



Dragon Medical Enterprise Network Edition

Service Pack 2

Planning and Deployment Guide



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Chapter 1: Getting Ready

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What's new in Dragon Medical Enterprise Network Edition Service Pack 2

Service Pack 2 introduces many server-side enhancements and features for administrators. See the following sections for details:

- [Upgrading Dragon Medical Enterprise Network Edition](#)
- [Managing speech nodes and optimization](#)
- [Managing user profiles and users](#)
- [Managing databases](#)
- [Managing audit events](#)
- [Job log filenames](#)
- [Using the Nuance Management Console](#)

Upgrading Dragon Medical Enterprise Network Edition	
Upgrading to Service Pack 2	<p>Upgrading the Profile Optimizer Server and Speech Nodes, Before you upgrade to Service Pack 2, you must uninstall your current Profile Optimizer server and Speech nodes. The existing Profile Optimizer database and logs should not be deleted. Please note that uninstalling the server and the speech nodes does not delete the existing database and log files for the Profile Optimizer.</p> <p>Before you uninstall a Speech Node, make sure to terminate the <code>Nuance.Co-nversionServer.ClientApp.exe</code> process using Task Manager. Please note that as of Service Pack 2, DMENE does not include the <code>Nuance.Co-nversionServer.ClientApp.exe</code> process. In any future upgrades from DMENE Service Pack 2 to a newer version of the product, you will not need to close the <code>Nuance.Co-nversionServer.ClientApp.exe</code> process.</p> <p>Upgrading the Profile Optimizer database If you are upgrading from DMENE 10.1 or SP 1, the upgrade process updates the Profile Optimizer database.</p>
Managing speech nodes and optimization	
Assign groups of speech nodes to a user profile location	<p>You can place speech nodes into groups, called speech node collections, and assign each collection to a user profile location in a site. The speech nodes in the collection</p>

	<p>perform optimization tasks on the profiles that are in the profile location.</p> <p>Placing speech nodes into a collection is an optional configuration. It allows you to organize speech nodes based on the location of user profiles in a site.</p> <p>You can assign one speech node collection to each user profile location. You can assign a speech node to one speech node collection. See "Configuring Speech node collections" in the <i>Nuance Management Server Administrator Guide</i> for details.</p>
<p>Auto-management of optimization based on the amount of acoustic data</p>	<p>When a speech node receives an ACO task, the node checks to see if the user profile contains enough acoustic data for optimization. The profile must have at least 15 minutes of new acoustic data for the speech node to run the ACO task. Prior to DMENE Service Pack 2, 4 minutes was the minimum amount of new acoustic data required to run ACO. See "Auto-checking the amount of new acoustic data before running optimization" in the <i>Nuance Management Server Administrator Guide</i> for details.</p>
<p>NMS and the Profile Optimizer Server share the same account</p>	<p>When you set up the NMS server, you no longer enter a login and password for an account the NMS can use to access the Profile Optimizer Server. The Profile Optimizer Server now runs under the same account as the NMS server. In the NMC, the following fields no longer appear under System Settings:</p> <ul style="list-style-type: none"> • Profile Optimizer Server login • Profile Optimizer Server password • Confirm password
<p>Viewing messages about tasks that fail</p>	<p>Administrators with the 'Dragon – Able to view Profile Optimizer task failure messages' right can view messages and information about tasks that fail. See "Setting Security Rights for NMC Administrator groups in Details" in the <i>Nuance Management Server Administrator Guide</i> for more details about security rights in the Nuance Management Console.</p>
<p>View information for specific Profile Optimizer tasks</p>	<p>You can display information for specific Profile Optimizer tasks. You enter search filter criteria into fields in the Profile Optimizer Tasks screen to refine the list of tasks that display. See "Searching and filtering Profile Optimizer task details" in the <i>Nuance Management Server Administrator Guide</i> for more information.</p>

<p>Profile Optimizer Server run under one windows service</p>	<p>Prior to DMENE Service Pack 2, the Profile Optimizer Server ran the following Windows Services:</p> <ul style="list-style-type: none"> • <i>Profile Optimizer Core Services</i> • <i>Profile Optimizer Host Manager</i> • <i>Profile Optimizer NMS Integration Service</i> <p>To streamline installations, troubleshooting, and logging, DMENE Service Pack 2 consolidates the three services into a single Windows service for the Profile Optimizer Server called the <i>Profile Optimizer Server service</i>.</p> <p>The <i>Profile Optimizer Server service</i> combines the functionality of the above three services:</p> <ul style="list-style-type: none"> • Polling the NMS for new tasks • Scheduling tasks that are scheduled to run periodically • Distributing tasks to speech nodes • Monitoring jobs and speech nodes to ensure that they are communicating with the Profile Optimizer Server <p>The <i>Profile Optimizer Server service</i> combines all logging into a single log file called <i>POService.txt</i>. The server creates the <i>POService.txt</i> file in the Logs folder that you specify when you install the Profile Optimizer Server.</p> <p>The consolidation Windows services means that only the following firewall ports need to be open:</p> <ul style="list-style-type: none"> • 905: A TCP/IP port that the NMS uses to communicate with the Profile Optimizer Server • 8001: A TCP/IP port that the speech node uses to communicate with the Profile Optimizer Server. The speech Node uses the HTTP protocol over this port. <p>The Profile Optimizer Server installation process opens the firewall ports.</p>
<p>Immediate processing of tasks</p>	<p>When the NMS server attempts to start an immediate ACO or LMO task for a user, and a job for that user and task type is already scheduled (either waiting to run for the first time, or in the postponed state), the NMS server updates the job parameters.</p> <p>If the job is in the postponed state, the NMS server sets the job to run as soon as possible, rather when the postponed state expires.</p>
<p>View information about the success or failure of optimization tasks</p>	<p>The Profile Optimizer Tasks screen contains new columns</p>

	including the Reason column that displays information about why a task was postponed or did not complete. See "Viewing Profile Optimizer task details" in the <i>Nuance Management Server Administrator Guide</i> for more information.
Managing user profiles and users	
Only non-corrupt user profiles receive medication updates	The Profile Optimizer Server only applies medication updates to non-corrupt user profiles. Before it applies a medication update, the server verifies that the user profile is associated with a vocabulary and a dictation source. See "Applying medication updates to clients" in the <i>Nuance Management Server Administrator Guide</i> for details.
Save or export a user profile before deleting a user account	When you attempt to delete a user account that is associated with a master user profile, the NMC displays a dialog box that lets you delete the account and the profile at the same time or delay the delete action until you export the profile. See "Deleting a user account" in the <i>Nuance Management Server Administrator Guide</i> for details.
View the adaptation status for a user profile	You may want to manage the load on the Profile Optimizer when the ACO process runs on user profiles. You can view the adaptation status of user profiles that have gone through or are currently in adaptation. See "View the adaptation status for a profile" in the <i>Nuance Management Server Administrator Guide</i> for details.
Import multiple users into the NMS server	<p>You can use the Import Users wizard to import multiple users at one time into the NMS server. You can also assign user account types and licenses to the users and assign the users to specific Groups.</p> <p>To import multiple users at one time, you must perform the following two main tasks:</p> <ol style="list-style-type: none"> i. Create a comma-delimited text file or an XML file that contains information about the users, including user names and passwords. ii. Use the file to import users into the Nuance Management Server. <p>See "Import multiple users into the NMS server" in the <i>Nuance Management Server Administrator Guide</i> for details.</p>
View user logout information	When a user logs out of Dragon, Dragon sends a 'session end' message to the Nuance Management Server. This message contains the user account name and the date and time when the user logged out of Dragon. Administrators can view this information in the Nuance Management Console under Utilities > Audit Events .

View information about users that experience vSync connection timeouts	NMS Administrators can now receive notification when a Dragon client cannot establish a vSync connection to a Citrix server. Administrators can use a vSync timeout notification tool, a stand-alone command line tool, to receive notifications when network issues cause vSync to timeout. See "Receiving notifications of vSync timeouts" in the <i>Nuance Management Server Administrator Guide</i> for details.
Managing databases	
Turn off scheduled backups of the NMS database	You can disable tasks that back up the NMS database. This is useful for sites that want to backup the NMS database themselves. See "Disabling scheduled backups of the NMS database" in the <i>Nuance Management Server Administrator Guide</i> for details.
Managing audit events	
View information for specific Audit Events	You can display information for specific Audit events. You enter search filter criteria into fields in the Events screen to refine the list of tasks that display. See "Auditing Events" in the <i>Nuance Management Server Administrator Guide</i> for more information.
Job log filenames	
Job log files use a new naming convention	The filenames of job log files that are stored on the Profile Optimizer Server are now based on the Job Id (an integer), the user profile name, the job type, and the type of the log file (speech node, Dragon, etc). The filenames are no longer based on Guid's. For example: 'jobId_profileName_JobTypeId.logFileType'. See "Dragon and Profile Optimizer Speech Node log"s in the <i>Nuance Management Server Administrator Guide</i> for details.
Using the Nuance Management Console	
Refresh the information in an NMC screen	Many screens in the Nuance Management console now include a Refresh button that lets you update the information on the screen. Screens with the Refresh button include User Accounts, Groups, Organizations, Speech Node Collections, Licenses Summary, Approval, Messages, Events, and Adaptation Status.

Introducing Dragon Medical Enterprise Network Edition

Dragon Medical Enterprise Network Edition is a revolutionary product for Healthcare Enterprise environments; providing a central server (the *Nuance Management Server*) to manage multiple local or remote speech recognition client machines where healthcare providers dictate. *Dragon Medical Enterprise* takes advantage of distributed processing across servers and workstations for greater efficiency.

The administrator can manage the entire system from the central *NMS Server*.

The *Planning and Deployment Guide* takes you through the steps to:

- Plan a deployment of a *Dragon Medical Enterprise Network*.
- Determine the number of servers and other equipment you will need.
- Prepare equipment for the DMENE installation.

Nuance also provides a separate *Installation Guide* that takes you through the process of installing the various server and client components, connecting them to a database that stores your organization's data, and installing/setting up *Dragon Medical Clients* that work with both the *NMS Server* and the other servers and components of the network.

Note:

Some DMENE features might have changed since this manual was printed. A current version of this book is always available on Nuance's documentation portal, in PDF format. Contact your Nuance representative about accessing that portal to retrieve the latest copy.

Planning an installation of *Dragon Medical Enterprise Network Edition*

Before you begin the installation, you should evaluate your own system installation skill set. If you do not have all of the required skills, you should have someone on standby who can help you with this installation. To plan the network and install the *Dragon Medical Enterprise Network Edition* server and client software, you should have adequate skills and experience to:

- Create a network domain/user account with full read/write access rights across all servers
- Create databases with SQL Server
- Set up backup plans for SQL Server
- Create and securely administer a Windows share
- Set Windows user rights and directory permissions
- Set up and configure Internet Information Services (IIS)
- Securely administer IIS (if using web server for master user profiles)
- Order, receive, and install SSL certificates in IIS (if using secure web server for master user profiles)
- Edit XML configuration files
- Manage Windows Services
- Configure a RAID array

Note:

You can choose to create the *NMS Server* database and backup dump device yourself during the installation process, but in many configurations, the *Dragon Medical Enterprise Network Edition* installers set up the SQL Server databases and dump devices for you. Later, the servers carry out automatic backups of selected data and retain those backups for particular lengths of time; however, because you might need to back up additional data or retain the data longer, database backup planning skills are essential. For more information on backups in DMENE, see the *DMENE Installation Guide* or the *Nuance Management Server Administrator Guide*

Chapter 2: Determining network requirements

You can configure your *Dragon Medical Enterprise Network Edition* network using the *Nuance Management Server* in several ways.

If you have a small enterprise, you can install all server components of the system on a single server machine. DMENE servers are flexible enough that if you have a larger organization, you can scale the system by installing server components on separate machines to balance the workload.

In addition, you can deploy multiple *Profile Optimizer Speech Nodes* to handle a high volume of user profile optimization for a large and prolific staff.

This chapter discusses all of the DMENE components and helps you determine the exact needs for your organization's network including the space you need for master user profile storage, the number of *Speech Nodes* you need, the space required for the *NMS Server* and *Profile Optimizer Server* databases, and the type of network equipment and switch settings recommended.

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Dragon Medical Enterprise Network Edition Overview

Dragon Medical Enterprise Network Edition and the *Nuance Management Server (NMS Server)* help you meet your expanding medical organization's enterprise level needs. You use the *NMS Server* to manage multiple Dragon clients from a single central server.

Network setup is now straightforward and efficient when you use the *NMS Server* to apply consistent settings to many workstations running Dragon clients throughout the medical facility, changing multiple settings on the *NMS Server* with the click of a mouse on its *NMC Console*.

For information about DMENE features and workflows for providers, please see the Dragon Help.

For the first time, you can take cross-network action on *Dragon* clients from a central *NMS Server*:

- Create multiple sites where Dragon clients are installed and assign the same backup location, master user profile storage location, and amount of archive storage/playback space to all users on one site in a single stroke.
- Grant, revoke, and manage all dictating healthcare provider (**Physician Author** and **Non-Physician Author**) and administrator (**NMS Administrator**) licenses, including viewing the number/type of licenses used/still available.
- Create groups of users and then assign entire groups to one or more sites, all at one time.
- Search through groups of users for those associated with a particular site.
- View/access *Dragon* logs on every Dragon client workstation.
- Initiate, schedule, and monitor acoustic/language model adaptation processes—monitoring each process for active versus idle state, start time, completion time, duration, and priority.
- Audit session events across the entire network (who logged on when and other related events) for a particular slice of time or particular user.
- Display a complete list of all downloaded software updates and approve or waive installation of them—all from a single window.
- Set a common Data Distribution Directory for all machines at one or more groups.
- Create user accounts for healthcare providers, then use simple software tools provided to quickly upgrade old user profiles, then associate upgraded profiles with new user accounts.
- Receive messages for software updates, command updates, medication updates, and license expiration notifications in a single location.
- Approve command and medication updates for download.
- Choose to encrypt all patient data for all dictating users in your organization.
- Choose to upload speech data to Nuance's Research department for particular users or all users in your organization.

These features help you to readily manage your DMENE network.

Understanding components in *Dragon Medical Enterprise Network Edition*

Dragon Medical Enterprise Network Edition is made up of software modules that include clients, servers, databases, user profile directories, and web services that integrate with one another. The modules are in these groups:

- *Nuance Management Server* components
- *Profile Optimizer* components
- *Dragon Medical Clients*
- Master user profiles directory (on any server of the network or on its own machine)
- Nuance hosted servers

Nuance Management Server components

The *Nuance Management Server (NMS Server)* components are:

- **Nuance Management Server (NMS Server)** — Main Web service that drives the DMENE and helps it interact with external clients and servers by carrying out several vital tasks involving allowing user access, determining settings on servers and clients, and storing information about user preferences and transcription formatting. In addition, the *NMS Server* works with the *Profile Optimizer Server* to ensure utilization of information about a particular speaker's voice and language models. Nuance also interacts with your organization through this server, using your unique organization ID to identify your server and downloading licenses you have purchased to it.
The *NMS Server* also stores user identification and related administrative information centrally, keeping user profiles available at any site the user travels ("roams") to within the hospital and its affiliate facilities, whether the machines are located in different offices of the same site or at other sites in distant cities.
- **Nuance Management Console (NMC Console)** — An interface to not only the *Nuance Management Server* for managing set up of all *Dragon Medical Clients* on the network, but to many functions of the *Profile Optimizer Server* as well.
- **NMS SQL Database** — Houses the SQL database that stores *Nuance Management Server* information about your organization, licenses, sites, users, groups, tasks in process, and messages/downloaded package approvals.

You install the *NMS Server* and the *NMC Console* on the same machine; however, you have the option of installing the database on the same or a separate physical server on your network.

Profile Optimizer components

Profile Optimizer components include:

- **Profile Optimizer Server** — Server that manages the iterative learning and integration of each user's unique speaking/pronunciation patterns by scheduling two processes, Acoustic Model Optimization (often referred to as simply **Acoustic Optimization** or ACO) and Language Model Optimization (LMO). The ACO process integrates information about how the individual

dictating speaks and pronounces words while the LMO process integrates information about words and phrases most likely to occur in the context of the particular user's speech/composition (writing) style and combines that information with known data about speakers of that user's language with the user's accent, if an accent is applicable.

- **Profile Optimizer Speech Nodes** — Modules that carry out the Acoustic Optimization (ACO) and Language Model Optimization (LMO) for each dictating healthcare provider.
- **Profile Optimizer Database** — Database that stores the schedules for the Acoustic Optimization (ACO) and Language Model Optimization (LMO) tasks. You usually place this database on the same machine where you created the *NMS SQL Database*.

Dragon Medical Enterprise Client — Receives and interprets healthcare provider dictation, producing text corresponding to each physician's speech. The *Dragon Medical Client* sends the text into a target application, such as an electronic health record (EHR) system, and also preserves text and audio in the speech profiles so that the optimizer can process it.

Master user profiles directory

Master User Profile Directory — Central storage area for master user profiles for dictating providers. A single central storage location applies to a particular site in DMENE. A master user profile contains the accumulated speech information for a particular healthcare provider from all the *Dragon Medical* client workstations where that person has dictated, enveloping the language the user speaks, the accent (if applicable) used, vocabulary or vocabularies, and microphone and/or dictation recording device. As the user dictates, over time, the *Profile Optimizer Server* and its *Speech Nodes* learn the particular user's speech patterns and integrate them into that individual user profile. These user profiles are called *roaming user profiles* in other editions of *Dragon Medical*, because their existence at a central location allows speakers to "roam" from location to location and work with the same profile. (These profiles are unrelated Microsoft Windows user profiles.)

Nuance hosted servers

Nuance hosts servers and services at its headquarters that your DMENE network interacts with:

- **Update Server** — Hosted by Nuance on the Internet. Automatically downloads various updates for *Dragon* to the *NMS Server* over the Internet.

Behind the scenes web services on the *NMS Server* help it interact with all of these clients and servers as well as carry out its own processes to manage the entire DMENE network.

Who works on the network

Two types of people work on the network:

- **System Administrators** — Manage the entire system through the *NMC Console*.
- **Healthcare Providers** — Dictate using *Dragon Medical Clients*.

Determining space requirements for user profiles

To determine how much storage space your network requires to manage user profiles for all of your dictating healthcare providers, you need to first understand the difference between a master user profile and a local cache user profile.

You then calculate how much storage space you need to work with these two types of user profiles, as explained in the subsections that follow:

- *Understanding master user profiles and local cache user profiles*
- *Determining storage space required for master user profiles*
- *Determining storage space required for local cache user profiles on client machines*

Understanding master user profiles and local cache user profiles

A *user profile* is a set of files containing data that *Dragon Medical Enterprise* uses to help recognize the individual provider's speech.

The user profile information is stored on the network (usually on the server where the *Profile Optimizer* is installed, or on a separate server or workstation machine), so that the person dictating can "roam" from machine to machine (from one examining room to the next or to a laptop for an off-site consultation) and have consistent recognition accuracy on every workstation. Accessing that information over the network can tend to slow down speech recognition, so to make the process more efficient, the first time the provider logs into *Dragon Medical* on a client machine, *Dragon* makes a copy of that provider's user profile and stores it locally on that client machine. The user profile stored on the network is called the *master user profile* and the copy stored locally is called the *local cache user profile*.

Each time a provider logs out of the *Dragon Medical Client*, the *NMS Server* integrates information from that client's local cache user profile into the master user profile. To minimize network bandwidth consumption the *NMS Server* does not retrieve all data from the local cache profile, only the new information from the current dictation session. The next time the provider logs into the *Dragon Medical Client*, *Dragon* looks for new information that may have come from dictation sessions on other workstations and copies them into the existing local cache, so again it does not need to copy the entire profile.

For planning purposes, you need to determine how much space your *Dragon Medical Enterprise* network requires to store *master* user profiles. How much storage space is required depends on how many providers you have and other specific data about those providers. Plus, you need to allow space for automatic backups that the *NMS Server* creates, because it stores those backups on the same device where the original profiles reside.

Similarly, you need to determine how much space each *Dragon Medical Client* machine requires to store *local cache* user profiles for all providers that dictate on that machine.

Determining storage space required for master user profiles

Gather the data needed to determine how much space should be allocated for storing master user profiles. This data includes:

- How many total healthcare providers are dictating with *Dragon Medical* throughout the entire organization?
- How many providers have an extra vocabulary? You should add an extra vocabulary for each provider who practices in more than one medical specialty, as well as for any provider who also uses *Dragon* to dictate email or create administrative documents other than clinical documents, to allocate adequate space for the extra speech information.
- How many providers will have more than one audio input device, such as a headset microphone in some locations and a USB microphone in others? How many extra devices does that add up to?
- Expected growth of your organization—How many new healthcare providers do you anticipate adding to the population of providers dictating with *Dragon Medical* in the next year?

Calculating storage space required for master user profiles

Number of Healthcare Providers Dictating					
Total Number of Providers (N)	Providers with one extra vocabulary (V)	Number of extra audio input device(s)(A)	Number of Providers Added Annually (P) (optional)	Acoustic Model Optimization Data Storage (M)	Multiply Total by 2.05 to Allow for Backups
Allow 25 MB for each provider.	Allow 15 MB for each extra vocabulary (Add another vocabulary when user also dictates outside Medical system into email or office apps).	Allow 13 MB for each extra audio input device (dictation source).	Add 53 MB for each provider, allowing each an extra audio input device and an extra vocabulary	Allow 500 MB of space for each provider times the number of audio input devices (dictation sources) the provider has.	Multiply the total by 2.05 to allow enough storage space for one backup plus an extra 5% for temporary storage of corrupted profiles.
$((N \times 25 \text{ MB}))$	$+ (V \times 15 \text{ MB})$	$+ (A \times 13 \text{ MB})$	$+ (P \times 53 \text{ MB})$	$(N + A)(500 \text{ MB})$	$\times 2.05$
	+	+	+	+	$\times 2.05$
TOTAL:					

Example: Calculating storage space required for master user profiles

Number of Healthcare Providers Dictating					
Total Number of Providers (N)	Providers with one extra vocabulary (V)	Number of extra audio input device(s)(A)	Number of Professionals Added Annually (P) (optional)	Acoustic Model Optimization Data Storage (M)	Multiply Total by 2.05 to Allow for Backups
Example:					
100 providers	12 with one extra vocabulary and 3 with two extra vocabularies	Each provider has a headset and a PowerMic II. First microphone already included in original space; second considered additional.	Planning to add 5 new providers in the coming year.	Multiply number of providers by 2 because each has 2 microphones; then multiply that total by 500 MB.	Multiply the total by 2.05 to allow enough storage space for one backup plus an extra 5% for temporary storage of corrupted profiles.
N = 100	V = 15	A = 100	P = 5	M = 200 x 500 MB	Total x 2.05
((100 x 25)	(18 x 15)	(100 x 13)	(5 x 53)	(200 x 500))	x 2.05
(2500	+ 270	+ 1300	+ 265	+ 100,000)	x 2.05
TOTAL: 104,335 MB x 2.05 = 213,928 MB (rounded up) = 214 GB					

As you later see, when you install the *NMS Server* and *Profile Optimizer* software, you indicate the name of the machine and path to the master user profiles. Nuance recommends that you place master user profiles on their own RAID array in *Dragon Medical Enterprise* configurations that have more than 10 users.

Note:

RAID refers to Redundant Array of Independent Disks, a technology that combines multiple small, inexpensive disk drives to form an array whose performance exceeds that of a single large and expensive drive. Your server or workstation sees this array of drives as a single logical storage unit.

Determining storage space required for local cache user profiles on client machines

In addition to calculating how much space you need for master user profiles, you need to ensure adequate space on each *Dragon Medical Client* workstation to make a local copy of the master user profile for the client to use when the provider dictates.

Calculating Storage Space Required for local user profiles on clients

Number of Healthcare Providers Dictating				
Number of Providers Dictating on Client (C)	Number of Providers with one Extra Vocabulary (V)	Number of Extra Audio Input Device(s) (A)	Number of Languages > LMO data (L)	Acoustic Model Optimization Data Storage (M)
Allow 25 MB for each provider.	Allow 15 MB for each extra vocabulary.	Allow 13 MB for each extra audio input device(dictation source).	Allow 10 MB for each vocabulary to account for language model optimization data	Allow 240 MB of space for each provider times the number of audio input devices (dictation sources) the provider has.
((C x 25 MB)	+ (V x 15 MB)	+ (A x 13 MB)	+ (25 x 10 MB)	+ (C x A)(240 MB))
TOTAL:				
Example: Allocating space for 10 dictating healthcare providers:				
10 providers	2 with one extra vocabulary and 1 with two extra vocabularies	All providers have a headset and a PowerMic II. The first microphone is already included in original space and the second is considered extra.	Every user has one vocabulary with a model to be optimized, so add 10 MB for every provider.	Multiply the number of providers by 2 because each has 2 microphones; then multiply that total by 240 MB.
N = 10	V = 6	A = 10	L = 10	M = 20 x 240 MB
((10 x 25)	+ (6 x 15)	+ (10 x 13)	+ (10 x 10)	+ (20 x 240))
(250	+ 90	+ 130	+ 100	+ 4800)
TOTAL: 5,370 MB or (rounded up) 6 GB				

From the *NMC Console*, you can set the amount of disk space to be reserved for user profiles on each workstation running a *Dragon Medical Client*. When the space is full, *Dragon* automatically copies the data to the *NMS Server* and clears the space for new data.

Deciding how often to tune acoustic and language models

The accuracy of dictation depends on how well-tuned the master user profile is for a particular healthcare provider. *Dragon Medical Enterprise* tunes each provider's master user profile with data from his or her unique acoustic model and language model.

Understanding ACO and LMO processes

The *Profile Optimizer* manages the aspect of speech recognition that involves learning each healthcare provider's individual pronunciation and speaking patterns. The server controls this learning process (called *adaptation*) by scheduling two processes, Acoustic Model Optimization (ACO) and Language Model Optimization (LMO), that run on the *Profile Optimizer Speech Nodes*. After an optimization process completes, the *Profile Optimizer Server* updates that healthcare provider's master user profile, integrating the ACO and LMO results.

The accuracy of dictation depends on how well-tuned the master user profile is for a particular healthcare provider. Research has shown that running both ACO and LMO processes regularly reduces the relative word error rate for the provider by 10 to 30% and can produce even greater improvements in recognition accuracy for providers who speak with an accent.

In Service Pack 2, when the NMS server attempts to start an immediate ACO or LMO task for a user, and a job for that user and task type is already scheduled (either waiting to run for the first time, or in the postponed state), the NMS server updates the job parameters. If the job is in the postponed state, the NMS server sets the job to run as soon as possible, rather than when the postponed state expires.

When you are determining how often to schedule Acoustic Model and Language Model Optimizations (ACO and LMO processes), you take into account several factors. But how often should the server carry out an ACO or LMO for a particular healthcare provider?

First, let's understand the purpose of each process.

Defining ACO/LMO processes and their impact on recognition

To help you assess how often an ACO or LMO process should occur, let's first look at what each process does:

- **Acoustic Optimization (ACO)** — This task optimizes the model used to recognize the way the provider speaks. The model incorporates characteristics such as the accent, dialect, tone of voice, and other aspects of how the speech sounds. When a speaker is new to *Dragon Medical*, you should run the optimization more often than after the speaker has worked with the product for a while.
- **Language Model Optimization (LMO)** — This task optimizes the language model used to help recognize the patterns of the provider's speech. The model incorporates how the provider dictates particular words and sequences of words his or her speech frequently employs.

Both of these processing run in the background and strictly on the *Speech Nodes*, so they do not affect the speed of recognition during dictation on *Dragon Medical Clients*.

You can and should run the ACO and LMO processes at different intervals for the same provider.

Factors in how often to run ACO processes

The ACO process, by contrast with LMO, is time intensive—it runs for 1 hour to process 1 hour of dictation. *Speech Nodes* spend more than 80% of their time running ACO processes.

Some of the factors to consider when deciding how often to carry out an ACO process are:

- Whether or not a particular provider has an accent
- Whether or not the product frequently has trouble interpreting a particular provider's speech
- How much dictation a provider or group of providers generates

To get the most out of the ACO process, you should schedule the process to take place every time the provider has dictated 5 hours of audio. A medical practitioner does not produce 5 hours of audio by working 5 hours, but may produce that much audio over a period of a month or two, while dictating as needed.

The absolute minimum frequency recommended for ACO is once every 6 months. However, if the provider dictates 10 hours of audio in those 6 months, the ACO process will incorporate only the last 5 hours of his or her dictation, so in such a case you would want to schedule the ACO every 3 months instead of every 6 months.

The best practice recommendation is to schedule an ACO every week only while the provider is new to *Dragon Medical*. After the provider has been dictating for a month or has dictated 5 hours of total audio, the provider is no longer considered new to dictation. You can then back off to scheduling the ACO once a month or as often as you find that the provider dictates 5 hours of new audio.

If the *Profile Optimizer Speech Node* does not find enough speech data for that provider in a given month, the node terminates the process and waits until the next scheduled ACO.

If a professional uses more than one audio input device (dictation source), such as one USB microphone and one *PowerMic*, then the *Speech Node* needs to carry out a separate ACO process for each of those devices

After a provider has dictated his or her first 5 hours of total audio, if the provider has an accent, you might want to schedule the provider for more frequent ACOs that you would schedule for providers who do not have an accent.

Running a maintenance ACO process periodically keeps the provider's master user profile synchronized with his or her voice.

Factors in how often to run LMO processes

Since an LMO process runs quickly, not tying up network or *Speech Node* resources, you can schedule an LMO for every user every day. Guidelines state at minimum to run an LMO process:

- Every day (or night) for providers whose speech *Dragon Medical* has difficulty recognizing or providers who have **ever** had their profile becomes corrupted.
- At least every week (but preferably every day) for providers new to dictating (who do not have a previously existing user profile or who have not yet dictated 5 full hours of audio).
- At least every month for providers with more experience dictating (who already have a user profile and have already dictated a minimum of 5 hours of audio) and who have **never** had profile corruption issues.

Some of the factors to consider when deciding how often to carry out an LMO process are:

- How much dictation a provider or group of providers generates
- How often you add new words to vocabularies
- How often you would like the *Profile Optimizer* to check for corrupted user profiles, because it checks for corruption every time it carries out an LMO process on the profile

Factors that have no effect on regularly scheduled processes

After you approve medication and command updates from the *Update Server*, you do not take any other action. The *Profile Optimizer Server* automatically schedules processes that integrate these updates into the appropriate models and master user profiles.

Determining number of Speech Nodes required for optimizations

Another aspect of managing speech recognition is the process of integrating new speech data into the acoustic and language models in the user profiles.

The component of *Dragon Medical Enterprise Network Edition* that updates and maintains acoustic and language models is the *Profile Optimizer Server*. DMENE includes a *Profile Optimizer Server*. The processes that integrate new information into the acoustic and language models for a particular healthcare provider are called *acoustic model optimization* and *language model optimization*.

Before you try to determine how to include a *Profile Optimizer Server* in your system, you should determine how much space is required to carry out these optimizations, taking into account several factors.

Determining number of Speech Nodes required to process acoustic and language models

Once you know the total number of dictating healthcare providers, you can then estimate how many *Profile Optimizer Speech Nodes* your network requires to regularly integrate and optimize the information *Dragon* learns about each provider's speech patterns.

Each individual *Profile Optimizer Speech Node* spends about 20 hours (1200 minutes) in a given day carrying out the process of learning how each speaker speaks and adapting an acoustic model for each dictating provider's voice based first on initial training, then later on actual day-to-day dictation. The acoustic model for a speaker needs to frequently incorporate corrections to speech recognition results. This process is called acoustic model optimization (ACO) the process is more or less continuous, depending on how many healthcare providers you have. The number of minutes varies because the person's speech patterns vary in ways that are not predictable. And the greater the speed of the processor that each *Profile Optimizer Speech Node* runs on, the greater the amount of speech it optimizes in a day.

The *Profile Optimizer Speech Node* spends the remaining time in a day interacting with the *Update Server* and *NMS Server* to integrate new words into each professional's vocabulary, effectively modifying the language model for that user. The language model also incorporates statistical information about words and phrases most likely to occur in the context of the particular user's speech/composition (writing) style and combines that information with known data about speakers of that user's language with the user's accent, if an accent is applicable. This process is called language model optimization (LMO).

The bulk of the *Profile Optimizer Speech Node's* time is spent carrying out ACO. ACO essentially requires an hour of adaptation for an hour of dictation. So estimating the average amount of dictation per provider gives you a good starting point to determining how many *Profile Optimizer Speech Nodes* you need.

The way that acoustic model optimization works is that although each *Profile Optimizer Speech Node* carries out 1200 minutes per day of adaptation, not all minutes of dictation are considered equal.

When a provider has logged in for the first time and has been speaking into the microphone, after the provider finishes dictating and logs out, the *Dragon Medical Client* sends data about the provider's speech to the corresponding master user profile on the network. If that provider has spoken for at least 15 minutes, the *Profile Optimizer Speech Node* then carries out an ACO process on the acoustic model for that provider and updates that master user profile accordingly. Later, when the provider logs on to dictate again, the *Dragon Medical Client* retrieves the optimized master user profile from the network and places it in its local cache. The provider should then see improved recognition.

After the provider again dictates, then logs out of the session, the client again sends data about the provider's speech to the master user profile on the network. The provider may require more than one session to accumulate enough dictation, but when he or she has dictated at least 50 more minutes, the *Profile Optimizer Speech Node* automatically carries out another ACO process. (These transfers of data and ACO processes occur on the *Speech Node*, without the provider even knowing about them.)

The first week that the provider dictates, the *Profile Optimizer Speech Node* carries out an ACO process. The same occurs after another week. ACO processes become progressively further apart the longer a provider dictates, until the provider's acoustic model reaches maintenance mode, where the *Profile Optimizer Speech Node* carries out an ACO only as often as you schedule it and only if the provider has dictated at least 5 hours of new speech during that period. For instance, you might schedule an ACO monthly; if the *Profile Optimizer Speech Node* does not find enough speech data for that provider during that month, the node terminates the process and waits until the next ACO that is scheduled.

The table that follows estimates how many providers a single node can process ACOs for at various levels of dictation.

Number of minutes required for adaptation processes

Days of Provider Dictation	Stage of Provider "Training"	Minutes of Dictation per Provider Before ACO	Number of Providers One Speech Node Supports	Time Required to Tune Acoustic Model for Number of Providers with One Speech Node
First few days	First few days	15 minutes	80 providers	80 providers X 15 minutes each = 1200 minutes in one day
End of 1st Week	Early dictation	50 minutes	25 providers	25 providers X 50 minutes each = 1200 minutes per day
End of 2nd Week	More dictation	100 minutes	12 providers	12 providers X 100 minutes each = 1200 minutes per day
End of Month		200 minutes	10 providers	10 providers X 200 minutes each = 1200 minutes
Upgraded and in Maintenance mode	Upgrade training and ongoing dictation	5 hours (300 minutes)	120 providers x 30% dictating at one time = 40 providers	40 providers X 30 minutes per day = processes acoustic models at 1200 minutes per day; two nodes can share ACO load during upgrade process

If a healthcare provider uses more than one audio input device (dictation source), such as one USB microphone and one *PowerMic II*, then the *Speech Node* needs to carry out a separate ACO process for each of those devices, so an extra audio input device is *almost* the same as another healthcare provider. *Almost* the same, but not exactly the same, because a provider who divides time between two devices probably spends less time dictating with each single device than another provider spends dictating with only one device.

A single *Speech Node* can handle ACO and LMO for only 40 to 80 providers if they are all just dictating for their first few weeks, but that same node can handle 120 providers who have been dictating long enough to require an ACO be scheduled only once a month.

Probably not all of your providers have the same level of experience with the speech recognition system, so you might have to make a judgment call. To help you make that call, you can enter your information into the table below and develop a grid that illustrates the number of *Speech Nodes* your installation should require.

Use the next table to estimate how many providers a single node can process ACOs for at various levels of dictation. If you add up the number of providers at each stage by the number minutes

before an ACO occurs, you can determine how many total minutes of ACO processing you need. However, not all providers are going to be dictating at the same time. For instance, if you have 240 providers, and only about 30% of them (80) are dictating at one time, you need to multiply the total number of minutes by 30% before dividing it by the 1200 minutes in a day a single node can carry out ACO processes. A percentage of 30% is a good estimate of how many providers dictate during a given period of time (such as a hospital shift); however, you can adjust the percentage if you believe as many as 50% or as few as 20% of your providers dictate at any one time.

Number of Speech Nodes required in your installation

Time Provider Has Dictated	Approx. Number of Providers at This Stage During This Month	Minutes of Dictation Before ACO	Multiplier of Min/Day	TOTAL minutes
2 Days		15 min	X 15	
1 Week		30 min	X 30	
2 Weeks		1 hr	X 60	
Month		2 hrs	X 120	
Being Upgraded		60 min	X 60	
More Than One Month (Maintenance)		5 hrs	X 30	
TOTALS				_____ x _____ % /1200 = _____ Nodes

Recommendations about number of providers

A good rule of thumb for how many providers a single *Speech Node* on a dual core machine can process ACOs for is 120 providers who are in maintenance mode per processor core beyond the first core. (The first core is reserved for all other server processes of the DMENE network.) So, when the *Speech Node* is on the same machine with the *Profile Optimizer Server*, you can have up to 120 providers in maintenance mode as long as the machine is dual core.

If you have a dual core machine dedicated to *Speech Nodes*, you can create two virtual machines, one for each core, and run a single *Speech Node* on each virtual machine.

The following table delineates how many *Speech Nodes* you should need as your network matures and your *Profile Optimizer Speech Nodes* run ACOs mostly in maintenance mode.

Number of Speech Nodes Recommended to Optimize Specific Numbers of Users at Particular ACO Intervals

Number of Providers	Interval between Acoustic Model Optimizations (ACOs) in Months					
	1 mo recommended	2 mo	3 mo	4 mo	5 mo	6 mo minimum
0 – 120	1	1	1	1	1	1
121 – 240	2	1	1	1	1	1
241 – 360	3	2	1	1	1	1
361-480	4	2	2	1	1	1
480 – 600	5	3	2	2	1	1
601 – 720	6	3	2	2	2	1
721 – 840	7	3	3	2	2	2
841 – 960	8	3	3	2	2	2
961 – 1080	9	4	3	3	2	2
1,081 – 1,200	10	4	4	3	2	2
1,201 – 1,320	11	5	4	3	3	2

If you have one or more *Speech Nodes* on the same machine with both the *Nuance Management Server* and the *Profile Optimizer Server*, note that the machine must have at least a quad core processor.

That quad core processor lets you can install up to three virtual machines for *Speech Nodes* on the physical server or workstation, one virtual machine per *Speech Node* for each additional core beyond the first core. The number of providers you can process with those three nodes is from 241 to 360 (up to 120 users per node) if you are running an ACO on those users every month. However, if you run the ACO only once every two months, you can increase the number of providers to between 480 and 600.

If you have the *Speech Nodes* on their own machine, separate from the servers, you can have four virtual machines on a quad core physical server, each running a single node, and all those *Speech Nodes* can together run ACOs every two months for from 1,081 to 1,200 healthcare providers.

Nuance recommends that you run an ACO on every provider once a month to maintain accurate speech recognition. The absolute minimum number of ACOs you should run for a single provider is one every 6 months, but Nuance recommends more frequent tuning of the acoustic models.

Estimating server storage requirements for Nuance Management and Profile Optimizer Server databases

To estimate how much disk space databases for the *Nuance Management Server* and *Profile Optimizer* require, you need to understand the kind of information each one contains.

About Nuance Management Server (NMS) and NMS SQL database

The *NMS SQL Database* stores information about the customer account for the organization as well as sites, users, groups, and licenses.

Most of this information makes a scant difference in the size of the *NMS* database. *NMS* generates the bulk of the data by taking actions such as auditing events, logging statuses, managing scheduled tasks, and storing messages and packages it receives from Nuance servers.

The 20 GB free space requirement for the *NMS* installation provides ample space for not only installation of the *NMS SQL Database*, the *NMS Server*, and the *Nuance Management Console (NMC)*, but for all data generated at most installations with up to 500 dictating providers.

You do not have to allocate any space on the *NMS Server* for data collection. When you choose to implement data collection (it is optional) to help Nuance improve *Dragon Medical Enterprise's* future speech recognition ability, the server does not collect the data; instead each *Dragon Medical Client* on the network collects data while the healthcare provider dictates, then sends the appropriate data from the local user cache profile to the computer hosting the master user profiles. The *NMS Server* retrieves and packages applicable data from the master user profiles, then sends it to Nuance every night. Because it is utilizing data already stored in the master user profiles, the *NMS Server* does not require additional storage space for data collection.

About Profile Optimizer Server and Profile Optimizer database

The *Profile Optimizer Database* often does not require as much space as the *NMS* database. This database contains the scheduling information for ACO and LMO tasks that take place on the *Profile Optimizer Speech Nodes*.

By default the *Profile Optimizer* creates a 10 MB file to contain the scheduling data in the database.

The Profile Optimizer Server stores all of the logs for the Profile Optimizer tasks, 50 log files for the Profile Optimizer Server service. You should reserve between 500 MB and 1 GB of storage space for all the log files the Profile Optimizer Server creates and stores.

Since the total space required for the *Profile Optimizer Server* and the *Profile Optimizer Database* is relatively small, you usually install both of them on the same physical server.

About disk space for server installations and logs

In addition to considering how much space each database requires, you should also be planning for space for each server installation and for logs that the *Profile Optimizer Speech Nodes* generate and store on the *Profile Optimizer Server*.

Each server requires about 20 GB of free space after the installation of the *NMS* and *Profile Optimizer* software.

In addition, each *Profile Optimizer Speech Node* generates two log files for each ACO and LMO process it carries out:

- Dragon log file—*Dragon Medical SDK Client* writes this file
- *Speech Node* service log file—*Profile Optimizer* services write these files

These files are generally between 3 and 5 KB each. The *Profile Optimizer Server* stores them for 30 days. Although the log files could grow larger, they are stored in a zipped format and compress very well. If you run an optimization process for every provider every day and have 500 providers, then assume every log will be as large as 5 KB, all of those logs would still use only 2.5 MB of storage space and in 30 days that would become 75 MB of storage space. After 30 days, the *Profile Optimizer* purges old log files, so the storage requirements do not grow substantially.

The *NMS Server* generates Windows communication foundation service log files for each user and stores up to the last 10 MB of them generated, a maximum of 50 log files for the entire server, before purging the oldest files and replacing them with newer ones as it generates them.

Storage space for all of these logs is relatively inconsequential; however, if you expand the number of providers in your organization, it is always best to take into account storage requirements for all generated files.

Recommended network/switch settings

Nuance recommends particular network interface card settings and network speed for equipment in the *Dragon Medical Enterprise Network Edition* network.

Network Interface Card (NIC) settings

Gigabit Cards: Gigabit cards should be set to automatic. The network switches and the cards plugged into them should have the same setting.

10 Mb/100 Mb Cards: Network link speed and duplex need to be set the same on all servers, workstations, hubs, switches, or other network equipment. If there is a mismatch in settings, or if the NICs are left set at **Auto Detect**, the end users of the system could see degradation in both performance and recognition. Nuance does not support the **Auto Detect** setting for 10/100 Mb cards.

Network speed

Nuance supports all network speeds/settings listed below when you set them consistently across the network:

- 100 Mbps/Full Duplex
- 10 Mbps/Full Duplex

Regardless of 100 or 10, matching the **Full Duplex** setting is required. The network switches and the cards plugged into them should have the same setting.

Using Network traffic switch for load balancing

If you use multiple *NMS Servers*, you can insert a network traffic switch, such as the one available through F5 and similar manufacturers, into your DMENE network for balancing the load distribution among those servers. For details on the exact message that the network traffic switch can send to the *NMS Server* to ping it, refer to the *DMENE Installation Guide* or the *Nuance Management Server Administrator Guide*.

Storage hardware requirements for master user profiles

For details on optional hardware you can deploy to store your master user profiles, refer to *Hardware and software requirements/storage options for master user profiles machine* on page 42.

Ports that you must open on your network

On the *Dragon Medical Enterprise Network Edition* network, you must open particular ports to ensure the free flow of data between the various servers and clients. A complete list of all the ports that should be open is given in the table at the end of this section. You must open all ports listed in the table on any hardware firewalls to ensure that no firewall blocks transmission of data and brings the network to a halt.

Ports to be opened on client, servers, and hardware firewalls of network

- Ports between *Dragon Medical Client* workstations and their *NMS Server*
- Ports between *Dragon Medical Client* workstations and the *Master User Profiles Server*
- Ports between workstations where you expect to run *NMC Console* and *NMS Server*
- Ports between *NMS Server* and its database if that database is on a separate server
- Ports between *Profile Optimizer Server* and its database if the database is on a separate server
- Ports between *NMS Server* and *Profile Optimizer Server*
- Ports between *Profile Optimizer* and each *Speech Node* machine
- Ports between each *Speech Node* machine and the *Master User Profiles Server*
- Ports between each *NMS Server* and the Nuance *Update* server.
- All ports mentioned above on all hardware firewalls protecting the network

Summary: Ports to be opened on Clients, Servers, and hardware firewalls

Type of port	Ports to open
Hardware Firewalls	All ports in this table.
NMS Server	<ul style="list-style-type: none"> ■ 8731 ■ 8051 ■ 443 – if using SSL to connect to the NMS web server. ■ 80 - to connect with the Nuance Update Server ■ 1433 - to connect to the NMS SQL database ■ 808 - to connect to the Profile Optimizer Server
Profile Optimizer Server	<ul style="list-style-type: none"> ■ 8001 ■ 905
Speech Node	<ul style="list-style-type: none"> ■ 8000
Master User Profiles Server	<ul style="list-style-type: none"> ■ 80 - for user profiles on an HTTP web server ■ 443 - for user profiles on an SSL web server
NMS Server SQL Database	<ul style="list-style-type: none"> ■ 1433 - if the NMS server and the NMS Server SQL database are on different physical servers

Chapter 3: Network configuration options for Dragon Medical Enterprise Network Edition

Once you have determined the servers, file servers, and network switches you need, you should examine the possible network configurations you could deploy. This chapter presents several configurations along with requirements and limitations of each to help you decide on the best configuration for your organization.

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Possible network configurations

You can configure your network for *Dragon Medical Enterprise Network Edition* with *Dragon Medical Clients* in several ways.

The possible configurations fall in these categories:

Small Organizations (Up to 100 providers)

- **Single Quad-Core Physical Server**
 - **One Quad-Core Server** for *NMS Server & NMC Console*, *NMS SQL* and *Profile Optimizer Databases & Profile Optimizer Server/Scheduler* and *One Speech Node*
 - Master User Profiles Directory on independent machine (server not required)

Medium Organizations (Up to 1,000 providers)

- **Two Physical Servers, One Quad-Core and One Eight-Core**
 - **First Server (Quad-Core):** *NMS Server & NMC Console*, *NMS SQL* and *Profile Optimizer Databases*, and *Profile Optimizer Scheduler/Server*
 - **Second Server (Eight-Core):** Up to 8 *Profile Optimizer Speech Nodes* (one for each core)
 - Master User Profiles Directory on first server or on a separate third machine (server not required, but recommended)

Large Organizations (Scalable for well over 1,000 providers)

- **Minimum of Three Physical Servers, all Eight-Core**
 - **One MS Server** for every 1,000 providers
 - **One Database Server** for *NMS SQL* and *Profile Optimizer Databases*, plus the *Profile Optimizer Scheduler/Server* and Master User Profiles Directory
 - **One Eight-Core Server** for every 8 *Profile Optimizer Speech Nodes*, allowing one node for every 1,000 providers

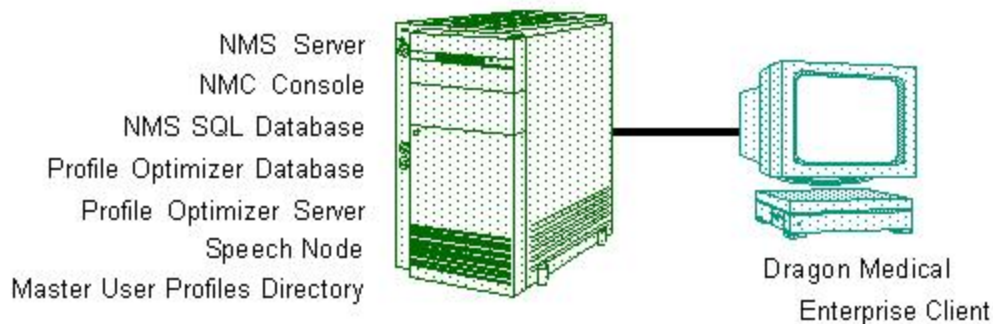
Small network configurations

Note:

You can have more than one master user profiles directory if you have more than one site. For more information, refer to the *Nuance Management Server (NMS) Administrator Guide*.

If you want to install all *NMS* and *Profile Optimizer* components on a single machine, you should not have more than 100 dictating providers. This configuration requires a high powered physical server to run both the *NMS* components and the *Profile Optimizer Servers* alongside a *Profile Optimizer Speech Node* while storing the master user profiles—all on the same machine.

A quad-core processor allows the *NMS* and *Profile Optimizer* tasks and databases to run on the first three cores while the *Profile Optimizer Speech Node* runs acoustic and language model optimizations on the last core. The *NMS Server* runs more efficiently on a quad-core server because it might need to run compression/encryption on up to 600 MB of data for a single user profile to support data collection. In addition, if you are storing them on the server, the master user profiles need to be on their own RAID array. Alternatively, you can place the *Master user profiles* directory on its own entirely separate machine, either a physical server or a workstation.



Hardware/Software Requirements and Limitations

For this configuration, you need a more robust server machine than you would require for an installation distributed over several machines.

Processor:

Quad-Core 2 GHz CPU

Minimum RAM:

4 GB recommended

Approx disk storage:

40 GB for the *NMS Server* and *Profile Optimizer Server*

Space required for the master user profiles

(refer to *Determining space requirements for user profiles* on page 13)

Maximum number of Speech Nodes:

If using only 1 physical server, it needs to be a Virtual Server Host. NMS and POS may share a Virtual Machine. The Speech Node must be on a separate Virtual Machine.

1 Profile Optimizer Speech Node

Speech Node uses one full core of the CPU and must be on a Virtual Machine if deployed on a single server.

Minimum and maximum number of providers:

From 10 to 100 dictating providers

Operating System and other software:

Windows Server 2008 or 2008 SP2 or Windows Server 2003 SP2 or 2003 R2. Either 32- or 64-bit version. SP2 is optional with Windows Server 2008.

Microsoft .NET Framework 3.5 SP1 and Microsoft .NET Framework 4.0 Client or full version required.

Master User Profiles storage:

Options:

- Master user profiles directory on its own RAID array
- Master user profiles on their own totally separate server or workstation

Requirements for Master user profiles on the Profile Optimizer Server

In this configuration, if you decide to store the master user profiles on the same machine as the *Profile Optimizer*, you should be sure that you install:

- Master user profiles are on their own RAID array.
- .NET Framework 4.0 and .NET Framework 3.5 SP1 on the server where the master user profiles are stored.

Notes: RAID array setup notes:

- If you can access the drive of the RAID array from the **MyComputer** window of the server without a mapped network connection, then you should treat the master user profiles directory as located on the server and install the required software.
 - If you must access the drive of the RAID array over a mapped or other network connection, treat the array as a separate machine.
-

Requirements for Dragon Medical Client Workstations

Regardless of the configuration, *Dragon Medical Clients* must be installed on workstations that meet the requirements outlined in *System Requirements for Dragon Medical Clients* on page 44.

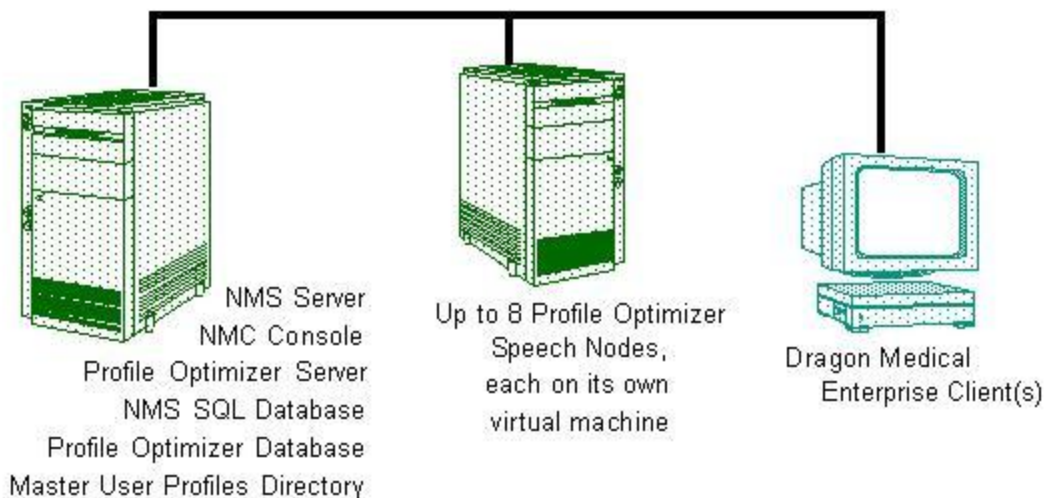
Medium network configurations

If you have 101 to 1,000 individuals dictating with *Dragon Medical Clients*, you need to begin to scale up your *Dragon Medical Enterprise Network Edition* system to manage the greater workload. One way to expand your system is to install various components of it on separate machines.

Although you have two databases, one for the *NMS* and one for the *Profile Optimizer*, both are small enough to install on one machine with a single SQL Server license. Whenever it is possible, Nuance recommends installing the databases on the same machine. Nuance requires a dual-core physical server for the *NMS Server*, so that it runs more efficiently, because the server might need to run compression/encryption on up to 600 MB of data for a single user profile to support data collection.

The most optimal distributed configuration installs the *NMS* and *Profile Optimizer* components on one physical server and installs the *Speech Nodes* on a separate physical server:

- First server software components:
 - *NMS Server* service with its *NMC Console*
 - *NMS SQL Database*
 - *Profile Optimizer Server*
 - *Profile Optimizer Database*
 - Master user profiles directory
- Second server software components:
 - Up to 8 *Profile Optimizer Speech Nodes*, each on its own virtual machine



Medium network configuration requirements

First server hardware requirements and limitations

Processor:

Dual-Core 2 GHz CPU

Minimum RAM:

4 GB RAM for NMS, 4 GB RAM for Profile Optimizer

Approx disk storage:

20 GB for the NMS Server

20 GB for the Profile Optimizer Server

Space required for the master user profiles: refer to *Determining space requirements for user profiles* on page 13.

Operating System and other software:

Windows Server 2008 or 2008 R2 or Windows Server 2003 SP2 or 2003 R2. Either 32- or 64-bit version. SP2 is optional with Windows Server 2008.

Microsoft .NET Framework 3.5 SP1 and Microsoft .NET Framework 4.0 Client or full version required.

Master User Profiles storage:

Master user profiles directory on its own RAID array

Second server (Speech Node) hardware requirements and limitations

Processor:

Eight-Core 2 GHz CPU

Minimum RAM:

8 GB RAM

Minimum hard disk space:

20 GB hard disk space for each Speech Node

Minimum and maximum number of providers:

From 101 to 1,000 dictating providers

Maximum number of Speech Nodes:

Up to 8 *Profile Optimizer Speech Nodes* per eight-core server, one node for each core on the server

Operating System and other software:

Windows XP SP3, Vista SP2, or Windows 7 workstation; or Windows Server 2008, 2008 R2, 2003 SP2, or 2003 R2, 32-bit or 64-bit.

Microsoft .NET Framework 3.5 SP1 and Microsoft .NET Framework 4.0 Client or full version required.

Requirements for Master user profiles on the Profile Optimizer Server

In this configuration, if you decide to store the master user profiles on the same machine as the *Profile Optimizer*, you should be sure that you install:

- Master user profiles are on their own RAID array.
- .NET Framework 4.0 and .NET Framework 3.5 SP1 on the server where the master user profiles are stored.

Notes: RAID array setup notes:

- If you can access the drive of the RAID array from the **MyComputer** window of the server without a mapped network connection, then you should treat the master user profiles directory as located on the server and install the required software.
 - If you must access the drive of the RAID array over a mapped or other network connection, treat the array as a separate machine.
-

Requirements for Dragon Medical Client Workstations

Regardless of the configuration, *Dragon Medical Clients* must be installed on workstations that meet the requirements outlined in *System Requirements for Dragon Medical Clients* on page 44.

Large network configurations

If you have a larger organization with more than 1,000 dictating healthcare providers, you need to scale the network by having at least three physical servers running multiple *NMS Servers* and multiple *Speech Nodes* on virtual machines.

Each of the physical servers in this configuration must be an eight-core server:

- At least one dual-core server with these software components:
 - One *NMS Server* for every 1,000 providers
 - An *NMC Console* for each *NMS Server*
- A single Database server with these components:
 - *Profile Optimizer Server*
 - *NMS SQL Database*
 - *Profile Optimizer Database*
 - Master User Profiles directory
- At least one eight-core server with these components:
 - Up to 8 *Profile Optimizer Speech Nodes*, one for every 120 providers

Note:

You can have more than subdirectory inside the master user profiles directory, one for each site. For more information about setting up sites, refer to the *Nuance Management Server Administrator Guide*.

The illustration that follows shows the most basic three server configuration that you would use with 1,000 providers, the minimum number to require a large configuration.

In a large distributed configuration, you can have multiple separate distributed *Master User Profile Servers* so that clients can have quick local access to the user profiles. In a situation like this, a connection between the client machine and the local *Master User Profile Server* can be much slower than the network connection between distributed sites; for instance, 10 Mbps might be an adequate speed for the local area network, whereas 100 Mbps might be required for the wide area network to other sites.

The *NMS Server* must be dual-core, because the *NMS Server* takes advantage of the extra core to provide management of your *Dragon Medical Enterprise Network Edition* network. The *Speech Node* server hardware must have one core for each *Speech Node*, so it is best to have an eight-core server for every eight nodes.

The next illustration shows the various servers and clients in a DMENE network configuration for 4,000 healthcare providers. Note that this configuration contains a large data center with a hospital site, a clinic site, and a network traffic switch to manage *NMS Server* load balancing. The network traffic switch (available through F5 and similar manufacturers) can send a request to each *NMS*

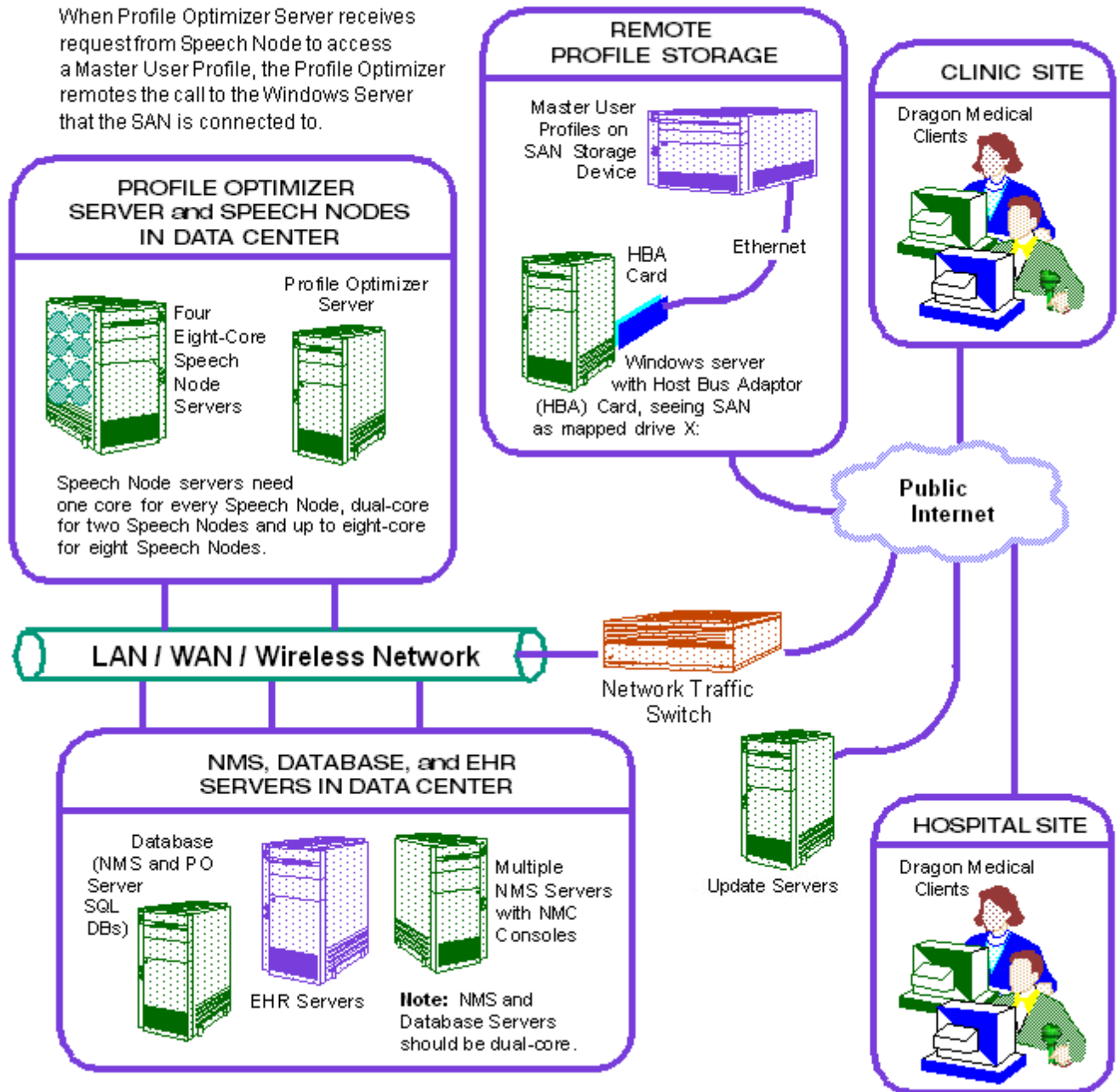
Server to query its status, tag a server as down if it does not respond, and reroute the traffic to other *NMS Servers*.

Notice that a *Master User Profile Server* local to the client providers rapid access to user profiles.

The next illustration shows the master user profiles stored on a remote SAN storage device. In this scenario, the *Profile Optimizer Server* receives requests from the *Speech Nodes* that want to access a profile and remotes those calls to the Windows server that the SAN storage device is connected to through a Host Bus Adaptor card on a 10/100/1000 Mbps Ethernet.

Remote Master User Profiles on SAN storage device and Profile Optimizer remotes calls to its server

When Profile Optimizer Server receives request from Speech Node to access a Master User Profile, the Profile Optimizer remotes the call to the Windows Server that the SAN is connected to.



First type: NMS Server hardware requirements and limitations

Processor:

Dual-Core 2 GHz CPU

Minimum RAM:

4 GB RAM

Approx disk storage:

20 GB for each *NMS Server* instance

Operating System and other software:

Windows Server 2008 or 2008 R2 or Windows Server 2003 SP2 or 2003 R2. Either 32- or 64-bit version. SP2 is optional with Windows Server 2008.

Microsoft .NET Framework 3.5 SP1 and Microsoft .NET Framework 4.0 Client or full version required.

Second type: Database server hardware requirements and limitations

Processor:

Dual-Core 2 GHz CPU

Minimum RAM:

4 GB RAM

Approx disk storage:

20 GB for the *Profile Optimizer Server*

Space required for the master user profiles

(refer to *Determining space requirements for user profiles* on page 13)

Operating System:

Windows Server 2008 or 2008 R2 or Windows Server 2003 SP2 or 2003 R2. Either 32- or 64-bit version. SP2 is optional with Windows Server 2008.

Master User Profiles storage:

Master user profiles directory on its own RAID array

For more details on the Master User Profiles software requirements, see *Hardware and software requirements/storage options for master user profiles machine* on page 42.

Third type: Speech Node server hardware requirements and limitations

Processor:

Eight-Core 2 GHz CPU

Minimum RAM:

8 GB RAM

Approx disk storage:

20 GB for each *Profile Optimizer Speech Node*

Minimum and maximum number of providers:

Up to 1,000 dictating providers per eight-core server.

Maximum number of Speech Nodes:

8 *Profile Optimizer Speech Nodes* per eight-core server, one node for each core on the server

Operating System and other software:

Windows XP SP3, Vista, or Windows 7 workstation; or Windows Server 2008, 2008 R2, 2003 SP2, or 2003 R2, 32-bit or 64-bit.

Microsoft .NET Framework 3.5 SP1 and Microsoft .NET Framework 4.0 Client or full version required.

Requirements for Master user profiles on the Profile Optimizer Server

In this configuration, if you decide to store the master user profiles on the same machine as the *Profile Optimizer*, you should be sure that you install:

- Master user profiles are on their own RAID array.
- .NET Framework 4.0 and .NET Framework 3.5 SP1 on the server where the master user profiles are stored.

Notes: RAID array setup notes:

- If you can access the drive of the RAID array from the **MyComputer** window of the server without a mapped network connection, then you should treat the master user profiles directory as located on the server and install the required software.
 - If you must access the drive of the RAID array over a mapped or other network connection, treat the array as a separate machine.
-

Requirements for Dragon Medical Client Workstations

Regardless of the configuration, *Dragon Medical Clients* must be installed on workstations that meet the requirements outlined in *System Requirements for Dragon Medical Clients* on page 44.

Hardware and software requirements/storage options for master user profiles machine

Any time after you have installed the *NMS Server* and started the *NMS Server* service (even before you have the *Profile Optimizer Server* installed or running), you can set up your *Master user profile storage* machine.

Hardware and software requirements

Hardware requirements

Processor:

Intel® Pentium 4® or later or AMD Athlon 64 1 GHz processor or later.
Recommended: 2.4 GHz processor or greater.
Faster processors produce faster performance.

RAM:

1 GB RAM for Windows XP Professional with SP3 or Windows Vista, 2 GB RAM for Windows Server 2003 SP2 or Windows 7, 32-bit and 64-bit. *Recommended:* 4 GB RAM for Windows 7, 64-bit, or Windows Server 2008.

Cache:

512 KB minimum L2 Cache. *Recommended:* 1 MB L2 Cache.

Software requirements

Operating system options for host machine:

You can store your master user profiles on a machine running one of these operating systems:

- Windows Server 2008
- Windows Server 2003 SP2
- Windows XP Professional with SP3
- Windows Vista
- Windows 7

Other software required:

The Windows-based machine where you store the master user profiles must have .NET Framework 3.5 SP1 installed.

Optional hardware

Storing Master User Profiles on RAID array

If you want or need to store the profiles on a RAID array, that array must be connected to a Windows-based machine with .NET Framework 3.5 SP1 installed.

Storing Master User Profiles remotely on a SAN storage device

You can store your master user profiles at a remote location for access from several sites by storing them on a SAN storage device and having the *Profile Optimizer* access the profiles by making remote calls to that server. To set up this kind of topology, when you store the master user profiles on a SAN storage device, the SAN device must be connected to a *Dragon Medical Enterprise Network Edition* server (usually the *Profile Optimizer Server* or another network server running Windows 2003 or 2008 Server with .NET Framework 3.5 SP1 and .NET Framework 4.0 installed) over a 10/100/1000 Mbps Ethernet using a Host Bus Adapter (HBA) card. The server that connects to the SAN must access the SAN storage device as a mapped drive (such as X:).

The *Profile Optimizer* remotes calls from the *Speech Nodes* to access the master user profiles to the server that the SAN is connected to.

Options for storing user profiles on machines running server components

You can store your master user profiles on either a server machine or a workstation or locate them on the same machine with any of the following components: *NMS Server*, *NMS SQL Database*, *Profile Optimizer Server*, or *Profile Optimizer Database*.

Optional software

In a typical installation, you would store your master user profiles on a domain (network) machine and access them through either a mapped disk drive or a UNC. Other alternatives include storing your user profiles on either a web server or a secure web server.

Storing your user profiles on a web server or secure (SSL) web server

You can store your master user profiles on a web server or a secure web server.

- *Dragon Medical Client* workstations would access the profiles on a web server through a URL starting with **http://**.
- *Dragon Medical Client* workstations would access the profiles on a secure (SSL) web server through a URL starting with **https://**.

- *NMS Server* and *NMC Console* would access the profiles through a UNC path that points to the user profile location.

For more information on compatible web servers and installing the software required to set them up, refer to the *DMENE Installation Guide*.

System Requirements for Dragon Medical Clients

Hardware requirements

Processor: Intel® Pentium 4 ® or later or AMD Athlon 64 1 GHz processor or later).

Recommended: 2.4 GHz processor or greater. Faster processors produce faster performance.

RAM 512 MB RAM for Windows XP Home or Professional, 1 GB RAM for Windows Vista, 2 GB RAM for Windows 7, 32-bit and 64-bit. *Recommended:* 4 GB RAM for Windows 7, 64-bit.

Cache: 512 KB minimum L2 Cache. *Recommended:* 1 MB L2 Cache.

Hard disk space: 2 GB. *Recommended:* 2.5 GB.

Sound card: Sound card capable of recording, set to 16 bit 11 KHz for audio recording, if any provider will dictate with a microphone plugged in to the Mic-in jack of the workstation.

USB port: If any provider will dictate with a USB microphone, such as a Nuance PowerMic II.

Speakers: For playback of recorded speech and *Text-to-speech* features.

Network: An Internet connection for working with the *NMS Server*.

Audio dictation source devices

Bluetooth (Optional): For Bluetooth wireless microphone support, visit <http://support.nuance.com/compatibility>.

Microphone: Nuance-approved noise-canceling headset microphone. For a complete listing of *Dragon*-compatible audio input devices, visit the Hardware Compatibility List on the Dragon Support Web pages at <http://support.nuance.com/compatibility/>.

This Edition of *Dragon* has built-in support for the Nuance PowerMics:

- PowerMic (beige)—Only newer beige PowerMics work with *Dragon Medical Clients* on Windows Vista.
- PowerMic II (black)—PowerMic II packaging should display Vista compliance labeling. If you are unsure about the compatibility, confirm that the firmware version is v2.02 or higher. For more information on PowerMic II, refer to https://isupport.nuance.com/OA_HTML/csksxvm.jsp?nSetNumber=13102

Software requirements

Operating systems:

32-bit operating systems: Windows XP Home or Windows XP Professional with Service Pack 3, Windows Vista™ Home or Professional Service Pack 2, or Windows 7.

64-bit operating systems: Windows Vista Home or Professional, Windows Vista with Service Pack 2, Windows Server 2003, Windows Server 2008, or Windows 7.

Note: Windows XP 64-bit is not supported.

Internet Browser: Microsoft® Internet Explorer 6 or higher (free download available at <http://www.microsoft.com>).

Summary of hardware and software requirements

	NMS SQL Database	Profile Optimizer Database	NMS Server & NMC Console	Profile Optimizer Server	Speech Nodes	Master User Profiles Host	Dragon Medical Client
Recommended Machine Type	Server	Server	Server	Server	Workstation or Server	Workstation or Server	Workstation
Recommended Processor Type	Xenon 3050 or equivalent	Xenon 3050 or equivalent	Xenon 3050 or equivalent	Xenon 3050 or equivalent	One core for each node	At least Pentium IV	Pentium IV or AMD Athlon 64
Recommended CPU Speed	2 GHz	2 GHz	2 GHz	2 GHz	2 GHz	2 GHz	2.4 GHz (AMD 1 GHz)
Gigabit Network Cards	Gigabit cards and switches/cards plugged into them = Automatic						
10 Mb/100 Mb Cards	Same network link speed & duplex settings on all servers, workstations, hubs, switches, and cards.						
Network Speed	100 Mbps/Full Duplex or 10 Mbps/Full Duplex						
Min Hard Disk Capacity/Free Space	20 GB	20 GB	20 GB	20 GB	20 GB	Based on calculation	2 GB; Recommended: 2.5 GB
Minimum RAM	4 GB	4 GB	4 GB	2 GB	1.4 GB for each node, up to 8 GB on an eight-core server	4 GB	512 MB on XP, 1 GB on Vista, 2 GB on Windows 7, 32- & 64-bit; Recommended: 4 GB on Windows 7, 64-bit
Minimum L2 cache	2 MB	2 MB	2 MB	2 MB	2 MB	2 MB	512 KB; Recommended: 1 MB L2
Other Hardware	---	---	---	---	---	---	Sound card recording at 16 bit 11 KHz and speakers for playback; Microphone;

	NMS SQL Database	Profile Optimizer Database	NMS Server & NMC Console	Profile Optimizer Server	Speech Nodes	Master User Profiles Host	Dragon Medical Client
							DVD reader
Windows Operating System Options	Windows Server 2008 or 2003 SP2	Windows Server 2008 or 2003 SP2	Windows Server 2008, 2008 R2, 2003 SP2, or 2003 R2 (32- or 64-bit)	Windows Server 2008, 2008 R2, 2003 SP2, or 2003 R2 (32- or 64-bit)	Windows XP SP3, Vista SP2, or 7 workstation; Windows Server 2008 or 2003 SP2	Windows XP SP2 or SP3, Vista, or 7 workstation; Windows Server 2008 or 2003 SP2; RAID Array may be required (see note below)	32-bit and 64-bit operating systems detailed below table.
Version of SQL Server	2008	2008	---	---	---	---	---
.NET Framework	Version 3.5 SP1 Required	Version 3.5 SP1 Required	Version 3.5 SP1 and Version 4.0 Client or full version Required	Version 3.5 SP1 and Version 4.0 Client or full version Required	Version 3.5 SP1 and Version 4.0 Client or full version Required	Vers 3.5 SP1 Required	---
Internet Information Services (IIS)	---	---	Required	---	---	---	----
In Windows Domain	Required	Required	Required	Not required	Not required	Required	Required
Windows Installer 3.1 or later	---	---	---	Required	Required	---	---
Dragon SDK Client	---	---	---	---	Required	---	---

	NMS SQL Database	Profile Optimizer Database	NMS Server & NMC Console	Profile Optimizer Server	Speech Nodes	Master User Profiles Host	Dragon Medical Client
Internet Browsers	---	---	Internet Explorer 7 or 8, FireFox 3.6, or any browser with support for WPF xap technology	---	---	---	Internet Explorer 6, 7, or 8

Notes:

Dragon Medical Enterprise Client software can run on several 32-bit and 64-bit operating systems:

32-bit operating systems: Windows XP Home or Windows XP Professional with Service Pack 2 or 3, Windows Vista™ Home or Professional Service Pack 2, or Windows 7.

64-bit operating systems: Windows Vista Home or Professional, Windows Vista with Service Pack 2, Windows Server 2008, or Windows 7.

Windows XP 64-bit is not supported.

Note:

Whenever you store the master user profiles on the same machine where the *Profile Optimizer Server* resides, you must store those profiles on a RAID array.

Summary of network configuration options

	Size and Type Configuration for Number of Providers		
	Small: Single Server	Medium: Two Servers	Large: Minimum Three Servers
Number of Providers	10 - 100	101 - 1,000	1,000 or more
Minimum Physical Servers	1 Server	2 Servers	3 Servers: One Dual-Core NMS Server & one Eight-Core Speech Node Server for every 1,000 providers (one Speech Node server allows for 8 Speech Nodes); One Database Server
NMS Server(s)			
Software	NMS Server Profile Optimizer Server NMS and Profile Optimizer Databases Master User Profiles Folder 1 Speech Node	NMS Server Profile Optimizer Server NMS and Profile Optimizer Databases Master User Profiles Folder	NMS Server
Hardware Specs	Quad-Core with minimum 4 GB RAM Hard Disk = 40 GB + 1 GB per provider	Dual-Core with minimum 4 GB RAM Hard Disk = 40 GB + 1 GB per provider	Dual-Core with minimum 4 GB RAM Hard Disk = 40 GB
Speech Node Server(s)			
Software	---	Up to 8 Speech Nodes on VMs	Up to 8 Speech Nodes on VMs
Hardware Specs	---	Eight-Core with minimum 8 GB RAM Hard Disk = 20 GB per node	Eight-Core with minimum 8 GB RAM Hard Disk = 20 GB per node
Separate Database Server			
Software	---	---	Profile Optimizer Server NMS and Profile Optimizer Databases Master User Profiles Folder
Hardware Specs	---	---	Dual-Core with minimum 4 GB RAM Hard Disk = 20 GB per node + 1 GB per provider

	Size and Type Configuration for Number of Providers		
	Small: Single Server	Medium: Two Servers	Large: Minimum Three Servers
Optional Multiple Distributed Master User Profile Servers, one for each site (for large systems with distributed sites)			
Software	---	---	Master User Profiles Folder
Hardware Specs	---	---	Intel® Pentium 4® or later or AMD Athlon 64 1 GHz processor or later with from 1 GB RAM to 4 GB RAM, depending on Operating System. Refer to <i>Hardware and software requirements/storage options for master user profiles machine</i> on page 42. Hard Disk = 20 GB + 1 GB per provider

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