Sybase) |
| NCC_Retrieve_Cost | 0.00039 | 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 call event 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 call event 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 call event recording CPU" on page 248 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. However, present memory configurations are adequate for the NCC server.

# NCC server disk space requirements

## Introduction

The disk space required for the NCC consists primarily of the network CBC database. Since there is 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 the 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 151.

## NCC configuration tables disk space

The determination of the NCC configuration table sizes is identical to "Configuration Tables Disk Space" on page 151, except that most values are zero, with the exception of nNetNodes, nNetSkillsets, and the predefined constants that are documented in Table 8.

## 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:** There is one Network Call-by-Call Statistics table 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 328. 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)
```

## NCC total disk space requirements

Calculations for the total disk space requirements for the NCC are similar to those for the Symposium Call Center Server given in "Detailed computations" on page 154. The overhead is the same for the sizes of the Windows NT, MAS, and Symposium Call Center Server executables, as well as the Master and User databases. The only differences 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

NTotalDiskSpaceRequiredMb =
   ((NCBC_DB_SpaceKb + NBlue_DB_SpaceKb) /
   Max_Disk_Utilization + Overhead_SpaceKb) / 1000
```

# NCC ELAN requirements

## Introduction

ELAN traffic associated with the NCC consists primarily of NCC traffic (NCCUpd_Utilization). This traffic consists of periodic broadcasting of the routing tables by the NCC nodes. These updates occur once every NCC_Period_Min minutes. For a single node, this traffic is insignificant, as shown in "Calculate ELAN utilization (Meridian 1)," on page 179. For a multinode network, the traffic is still considered to be insignificant compared to the capacity of the ELAN.

The following routing tables are propagated from the NCC:

- NINCCSite—changes only
- NINCCRanking—changes only
- NINCCNetworkSkillset—changes only
- NINCCRemoteApplication—entire table

# NCC CLAN requirements

## Introduction

The NCC CLAN primarily carries traffic for CBC recording and reporting.

## NCC CLAN detailed requirements

The traffic on the CLAN consists of CBC event data and consolidated CBC reporting traffic. The NCC ELAN utilization is calculated as

```
NCC_CLan_Utilization =
  NCC_NCBC_Utilization + NCBC_Reporting_Utilization
```

The following sections describe the detailed computations for each component.

### CBC CLAN requirements

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 cancelled 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
```

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 328.

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.

### NCC 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. As such, 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
```

# 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 described in "CBC CLAN requirements" on page 254 as *NCC_NCBC_BW_Requried_MbitsSec*.

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.

## 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.

## 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 above. If there is a single router on both LANs, then the total WAN bandwidth that the 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 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
  requirements computations" on page 247)

NCC_Database_Size_MB =
  sizeof(NIeNetCallbyCallStatYYYMMDD) / 1024

NCC_DB_CPU_Cost = DBBackupMLR_cost

NCC_BackupElpasedTime_Hours =
  NCC_Database_Size_MB / 1000 * NCC_DB_CPU_Cost * 1.5
  / (3600 * NCC_Available_CPU/100)
```

# Chapter 7

# Planning Meridian Mail requirements (Meridian 1 only)

## In this chapter

# Meridian Mail platforms

## Introduction

Meridian Mail, Release 8 or higher must be used with Symposium Call Center Server. The following table shows the four Meridian Mail platforms, the numbers 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. Thirty-six 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.

# Meridian Mail ports requirements

## Introduction

This chapter provides information for determining the number of voice ports required to accommodate Meridian Mail on a Symposium Call Center Server system.

## To calculate ports requirements

The number of voice ports required depends on

- the rate of port requests
- the duration of voice session
- the Grade of Service

Grade of Service (GOS) refers to the probability that requests will be delayed by more than a certain number of seconds. For 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.

The computation of voice port requirements for Give Controlled Broadcasts (GBC) in Start/Stop mode include the computation of port request rate based on Broadcast Port Wait timer, Poisson request arrival rate, and the 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 (GCBC) mode are based on Erlang B and the maximum number of calls per port (=50).

Total number of ports required is computed as

```
TotalVoicePorts =
  nGIVR_Ports + nVSCDG_Ports + nGCB_Ports + nGCBC_Ports
```

Total number of ports required by the Symposium Call Center Server controlled voice processing (control is maintained over the ACCESS link) 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 the number of ports supported by a single ACCESS link (96 ports).

For the predefined workloads with the Symposium Voice Processing (SVP) call model (see "Workload types" on page 295), 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.

**Note:** Voice ports cannot be shared on either the Meridian 1 or DMS/MSL-100 switches.

## Installation grounding (Meridian 1 only)

To avoid damage that could occur to the Symposium Call Center Server, the switch, or Meridian Mail 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.

## 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 |
| 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 session (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 295), 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 numbers 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 263, 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 295), 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

| nGCB_WTimer | Announcement duration (seconds) | | | |
|---|---|---|---|---|
| | 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 |
| 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 |

| nGCB_WTimer | Announcement duration (seconds) | | | |
|---|---|---|---|---|
| | 30 | 60 | 90 | 120 |
| 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 |
| 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 |

|  | Announcement duration (seconds) | | | |
|---|---|---|---|---|
| **nGCB_WTimer** | **30** | **60** | **90** | **120** |
| 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 = 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 295), the number
of required voice ports for GCBC is zero.

### 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 |

| Rate (calls per hour) | nGCBC_Duration (Seconds) | | | |
|---|---|---|---|---|
| | 30 | 60 | 90 | 120 |
| 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 |
| 10 000 | 2 | 4 | 6 | 8 |

## CSL link

The command and status link (CSL) facilitates communication between Meridian 1 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 kbps. The maximum utilization of CSL link is 70 percent. Maximum CSL call rate is estimated to be 56 523 Calls/Hour if all calls require voice service. The following table shows the utilization of the CSL link based on workload and the call rate:

**CSL utilization per workload**

| 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 describes the computation if CSL link capacity as well as the maximum rate of CSL related calls (Voice) are supported. Using the computations below, the Maximum CSL call rate is estimated to be 56 523 calls per hour.

The following table shows the variables and their values used in the CSL link calculations. For further details, see Appendix F, "Symposium Call Center Server detailed calculations."

### CSL services (Sizes include overhead)

| 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 "Common parameters" on page 299) |

```
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)
```

## NLI link

The network loop interface (NLI) link facilitates the voice path between Meridian 1 and Meridian Mail. It is used only for calls requiring IVR service. The number of the voice ports needed for this link must be calculated according to the number of voice sessions required by the 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.

# MLS requirements

## Introduction

The ACCESS link is used for communications between Symposium Call Center Server and Meridian Mail. It is required for all Meridian Mail-based voice processing. The following table shows the utilization of the ACCESS link based on workload and the call rate. The recommended ACCESS link speed is 19.2 kbps.

| Call rate | ACCESS utilization (%) |
| --- | --- |
| 1000 | 2.0% |
| 5000 | 9.8% |
| 10000 | 19.6% |
| 15000 | 29.3% |
| 20000 | 39.1% |
| 25000 | 48.9% |

## ACCESS link

Symposium Call Center Server can support a single ACCESS link that is used by the Symposium Call Center Server software to control voice processing on Meridian Mail voice ports. Voice services, such as Give Controlled Broadcast Open/Close Voice Session, are examples of controlled voice processing. A single ACCESS link supports up to 96 voice ports. This might limit Symposium Call Center Server performance by limiting the rate of calls that require Symposium Call Center Server control of voice processing.

Symposium Call Center Server voice services that do not require local voice port control (such as Give IVR) do not result in the ACCESS link usage and, therefore, are not subject to the 96 ports limitation. Additional voice ports might be required, however, to support these services.

**Note:** For the predefined workloads with SVP call model (see "Workload types" on page 295), it is estimated that Symposium Call Center Server requires 64 to 96 voice ports or more, depending on the call rate. See the detailed computations of ports in "Planning Meridian Mail requirements (Meridian 1 only)" on page 259.

# Chapter 8

# Planning Meridian 1 switch requirements

## In this chapter

# Meridian 1 switch requirements

## Supported software loads

You must use Meridian 1 Release 24 or 25 in conjunction with Symposium Call Center Server Release 4.0.

## Maximum achievable call rates

To determine the maximum achievable call rates for different Meridian 1 models, you must sum up all contributions resulting from both the call complexity and the MLS commands issued by CTI applications. You must also add 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. For more information, refer to your switch documentation.

## 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, such as SMI. 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 Networked ACD.

## 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.

# 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.

## Number of servers supported

A single DMS/MSL-100 can support up to 16 Symposium Call Center Server systems. Each Symposium Call Center Server system must be engineered independently of each other, but the DMS/MSL-100 must be engineered as a shared resource.

## 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 Symposium Call Center Servers. 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/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 191 and "External IVR traffic impact on the ELAN" on page 199. 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.

# 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 Symposium Call Center Server 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 158)
- MLS traffic on the ELAN (see "MLS traffic on the ELAN" on page 187)
- and MLS traffic on the CLAN (see "MLS traffic impact on the CLAN" on page 216)

# Audio routes

## Audio route requirements

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

## CDNs

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 only supports 1000 active agents, with active calls and 3000 waiting calls. Therefore, the maximum number of waiting calls must be less than or equal to 3000. For 3000 waiting calls, you require six CDNs. Therefore, the maximum number of CDNs required is six.

# Chapter 10

# Other guidelines

## In this chapter

# Symposium Call Center Server client

## Client hardware configuration

To avoid performance and reliability problems, the minimum recommended Symposium Call Center Server client hardware configuration consists of an Intel Pentium 90 MHz PC with the following hardware features:

- 32 Mbytes of RAM (Windows 95 and Windows 98) or 64 Mbytes of RAM (Windows NT 4.0 Workstation or Windows 2000 Professional)
- hard drive with 1 Gbyte available
- 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 90 with 32 Mbytes of RAM might be sufficient for small sites managing a small number of objects (less than 100) at once and generate simple reports. A faster system is recommended for managing large numbers of objects (greater than 1000) and generating large reports.
- The generation of large call-by-call (CBC) reports can require up to 1 Gbyte of free disk space and can take up to two hours to produce with a Pentium 90 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 Windows 95, Windows 98, Windows NT 4.0 Workstation, or the Windows 2000 Professional operating system. The following table shows 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 NT 4.0 Workstation | 16 Mbytes | 100 Mbytes | 130 Mbytes |
| Windows 2000 Professional | 16 Mbytes | 100 Mbytes | 130 Mbytes |

**Note:** Report generation on a Windows NT 4.0 or Windows 2000 Professional 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. It is recommended that at least 100 Mbytes of free disk be available at run time, on the drive where the swapfile is located.

**Temporary files**

The creation of reports 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. It is important that a client system with enough capacity is used to generate whatever report is being run. See "Client hardware configuration" on page 284.

# Routers

## Introduction

A router is required for networked Symposium Call Center Servers to isolate CLAN and ELAN traffic. The router ensures that traffic bound for one LAN does not appear on the other.

## Configuring routers

Customers must ensure that ELAN traffic never traverses a CLAN and CLAN traffic never traverses an ELAN.

**Note:** This restriction applies to both networked and non-networked (nodal) environments.

A router can also route traffic between the Symposium Call Center Server nodes. In addition, a router is required for remote administrator logons. Any router that supports IP routing and is capable of handling the traffic required can be used.

A set of routers might also be required to support configurations where the DMS/MSL-100 and Symposium Call Center Server are in separate physical locations. A set of routers with a WAN connection can provide a connection between the customer's Symposium Call Center Server system and the DMS/MSL-100. Any router that supports IP routing and is capable of handling the ELAN traffic can be used.

# Interactive Voice Response

## Meridian 1 external IVR system

Refer to the engineering guidelines for the external IVR system to properly configure the external IVR system and the Meridian 1. 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 the Symposium Call Center Server. Because of limited CTI support in Release 3.0, 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 pertain to digital transfer.

# Uninterruptible Power Supply

## Introduction

Nortel Networks recommends the use of an Uninterruptible Power Supply (UPS) with the 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 the Symposium Call Center Server must meet the following requirements:

### Requirements

Provides at least ten minutes of power to stop all services and shut down the server (to calculate power requirements, see page 291)

Uses an Ethernet SNMP interface

Physically fit 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 NT 4.0 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.

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 might need to install a network hub.

- The LAN to which you connect the UPS must be an Ethernet LAN. If your server is connect 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 ten 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.

# Appendix A

# 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

## 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 |
| 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 |

| Parameter | Entry | Small | Medium | Large | UprEnd |
|---|---|---|---|---|---|
| **Call resources parameters** | | | | | |
| Number of IVR queues | 5 | 10 | 20 | 30 | 50 |
| Number of IVR ports | 10 | 50 | 100 | 250 | 750 |
| 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 (Meridian 1) | 60 | 300 | 600 | 1500 | 3000 |
| Number of CDNs | 8 | 8 | 15 | 75 | 240 |
| Number of RAN and music routes | 30 | 40 | 50 | 100 | 250 |
| Number of DNISs (Meridian 1) | 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% |
| **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 (Meridian 1) | 1 | 4 | 12 | 16 | 24 |

| Parameter | Entry | Small | Medium | Large | UprEnd |
|---|---|---|---|---|---|
| Average number of nodes per network skillset (Meridian 1) | 1 | 2 | 3 | 4 | 6 |
| Average number of trunks per trunk route (Meridian 1) | 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 | | | | |

### Networking parameters (Meridian 1 only)

### Global networking parameters

| Parameter | Entry | Small | Medium | Large | UprEnd |
|---|---|---|---|---|---|
| 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

| Parameter | Entry | Small | Medium | Large | UprEnd |
|---|---|---|---|---|---|
| Proportion of all incoming network calls that are presented to agents at the local node | 100% | 50% | 25% | 17% | 3% |

| Parameter | Entry | Small | Medium | Large | UprEnd |
|---|---|---|---|---|---|
| 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 |
| 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 (Meridian 1) | 5 | 10 | 20 | 30 | 50 |
| Number of rows per route RTD (Meridian 1) | 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 |

| Parameter | Entry | Small | Medium | Large | UprEnd |
|---|---|---|---|---|---|
| Number of rows of IVR statistics (Meridian 1) | 5 | 10 | 20 | 30 | 50 |
| Number of rows of route statistics (Meridian 1) | 128 | 128 | 128 | 250 | 250 |

**Note:** These workloads do not include descriptions of typical use of Symposium Call Center Server data extraction. Each installation can have very different requirements.

## 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 |

| Parameter | Value |
|---|:---:|
| The number of streams sent for statistic i | 2 |
| The RSM packet size | 64K |
| **Event interface parameters (Meridian 1 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 |
| **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 |
| umber 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% |

| Parameter | Value |
|---|---|
| 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 |
| 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 |

| Parameter | Value |
|---|---|
| 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 (Meridian 1 only)** | |
| Proportion of network CBC data that is collected at the local node when it is a destination node | 100% |
| 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% |
| AcctualNetworkingNetw | 80% |
| Average number of network skillset queues entered per network call | 2 |
| Routing table update interval | 5 |
| **Voice services (Meridian 1 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 |

| Parameter | Value |
|---|---|
| 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 used:

### 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 (Meridian 1 Only)
- Route Performance (Meridian 1 Only)
- IVR Queue Statistics (Meridian 1 Only)
- IVR Port Statistics (Meridian 1 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 call models
The following call complexity models apply to the Meridian 1 switch:

- **SVP** (Symposium Voice Processing)—This call model includes basic call, queuing to two skillsets, and applying voice services controlled by the

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 (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 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 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:

| Parameter | Meridian 1 | | | DMS/MSL-100 | |
|---|---|---|---|---|---|
| | **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 |
| 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 |

| Parameter | Meridian 1 | | | DMS/MSL-100 | |
| | SVP | MVP | Hybrid | Simple | Complex |
|---|---|---|---|---|---|
| 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 |
| 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 |

| Parameter | Meridian 1 | | | DMS/MSL-100 | |
|---|---|---|---|---|---|
| | SVP | MVP | Hybrid | Simple | Complex |
| 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 is 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 only)

For the purposes of the Symposium Call Center Server performance evaluation, two typical local outbound call models are defined. These models apply to calls that originate from the local node. Unlike the inbound case, the outbound models are only available for the Meridian 1, because of the limited Meridian Link Services Manager (MLSM) features for the DMS/MSL-100 switch.

**Note:** The only MLINK 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 might 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:

| Successful outbound calls (Out Call) | Unsuccessful outbound calls *aAttPerOutCall* | |
|---|---|---|
| | Connected | Not Connected *pUCallsNCon* = Not connected calls / Unsuccessful calls |

### Example

If aAttPerOutCall = 4, then to generate an outbound rate of 5000 CPH, it would be necessary to have a total of 25 000 call attempts (5000 successful and 20 000 unsuccessful) predictive dialing call attempts. 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 above 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 various call services per call type. These numbers are summarized in the following table:

| Parameter | Symposium Call Center Server Meridian 1 | |
|---|---|---|
| | Predictive dialing | CTI application |
| Basic Call | 1 | 1 |
| pTransferOut | 0% | 0% |
| pConferenceOut | 0% | 0% |
| aAttPerOutCall | 4 | 4 |

| Parameter | Symposium Call Center Server Meridian 1 | |
| --- | --- | --- |
| | Predictive dialing | CTI application |
| 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

| Call rate (CPH) Peak/Daily | Disk space required (Gbytes) | | | | |
|---|---|---|---|---|---|
| | **Entry** | **Small** | **Medium** | **Large** | **UpperEnd** |
| 1000/500 | 4.2 | 5.3 | 6.9 | 14.0 | 34.4 |
| 5000/2500 | 6.6 | 6.6 | 7.6 | 15.1 | 35.8 |
| 10 000/5000 | 9.6 | 9.6 | 9.6 | 15.8 | 37.0 |
| 15 000//7500 | 12.6 | 12.6 | 12.6 | 16.3 | 38.0 |
| 20 000/10 000 | 15.6 | 15.6 | 15.6 | 16.7 | 39.0 |
| 25 000/12 500 | 18.6 | 18.6 | 18.6 | 18.6 | 39.9 |

# 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 switch

The following table shows system performance limits for the Meridian 1 switch with different mean holding times (MHT):

| Processor | MHT (Minutes) | SVP Call Model | | MVP Call Model | | Hybrid Call Model | |
|---|---|---|---|---|---|---|---|
| | | Agents | PeakCallRate (CPH) | Agents | PeakCallRate (CPH) | Agents | PeakCallRate (CPH) |
| PP200 | 2 | 75 | 2250 | 140 | 4200 | 120 | 3600 |
| | 3 | 95 | 1900 | 160 | 3200 | 140 | 2800 |
| | 4 | 105 | 1575 | 175 | 2625 | 150 | 2250 |
| PII450 | 2 | 175 | 1250 | 320 | 9600 | 275 | 8250 |
| | 3 | 225 | 4500 | 350 | 7000 | 320 | 6400 |
| | 4 | 250 | 3750 | 375 | 5625 | 345 | 5175 |
| PIII500 | 2 | 240 | 7200 | 420 | 12 600 | 360 | 10 800 |
| | 3 | 290 | 5800 | 470 | 94 010 | 420 | 8400 |
| | 4 | 340 | 5100 | 500 | 7500 | 450 | 6750 |

| Processor | MHT (Minutes) | SVP Call Model | | MVP Call Model | | Hybrid Call Model | |
|---|---|---|---|---|---|---|---|
| | | Agents | PeakCallRate (CPH) | Agents | PeakCallRate (CPH) | Agents | PeakCallRate (CPH) |
| PIII650 | 2 | 320 | 9600 | 570 | 17 100 | 490 | 14 700 |
| | 3 | 400 | 8000 | 640 | 12 800 | 560 | 11 200 |
| | 4 | 460 | 6900 | 670 | 10 050 | 610 | 9150 |
| 2PIII500 | 2 | 350 | 10 500 | 610 | 18 300 | 540 | 16 200 |
| | 3 | 440 | 8800 | 680 | 13 600 | 610 | 12 200 |
| | 4 | 500 | 7500 | 720 | 10 800 | 660 | 9900 |
| PIII1.0B | 2 | 460 | 13 800 | 800 | 24 000 | 680 | 20 400 |
| | 3 | 575 | 11 500 | 880 | 17 600 | 790 | 15 800 |
| | 4 | 650 | 9750 | 940 | 14 100 | 850 | 12 750 |

The following table shows the system performance limits for the Meridian 1 switch with different RTD refresh rates. The MHT is assumed to be three minutes:

| Processor | MHT (Minutes) | SVP Call Model | | MVP Call Model | | Hybrid Call Model | |
|---|---|---|---|---|---|---|---|
| | | Agents | PeakCallRate (CPH) | Agents | PeakCallRate (CPH) | Agents | PeakCallRate (CPH) |
| PP200 | 2/3 | 90 | 1800 | 130 | 2600 | 120 | 2400 |
| | 3/5 | 100 | 2000 | 150 | 3000 | 130 | 2600 |
| | 4/10 | 100 | 2000 | 160 | 3200 | 150 | 3000 |
| PII450 | 2/3 | 180 | 3600 | 250 | 5000 | 240 | 4800 |
| | 3/5 | 200 | 4000 | 310 | 6200 | 280 | 5600 |
| | 4/10 | 220 | 4400 | 360 | 7200 | 320 | 6400 |

| Processor | MHT (Minutes) | SVP Call Model | | MVP Call Model | | Hybrid Call Model | |
|---|---|---|---|---|---|---|---|
| | | Agents | PeakCallRate (CPH) | Agents | PeakCallRate (CPH) | Agents | PeakCallRate (CPH) |
| PIII500 | 2/3 | 240 | 4800 | 330 | 6600 | 300 | 6000 |
| | 3/5 | 260 | 5200 | 380 | 7600 | 350 | 7000 |
| | 4/10 | 290 | 5800 | 475 | 9500 | 420 | 8400 |
| PIII650 | 2/3 | 320 | 6400 | 430 | 8600 | 390 | 7800 |
| | 3/5 | 360 | 7200 | 520 | 10 400 | 480 | 9600 |
| | 4/10 | 410 | 8200 | 640 | 12 800 | 570 | 11 400 |
| 2PIII500 | 2/3 | 340 | 6800 | 460 | 9200 | 430 | 8600 |
| | 3/5 | 380 | 7600 | 560 | 11 200 | 510 | 10 200 |
| | 4/10 | 440 | 8800 | 680 | 13 600 | 620 | 12 400 |
| PIII1.0B | 2/3 | 440 | 8800 | 570 | 11 400 | 540 | 10 800 |
| | 3/5 | 510 | 10 200 | 710 | 14 200 | 650 | 13 000 |
| | 4/10 | 570 | 11 400 | 890 | 17 800 | 800 | 16 000 |

## System performance limits for the DMS/MSL-100 switch

The following table shows the system performance limits for the DMS/MSL-100 switch with different mean holding times (MHT):

| Processor | MHT (Minutes) | Simple Call Model | | Complex Call Model | |
|---|---|---|---|---|---|
| | | Agents | PeakCallRate (CPH) | Agents | PeakCallRate (CPH) |
| 2PIII500 | 2 | 650 | 19 500 | 610 | 18 300 |
| | 3 | 710 | 14 200 | 670 | 13 400 |
| | 4 | 750 | 11 250 | 720 | 10 800 |
| PIII1.0B | 2 | 840 | 25 200 | 780 | 23 400 |
| | 3 | 920 | 18 400 | 870 | 17 400 |
| | 4 | 960 | 14 400 | 930 | 13 950 |

The following table shows the system performance limits for the DMS/MSL-100 switch with different RTD refresh rates. The MHT is assumed to be three minutes:

| Processor | RTD Refresh Rates (Seconds) | Simple Call Model | | Complex Call Model | |
|---|---|---|---|---|---|
| | | Agents | PeakCallRate (CPH) | Agents | PeakCallRate (CPH) |
| 2PIII500 | 2/3 | 470 | 9400 | 460 | 9200 |
| | 3/5 | 570 | 11 400 | 560 | 11 200 |
| | 4/10 | 720 | 14 400 | 680 | 13 600 |
| PIII1.0B | 2/3 | 580 | 11 600 | 570 | 11 400 |
| | 3/5 | 730 | 14 600 | 710 | 14 200 |
| | 4/10 | 930 | 18 600 | 890 | 17 800 |

# 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
- Meridian Link 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.

**Notes:**

- ELAN utilization should not exceed 10 percent for the Meridian 1 switch or 30 percent for the DMS/MSL-100 switch.
- NCC traffic can be routed over the CLAN. The examples assume that NCC traffic is routed over the ELAN.

## MVP Call Model

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% |
| 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

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
- non-Symposium Call Center Server customer traffic (not included)

**Note:** CLAN utilization should not exceed ten percent.

## CLAN utilization for real-time display traffic (MVP call model)

### CLAN utilization per workload (%)

| Call rate | Entry | Small | Medium | Large | UpperEnd |
|---|---|---|---|---|---|
| 1000 | <1% | <1% | <1% | 3.2% | 13.0% |
| 5000 | <1% | <1% | <1% | 3.2% | 13.0% |
| 10 000 | <1% | <1% | <1% | 3.2% | 13.0% |
| 15 000 | <1% | <1% | <1% | 3.2% | 13.0% |
| 20 000 | <1% | <1% | <1% | 3.2% | 13.0% |
| 25 000 | <1% | <1% | <1% | 3.2% | 13.0% |

**Note:** Utilization is identical for the SVP and MVP call models.

## CLAN utilization for real-time API traffic (MVP call model)

### Real-time Data API CLAN requirements per workload

| Call rate (CPH) | Entry | Small | Medium | Large | UpperEnd |
|---|---|---|---|---|---|
| 1000 | <1% | <1% | <1% | 1.7% | 4.2% |
| 5000 | <1% | <1% | <1% | 1.7% | 4.2% |
| 10 000 | <1% | <1% | <1% | 1.7% | 4.2% |
| 15 000 | <1% | <1% | <1% | 1.7% | 4.2% |
| 20 000 | <1% | <1% | <1% | 1.7% | 4.2% |
| 25 000 | <1% | <1% | <1% | 1.7% | 4.2% |

## CLAN utilization for Graphical Real-time Display traffic (MVP call model)

**GRTD CLAN requirements per workload**

| Call rate | Entry | Small | Medium | Large | UpperEnd |
|-----------|-------|-------|--------|-------|----------|
| 1000      | <1%   | <1%   | <1%    | 1.5%  | 3.9%     |
| 5000      | <1%   | <1%   | <1%    | 1.5%  | 3.9%     |
| 10 000    | <1%   | <1%   | <1%    | 1.5%  | 3.9%     |
| 15 000    | <1%   | <1%   | <1%    | 1.5%  | 3.9%     |
| 20 000    | <1%   | <1%   | <1%    | 1.5%  | 3.9%     |
| 25 000    | <1%   | <1%   | <1%    | 1.5%  | 3.9%     |

## CLAN utilization for Real-time Statistics Multicast (RSM) (Meridian 1 Call Model)

**RSM CLAN Requirements per Workload**

| Call rate | Entry | Small | Medium | Large | UpperEnd |
|-----------|-------|-------|--------|-------|----------|
| 1000      | <1%   | <1%   | <1%    | 1.8%  | 4.3%     |
| 5000      | <1%   | <1%   | <1%    | 1.8%  | 4.3%     |
| 10 000    | <1%   | <1%   | <1%    | 1.8%  | 4.3%     |
| 15 000    | <1%   | <1%   | <1%    | 1.8%  | 4.3%     |
| 20 000    | <1%   | <1%   | <1%    | 1.8%  | 4.3%     |
| 25 000    | <1%   | <1%   | <1%    | 1.8%  | 4.3%     |

## CLAN utilization for Symposium Event Interface (SEI) (Meridian 1 Call Model)

**RSM CLAN Requirements per Workload**

| Call rate | Entry | Small | Medium | Large | UpperEnd |
|---|---|---|---|---|---|
| 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% |

## CLAN utilization for Host Data Exchange

| 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% |

# 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
- ten percent of calls are networked out.

| Number of nodes | Disk space required (Gbytes) |
|:---:|:---:|
| 2 | 8 |
| 4 | 10 |
| 6 | 11 |
| 10 | 13 |
| 20 | 13 |
| 30 | 13 |

**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 B

# 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**

| 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 4 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 1 and 2 or 14

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 1

### Event table sizes

**Table 2   Symposium Call Center Server event tables**

| Table name | Row size ANSI (KB) | 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
```

The computations below use parameters CallsPerInterval and CallsPerDay. These parameters represent the average number of calls processed by the 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   Symposium Call Center Server interval stat tables (number of records per interval)**

| Table name | Row size ANSI (KB) | 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 |
| 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)) |

**Table 3   Symposium Call Center Server interval stat tables (number of records per interval)**

| Table name | Row size ANSI (KB) | Number of rows computations |
|---|---|---|
| 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   Symposium Call Center Server temp interval stat tables (number of records per interval)**

| Table name | Row size ANSI (KB) | 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) |
| NItIVRPortStat | 0.056 | nIVRPorts |
| NItIVRStat | 0.047 | min(CallsPerInterval, nIVRQ) |
| NItNetworkInCallStat | 0.056 | min(NetInCallsPerInterval, nApplications * (nNetNodes - 1)) |

**Table 4  Symposium Call Center Server temp interval stat tables (number of records per interval)**

| Table name | Row size ANSI (KB) | Number of rows computations |
|---|---|---|
| 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  Symposium Call Center Server Daily stat tables (number of records per day)**

| Table name | Row size ANSI (KB) | 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 |
| NIdDNISStat | 0.099 | min(CallsPerDay, nDNIS) |
| NIdIVRPortStat | 0.063 | nIVRPorts |
| NIdIVRStat | 0.067 | nIVRQ |

**Table 5   Symposium Call Center Server Daily stat tables (number of records per day)**

| Table name | Row size ANSI (KB) | Number of rows computations |
|---|---|---|
| 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   Symposium Call Center Server weekly stat tables (number of records per week)**

| Table Name | Row size ANSI (KB) | 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 |
| NIwNetworkInCallStat | 0.067 | nApplications * (nNetNodes - 1) |

**Table 6   Symposium Call Center Server weekly stat tables (number of records per week)**

| Table Name | Row size ANSI (KB) | Number of Rows computations |
|---|---|---|
| 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   Symposium Call Center Server monthly stat tables (number of records per month)**

| Table name | Row size ANSI (KB) | 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    Symposium Call Center Server monthly stat tables (number of records per month)**

| Table name | Row size ANSI (KB) | Number of rows computations |
|---|---|---|
| NImNetworkOutStat | 0.059 | nApplications * (nNetNodes - 1) |
| NImRANMusicRouteStat | 0.020 | nRMRoutes |
| NImRouteStat | 0.027 | nRoutes |
| NImSkillsetStat | 0.069 | nSkillsets * aAppl_Skill + nNetSkillsets * aAppl_NetSkill * aNodes_NetSkill |
| NImTrunkStat | 0.039 | nTrunks * aTrunk_Routes |

**Table 8    Symposium Call Center Server configuration tables**

| Table name | Row size ANSI (KB) | Number of rows computations |
|---|---|---|
| NIActivityCode | 0.092 | nActCodes |
| NIAgentByTaskFlow | 0.038 | nAgents * nScripts |
| NIAgentByTaskFlowVariable | 0.027 | nAgents * nScripts * nTFVarsPerTF |
| NIApplication | 0.048 | nApplications |
| NIApplicationByTaskFlow | 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 |
| NIIVRPort | 0.117 | nIVRPorts |
| NIIVRQueue | 0.075 | nIVRQ |
| NINCCConfig | 0.035 | nCustomers |

**Table 8   Symposium Call Center Server configuration tables**

| Table name | Row size ANSI (KB) | Number of rows computations |
|---|---|---|
| NINCCNetworkSkillset | 0.105 | nNetSkillsets |
| NINCCNetworkSkillsetBySite | 0.022 | nNetSkillsets * nNetNodes |
| NINCCRanking | 0.030 | nNetNodes * (nNetNodes-1) * nNetSkillsets |
| NINCCRankingAssign | 0.128 | nNetNodes * nNetSkillsets * pBatchAssignFactor/100 |
| NINCCRankingAssignData | 0.018 | (nNetNodes * nNetSkillsets * pBatchAssignFactor/100) * (nNetNodes * nNetSkillsets * 20) |
| NINCCRemoteApplication | 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 |
| NISkillset | 0.150 | nSkillsets |
| NISkillsetAssign | 0.125 | nTAgents * aSkill_Agent * pBatchAssignFactor/100 / 100 |
| NISkillsetAssignData | 0.030 | nTAgents * aSkill_Agent * pBatchAssignFactor/100 |

**Table 8   Symposium Call Center Server configuration tables**

| Table name | Row size ANSI (KB) | Number of rows computations |
|---|---|---|
| NISkillsetByAgent | 0.033 | nTAgents * aSkill_Agent * 1.5 |
| NISkillsetByTaskFlow | 0.016 | (nSkillsets  * nScripts) / aAppl_Skill |
| NISkillsetByTaskFlowVariable | 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 |
| NITaskFlowVariableByTaskFlow | 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 |
| 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 3K 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 rows 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, "Symposium Call Center Server Daily stat tables (number of records per day)."

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, "Symposium Call Center Server Daily stat tables (number of records per day)."

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 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 32K[1]. Therefore, the computations for these tables are

  `MAX(32,NumberOfRecords(<table>)*<RowSize>)`

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 343.

       1.  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.

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 C

# 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 as well as the number of views that each report is based on. 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 | Meridian 1 | | | 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**

| Title | Meridian 1 | | | 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 | | |
| **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 |
| Application Performance | 61 | 12 | 1 | 61 | 12 | 1 |

**Table 9   Symposium Call Center Server standard reports**

| Title | Meridian 1 | | | DMS/MSL-100 | | |
|---|---|---|---|---|---|---|
| | Bytes per row | Columns | Views | Bytes per row | Columns | Views |
| 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 |
| Agent Performance by Supervisor | 469 | 51 | 1 | 445 | 45 | 1 |

**Table 9   Symposium Call Center Server standard reports**

| Title | Meridian 1 | | | 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 | | |
| **Weekly 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 |

**Table 9   Symposium Call Center Server standard reports**

| Title | Meridian 1 | | | DMS/MSL-100 | | |
|---|---|---|---|---|---|---|
| | Bytes per row | Columns | Views | Bytes per row | Columns | Views |
| 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 |
| DNIS Statistics | 130 | 20 | 1 | 122 | 18 | 1 |

**Table 9   Symposium Call Center Server standard reports**

| Title | Meridian 1 | | | DMS/MSL-100 | | |
|---|---|---|---|---|---|---|
| | Bytes per row | Columns | Views | Bytes per row | Columns | Views |
| 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 |
| Agent Performance Calls Answered Bottom 5 | 461 | 49 | 1 | 445 | 45 | 1 |

**Table 9   Symposium Call Center Server standard reports**

| Title | Meridian 1 | | | DMS/MSL-100 | | |
|---|---|---|---|---|---|---|
| | Bytes per row | Columns | Views | Bytes per row | Columns | Views |
| 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 | | |
| Network Outgoing Calls | 105 | 8 | 1 | N/A | | |
| Network Route Performance | 53 | 8 | 1 | N/A | | |

**Table 9   Symposium Call Center Server standard reports**

| Title | Meridian 1 | | | DMS/MSL-100 | | |
|---|---|---|---|---|---|---|
| | Bytes per row | Columns | Views | Bytes per row | Columns | Views |
| 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 |
| DNIS Statistics | 77 | 7 | 1 | 77 | 7 | 1 |
| Network Incoming Calls | 45 | 6 | 1 | N/A | | |
| Network Outgoing Calls | 45 | 6 | 1 | N/A | | |

**Table 9   Symposium Call Center Server standard reports**

| Title | Meridian 1 | | | DMS/MSL-100 | | |
|---|---|---|---|---|---|---|
| | Bytes per row | Columns | Views | Bytes per row | Columns | Views |
| 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 | | |
| 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 | | |

**Table 9   Symposium Call Center Server standard reports**

| Title | Meridian 1 | | | DMS/MSL-100 | | |
|---|---|---|---|---|---|---|
| | Bytes per row | Columns | Views | Bytes per row | Columns | Views |
| 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 | | |
| **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 | | |

**Table 9  Symposium Call Center Server standard reports**

| Title | Meridian 1 | | | DMS/MSL-100 | | |
|---|---|---|---|---|---|---|
| | Bytes per row | Columns | Views | Bytes per row | Columns | Views |
| 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 D

# 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

$$Delay = \frac{\rho \cdot \left[ \dfrac{mb^2}{m^2} + (4e+2)a + 5a^2 + 4e(2e-1)a^2 \right]}{2 \cdot (1 - \rho(1 + (2e+1)\cdot a))} + \left( 1 + 2ea + \frac{a}{2} \right) - \frac{(1 - e^{-2a\rho}) \cdot \left[ \left( \dfrac{2}{\rho} + 2 \cdot \dfrac{a}{e} \right) - 6a \right]}{2 \cdot [(Fpe^{-\rho a - 1} - 1) + e^{-2\rho a}]}$$

**Note**: The derivation of this formula can be found in *Telecommunication Networks* by Mischa Schwartz, Addison-Wesley, 1987.

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. 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).

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. 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 metres, 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 metres) and smaller packet sizes. Beyond 3000 metres, the throughput limit with an Ethernet LAN is reduced, and longer transaction delays can be expected.

# Appendix E

# CPU utilization upper limits

## In this appendix

# Overview

## Introduction

This appendix presents the rationale for using 50 percent as the upper limit on CPU utilization for the configurations with 256 Mbytes of RAM.

# 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 login or logout 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 adhoc 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. It is also recommended 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.

## Reserve capacity

As for "burstiness" and unexpected loading, a good rule of thumb is to have 25 to 30 percent of capacity in reserve.

# 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 $\rho$ 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. Operating in this part of the curve is not recommended 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. What is desirable is to operate in the flatter part of the curve which is much less sensitive to load fluctuations keeping mean buffer sizes relatively constant. Seventy percent is a safe upper bound for this region. However, 50 percent allows for a larger margin of safety.

# 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. To minimize the impact of these functions on call processing, the use of these functions has been restricted. A number of recommendations are also made on how and when these functions should be used. Nortel Networks recommends against running two or more large non-steady state activities concurrently.

## 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-mass login and logout 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.

# Appendix F

# 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

Table 10 shows the high runner Command and Status Link (CSL) for example, setting up and taking down an IVR session, services along with the total sizes of the messages[1] 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.

**Table 10   CSL services (sizes include overhead)**

| Command and status link service | Variable name | Size (Bytes) |
|---|---|---|
| Setup Session | CSLSetupBytes | 82 |
| Release Session | CSLReleaseBytes | 25 |
| Total Session | CSL_Bytes_PerSession | 107 |

1. The sizes include the Overhead of 7 bytes per message.

# Access link calculations

## Introduction

Table 11 shows ACCESS services related to the scripts shown above along with the total sizes of the messages[1] 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*).

**Table 11   ACCESS services (sizes include overhead)**

| ACCESS Session Services | Size to MMail | Size from MMail | #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_MMail, from_MMail)) | | | 238 | 485 |

1. The sizes include the overhead and ACK per message.

# Appendix G

# Symposium Call Center Server database views

## In this appendix

# Symposium Call Center Server 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 12 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 12   Symposium Call Center Server views**

| View | Meridian 1 | | DMS/MSL-100 | |
|---|---|---|---|---|
| | Bytes per row | Columns | Bytes per row | Columns |
| **Configuration views** | | | | |
| AccessRights | 383 | 19 | 383 | 19 |
| ActivityCode | 62 | 2 | 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 | 4 | 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 |

**Table 12   Symposium Call Center Server views**

| View | Meridian 1 | | DMS/MSL-100 | |
|------|------------|--|-------------|--|
|      | **Bytes per row** | **Columns** | **Bytes per row** | **Columns** |
| IVRQueue | 126 | 6 | N/A | |
| 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 |
| 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 12   Symposium Call Center Server views**

| View | Meridian 1 | | 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 | 307 | 14 | 307 | 14 |
| iAgentByApplicationStat | 247 | 13 | 243 | 12 |
| iAgentBySkillsetStat | 253 | 15 | 249 | 14 |
| iAgentPerformanceStat | 513 | 68 | 487 | 60 |
| iApplicationStat | 443 | 174 | 435 | 171 |
| iCDNStat | 91 | 10 | 93 | 11 |
| iDNISStat | 151 | 25 | 147 | 23 |
| iIVRPortStat | 162 | 15 | 162 | 15 |
| iIVRStat | 108 | 18 | 108 | 18 |
| iNetworkInCallStat | 179 | 23 | N/A | |
| iNetworkOutStat | 175 | 21 | N/A | |

**Table 12   Symposium Call Center Server views**

| View | Meridian 1 | | 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 | 307 | 14 | 307 | 14 |
| dAgentByApplicationStat | 249 | 13 | 245 | 12 |
| dAgentBySkillsetStat | 257 | 15 | 253 | 14 |
| dAgentPerformanceStat | 587 | 68 | 555 | 60 |
| dApplicationStat | 739 | 174 | 727 | 171 |
| dCDNStat | 99 | 10 | 103 | 11 |
| dDNISStat | 177 | 25 | 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 | 307 | 14 | 307 | 14 |
| wAgentByApplicationStat | 249 | 13 | 245 | 12 |
| wAgentBySkillsetStat | 257 | 15 | 253 | 14 |
| wAgentPerformanceStat | 587 | 68 | 555 | 60 |

**Table 12   Symposium Call Center Server views**

| View | Meridian 1 | | DMS/MSL-100 | |
|---|---|---|---|---|
| | Bytes per row | Columns | Bytes per row | Columns |
| wApplicationStat | 739 | 174 | 727 | 171 |
| wCDNStat | 99 | 10 | 103 | 11 |
| wDNISStat | 177 | 25 | 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 | 307 | 14 | 307 | 14 |
| mAgentByApplicationStat | 249 | 13 | 245 | 12 |
| mAgentBySkillsetStat | 257 | 15 | 253 | 14 |
| mAgentPerformanceStat | 587 | 68 | 555 | 60 |
| mApplicationStat | 739 | 174 | 727 | 171 |
| mCDNStat | 99 | 10 | 103 | 11 |
| mDNISStat | 177 | 25 | 169 | 23 |
| mIVRPortStat | 168 | 15 | 168 | 15 |
| mIVRStat | 128 | 18 | 128 | 18 |
| mNetworkInCallStat | 189 | 23 | N/A | |
| mNetworkOutStat | 181 | 21 | N/A | |

**Table 12   Symposium Call Center Server views**

| View | Meridian 1 | | 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 H

# Abbreviations and acronyms

### In this appendix

# Abbreviations and acronyms

| Abbreviation/<br>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 |
| CSL | Command and Status Link |
| CSMA/CD | Carrier Sense Multiple Access/Collision Detection |
| CTI | Computer Telephony Interface |
| DAT | Digital Audio Tape |
| DMS | Digital Multiplexor Switch |

| Abbreviation/ acronym | Expanded name |
| --- | --- |
| 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 |
| IVR | Interactive Voice Response |

| Abbreviation/ acronym | Expanded name |
|---|---|
| M1 | Meridian 1 |
| 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 |
| ODBC | Open Database Connectivity |
| PBX | Private Branch Exchange |

| Abbreviation/acronym | Expanded name |
|---|---|
| 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 | Transport Control Protocol/Internet Protocol |
| TN | Terminal Number |
| UART | Universal Asynchronous Receiver Transmittal |

| Abbreviation/<br>acronym | Expanded name |
|---|---|
| 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 the Symposium Call Center Server and Meridian Mail.

**ACCESS voice port**

A Meridian Mail 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 the Symposium Call Center Server. Resources must be configured with matching values on both the switch and the 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 maintaining the Symposium Call Center Server.

**agent**

A user who is responsible for handling customer calls.

**agent login ID**

A unique identification number assigned to a particular agent. The agent uses this number when logging in. 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 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.

### Automatic call distribution directory number
Primary and supplementary DNs associated with an ACD group. Calls made to these DNs 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 the 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 calls can be presented to an agent whose secondary DN is active, 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

This is 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.

### 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.

**Customer local area network**

The LAN to which your corporate services and resources connect. The 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 the 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
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 DMS/MSL-100 server 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. A DLL can be used by several applications at the same time.

# E

### ELAN
*See* embedded local area network.

### embedded local area network
A dedicated Ethernet TCP/IP LAN that connects the 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 the 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 Redundant Array of Inexpensive Disks.

# 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. The value of a global variable can only be changed in the Script Variable Properties sheet. It cannot be changed in a script. *See also* call variable, script 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 login or logout. 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 numbers separated by periods. Each number 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* mathematical expression, Redundant Array of Inexpensive Disks.

# M

### M1
Meridian 1 switch

### master script
The first script executed when a call arrives at the 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* logical expression, Redundant Array of Inexpensive Disks.

### 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.

### 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

1. A unique identifier for a phoneset, used by the switch to route calls to the phoneset. 2. 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.

**Redundant Array of Inexpensive Disks**
A category of disk drives that employs two or more drives in combination for fault tolerance and performance.

**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* 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.

### 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. The 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 set of protocols for managing complex networks. SNMP works by sending messages, called protocol data units (PDUs), to different parts of a network and then analyzing the responses.

### 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, for example.

### 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 the 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 This script 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* Transport 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, and 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, and 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.

### Transport 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 also* 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 the Symposium Call Center Server.

### 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 the Symposium Call Center Server.

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# Nortel Networks Symposium Call Center Server
## Planning and Engineering Guide

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