

GE Healthcare

Configuring Environments for Centricity® Practice Solution

Version 10.0
June 2011



Centricity Practice Solution
DOC0895934
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Revision history

| Date | Description |
|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| June 2011 DOC0895934 Rev 1 | Update for version 10.0. This content was formerly released in the <i>Systems Planning and Requirements for Centricity Practice Solution</i> . |

Configuring servers and workstations to run Centricity Practice Solution

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This chapter includes all hardware and software requirements for Centricity Practice Solution in a 64-bit Windows Server 2008 R2 environment.

!!! GE may change configuration recommendations at any time without notice.

GE is not responsible for the performance of Centricity Practice Solution on hardware, software, or network configurations not recommended by GE. Check the Centricity Practice Web site regularly for updates to this document and for other configuration requirements.

The following planning resources are available at <http://centricitypractice.gehealthcare.com>:

- *System Planning and Requirements for Centricity Practice Solution*. This guide contains detailed system planning information and maintenance procedures.
- *Calculating Hardware Requirements for Centricity Practice Solution* (Microsoft Excel spreadsheet). Use this spreadsheet to compute memory requirements for a dedicated Centricity Practice Solution Database Server.



The spreadsheet is available in the same folder as this document. The path is `./guides/calculating_hardware_requirements_cps.xls`.

- A demo version of the software can be installed on a system running a Windows Server operating system and a full version of SQL Server 2008 R2.

Terminology

| This term... | Means this... |
|--------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Active Directory authentication | The Active Directory authentication option validates a user's login name and password against an Active Directory profile. With Active Directory authentication, all user login names, passwords, and security group associations are defined and maintained in Active Directory, but that information is also stored in the Centricity Practice Solution database, with an options to automatically create users when they first log into the application, and to synchronize the security group membership between the two. |
| Application authentication | The application authentication option validates a user's login name and password against values stored in the Centricity Practice Solution database, via the Service Layer. User names, login IDs, and passwords are all managed within the application. |
| Application server | <p>A Windows server running Service Layer and JBoss web server to handle all application tasks between user workstations and the database server, including application Web sites and Web services.</p> <p>Application server components can be combined on the Database server (Windows environments) or with Data Exchange components.</p> |
| Centricity Clinical Gateway | <p>Centricity Clinical Gateway (CCG) provides seamless communications between Centricity products and external healthcare applications and systems. CCG may be required for exchanging data with external systems.</p> <p>CCG is optional. If used, it is installed to the Data Exchange server. Different versions of the gateway cannot be run on the same server.</p> |
| Centricity Practice Solution Web site | A Web site used to launch the client application on networked workstations or terminals and hosted by the Service Layer and JBoss application server. |
| Cloverleaf 5.5 MB (Multi-Byte) interface engine | <p>Part of Centricity Clinical Gateway, the Cloverleaf interface engine receives messages from internal and external sources in a variety of protocols. Messages are translated as required and routed to specified destinations. Cloverleaf interface engine and sites (interfaces) are required to exchange data.</p> <p>You can continue to use older versions of Cloverleaf on the same system if required for non-GE legacy applications.</p> |
| Database server | The server that hosts the database that stores Centricity application data. |
| Data Exchange server | <p>A Windows server used to manage data exchange with remote systems. Data Transfer Station, MIK, and Centricity Clinical Gateway may be installed to this server.</p> <p>In limited circumstances, some data exchange components can be installed to the Database server. For best results, GE recommends installing to a separate machine.</p> |

| This term... | Means this... |
|-------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Data Transfer Station (DTS) | <p>Runs on a dedicated machine and automates clinical data transfers to and from external systems via LinkLogic and (optionally) Cloverleaf interface engine.</p> <p>Multiple instances of DTS can be implemented. GE recommends locating each instance on a separate machine.</p> |
| JBoss | See Service Layer. |
| KnowledgeBase | Clinical content that is updated quarterly. KnowledgeBase updates formulary names, ICD codes, allergy custom lists, medication references and interaction information, and problem references (CPT codes and keywords). |
| LinkLogic | LinkLogic runs within the Centricity application and is used to exchange information with other health care information systems. LinkLogic imports demographics, documents, lab results, appointments, and references to external images into the Centricity database and exports application data for demographics, documents, observations, procedures, allergies, problems and clinical summaries. |
| MIK (Millbrook Integration Kit) | MIK is a service that automates business data transfers for Centricity PM. MIK is typically installed to the database server in a PM-only implementation. It is installed to the Data Exchange server in a joint EMR-PM implementation. |
| Service Layer | <p>The Service Layer handles all application tasks between user workstations and the Database Server. It is a service-oriented architecture (SOA) Java-based application server (JBoss) with Web services interface that supports:</p> <ul style="list-style-type: none"> • Legacy Clinical Web Services (Dosing Calculator, Growth Charts, Medication/Problem Web Lookup) and application Web sites • Tighter integration with Centricity Business Systems (Flowcast) and a platform for future interoperability with other GE systems • Enhanced integration with third-party software applications <p>Service Layer can be installed to the Database server (Windows environments) or to the Application server.</p> |
| Staging area/ staging location | The directory on the database server that contains the Centricity application and database files used in the installation process. The contents of the Centricity installation media is copied to this directory and remains there during and after installation. The database installation files can be copied to this directory as well. The staging directory should have at least 2 GB of free space. |

Hardware and software planning considerations

To prepare for Centricity Practice Solution, you need to define, order, set up, and test all hardware, required software, and networks.

To determine your server hardware requirements, you need to consider how your organization will implement Centricity Practice Solution, including the scope of your Centricity Practice Solution database requirements.

Use GE consultants when planning system hardware

Contact GE for help understanding and planning your equipment needs. Also plan to work closely with your clinic teams as they develop new workflows incorporating Centricity Practice Solution.

Review and, if necessary, update clinic hardware requirements to meet changing needs.

For help understanding and planning database requirements in relation to providers, staff, and patients, see “Databases and servers” in [System Planning and Requirements for Centricity Practice Solution](#).

Upgrade and integration options

Refer to the upgrade matrix in the [Upgrading to Centricity Practice Solution](#) guide for supported upgrade paths.

Supported integration configuration

- Centricity Practice Solution 10x(Practice Management only) with Centricity Electronic Medical Record 9x (with/without Remote Desktop Services/Citrix)

!!! To run both applications on the same machine, always install Centricity Electronic Medical Record first and then manually re-register mlCrwLib2.DLL (Crystal Reports) in the Centricity Practice Solution\Centricity Practice Solution Client folder. For details, see your Centricity Practice Solution [install](#) or [upgrade](#) documentation.

Unsupported integration configurations

The following configurations are not supported:

- Centricity Practice Solution 10x(Practice Management only) and Centricity Electronic Medical Record 2005 (or earlier versions) (with/without Remote Desktop Services/Citrix)
- Centricity Practice Solution Chart (EMR only, any version) without Centricity Practice Solution Practice Management. For an EMR-only implementation, consider Centricity Electronic Medical Record.

Planning considerations

Consider the following when planning:

- **Plan for productivity and growth.** “We can probably make do with these Pentium II 450 Mhz machines...” Your hardware budget should realistically support your organization’s goals. If you plan to use older equipment, confirm that they meet the minimum requirements for the application.

Using older technology may be acceptable in some situations, but understand the trade-offs. Slower machines can reduce employee productivity.

- **Set up at least one workstation for testing.** Not all workstations have to be in place for the server to be installed and software loaded. However, you want at least one client workstation to test network connectivity and software.
- **What needs to be ordered separately?** Most workstations come with all needed cables, but some peripheral devices do not. Verify with the hardware vendor that power cables, network connectors, and other items either come with the equipment or are ordered separately.

!!! Centricity Advanced ePrescribing: When you implement Advanced ePrescribing, your database space requirement will increase by up to 30 GB immediately, with an annual growth rate of around 10 percent (up to 3 GB). The transaction log may also grow immediately by 120 GB.

Virtual environments

Two virtual environments are supported:

- 1** Use the Server Virtualization Specification with VMware's ESX 4.0.
 - a** Up to 1000 users can be supported.
 - b** GE Healthcare recommends VMWare ESX 4.0 with VSAN.
- 2** Use the Server Virtualization Specification with Microsoft's Hyper-V.
 - a** Up to 500 users can be supported.
 - b** The 64-bit Windows Server 2008 R2 operating system is the minimum recommended OS for host systems when using Hyper-V.
- 3** Use the Standalone Server Specification to take full advantage of the Intel Nehalem and Westmere processor chip sets.
 - a** Up to 2000 users can be supported.
 - b** Facilitates scalability across multiple traditional concurrent user tiers for the same economical price point.

Server Virtualization Specification

Virtualization is a technology where a physical "host" operating system supports one or more virtual "guest" operating systems. This document uses the terms "host" and "guest" to refer to the physical systems and the virtual systems they support.

When considering the performance of Centricity Practice Solution in a virtualized environment, be sure to measure the performance of the host systems as well as the guest systems.

Host Specification

The tests on which these recommendations were based were completed on host systems similar to the one described below. The use of Solid State Drives (SSDs) helps achieve high IOPS and helps minimize the physical footprint.

- Hewlett-Packard ProLiant DL 380 G6 Server (with both SSD and HP MSA70 Arrays)
- Dual Intel Xeon X5550 CPUs (2 CPUs, 4 cores each, hyper-threading enabled)
- 72GB RAM (18 x 4GB)
- 4 x 1GbE NICs (or 8 with 4 dedicated to VSAN)
- Fiber Channel P2000 series and up to EVA storage for site +1000 users
- 11x SFF SAS 10K 300GB Raid-5 with hot spare
- Windows Server 2008 R2 64-bit

Each customer installation requires a different combination of guest operating systems. Allocate the guest operating systems across the host operating systems. Balancing how the guest systems use CPU, memory, disk and network across the available hosts will improve the performance of the Centricity Practice Solution installation.

Guest Specification

Guest systems support the database, secondary servers and third party extension modules.

Database Guest Specification

The Centricity Practice Solution product relies on the SQL Server database. The releases described in this document require 64-bit SQL Server 2008 SP1 or R2 and the 64-bit Windows Server 2008 R2 operating system.

Refer to the Calculating Hardware Requirements spreadsheet to determine the RAM, IOPS, Network, CPUs and disk space needed to support these configurations.

| Users | 1-125 | 126-500 | 501-up |
|--------------|-------|---------|---------------|
| CPUs VMWare | 2 | 4 | 8 |
| CPUs Hyper-V | 2 | 4 | Not supported |

Terminal Services Guest Specification

The Centricity Practice Solution product may be used either with Citrix XenApp or with Microsoft Remote Desktop Services. For Citrix, the minimum supported version of XenApp Presentation Server is 6.0 SP2 and the minimum supported version of the ICA Client is 11.2. For Microsoft, Windows Server 2008 R2 contains the minimum supported RDP server and 6.1 is the minimum supported version of the RDP client. This client is available for Windows 7, Windows Vista and Windows XP SP3.

Refer to the Calculating Hardware Requirements spreadsheet to determine the RAM, IOPS, Network, CPUs, disk space, the number of hosts and guests needed to support the configurations in the table below. Additional hosts and guests are added as needed to provide the required number of terminal services connections.

| Users | 1-25 | 26-up |
|--------------|------|-------------------------|
| CPUs VMWare | 3 | Add hosts and/or guests |
| CPUs Hyper-V | 3 | Add hosts and/or guests |

Secondary Servers Guest Specification

The application server needs to scale as the number of users grows.

| Service Layer: 64-bit OS Only | | | |
|-------------------------------|------|-------|-----------|
| Users | RAM | Cores | CPU Class |
| 500 | 8GB | 4 | X5550 |
| 1000 | 16GB | 6 | X5670 |
| 2000 | 32GB | 12 | X5670 |

Use the information in the table below to estimate the guest operating system needs to support the secondary servers.

| Secondary Servers | Processor | RAM |
|----------------------------------|-----------|------|
| Data Exchange Server (Interface) | 2 CPU | 4 GB |
| Analytics (Reporting) | 1 CPU | 4 GB |
| MQIC (Quality) | 1 CPU | 4 GB |

Third-Party Extension Module Guest Specification

Use the information in the table below to estimate the guest operating system needs to support the Third-Party Extension Modules. Many of these extension modules may be run in either 32-bit or 64-bit guest operating systems, either Windows Server 2003 or Windows Server 2008 R2. Verify the requirements with the provider of the extension module.

| Third-Party Extension Module | Processor | RAM | Disk |
|----------------------------------------------------------------------|-------------------------------------------|------|--------|
| eScript Messenger (eRx) | 2 CPU | 4 GB | 50 GB |
| Document Management (1-25 Users) | 2 CPU | 2 GB | 500 GB |
| Document Management (26-125 Users) | 2 CPU | 4 GB | 1 TB |
| Document Management (126+ Users) | 2 CPU | 4 GB | 1.5 TB |
| Web Server (Centricity Portal and Secure Messenger) (1-125 Users) | 2 CPU | 4 GB | 50 GB |
| Web Server (Centricity Portal and Secure Messenger) (126+ Users) | 2 CPUs | 4 GB | 50 GB |
| Mobile Charge Capture | 1 CPU | 4 GB | 50 GB |
| Faxing (Bizcom – Faxcom CV plus) | n/a for virtualization. Use separate host | | |

Overview of implementation scenarios by clinic size

The following tables depict sample hardware configurations anticipated for small, medium, and large environments.

Small - 1 to 25 concurrent users

Recommended configuration for small clinics: The client runs on separate workstations and other application components are hosted on two servers:

- *Server 1 Database Server:* Application database, MIK (Millbrook Interface Kit)
- *Server 2 Data Exchange Server:* Service Layer, including JBoss application server and application Web site(s), Data Transfer Station, and optionally Centricity Clinical Gateway or Kryptiq eScript Messenger (eSM) (for Advanced ePrescribing)









GE recommends you follow industry standard IT configurations for security and reliability that install database and application servers to separate hosts.

For a hardware specification for Server 2 combining Application server and Data Exchange server components, see [Application Server/Data Exchange Server hardware requirements on page 17](#).

Supported configuration for small clinics: The client runs on separate workstations and other application components are hosted on two servers:

- *Server 1 Database Server:* Application database, Service Layer, (including JBoss application server and Centricity Practice Solution Web site). Also hosts Centricity Analytics, MIK (Millbrook Interface Kit) and optional Demo Database Web site.
- *Server 2 Data Exchange Server:* Data Transfer Station and optionally, Centricity Clinical Gateway or Kryptiq eScript Messenger (eSM) for Advanced ePrescribing.)

| | | | |
|------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| |  |  |  |
| Small - Recommended configuration | Client workstations | Database/Application Server. Analytics MIK | Data Exchange Server Data Transfer Station Service Layer (JBoss) Application Web site CCG , eSM server, ePrescribing |
| | 32-bit or 64-bit OS | 64-bit OS | 64- or 32-bit OS |

| | | | |
|----------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|
| Small - Supported configuration |  |  |  |
| | Client workstations | Database/Application Server Service Layer (JBoss) Web site, Analytics, MIK | Data Exchange Server Data Transfer Station Centricity Clinical Gateway eSM server, ePrescribing |
| | 32-bit or 64-bit OS | 64-bit OS | 64- or 32-bit OS |

Medium - 26 to 250 concurrent users

Recommended configuration: Separate servers host the three main application components:






- *Server 1 Database Server:* One or more Centricity Practice Solution databases on a dedicated server, Centricity Analytics, MIK
- *Server 2 Application Server:* Service Layer (JBoss application server and Centricity Practice Solution Web sites)



Installing to a separate server is recommended and may be required to support large multi-site implementations, custom third-party software integrations, and future Electronic Medical Record features and functionality. A separate machine can be workstation class. See [Application server software on page 20](#).







- *Server 3+ Data Exchange Servers:* Additional machines for Data Transfer Station(s) and optionally, Centricity Clinical Gateway, eScript Messenger (eSM) for Advanced ePrescribing

Larger environments may require two or more separate Centricity Practice Solution databases, to maintain separate patient charts among different groups of physicians. This means that multiple application web sites will run under the Service Layer, each connected to a separate database.

| | | | | | |
|-------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| |  |  |  |  |  |
| Medium - Recommended configuration | Workstations | Application database(s), Analytics, MIK | Service Layer (JBoss) Web sites Can be combined with DB server Centricity Clinical Gateway | Dedicated Data Transfer Station(s) | eSM server ePrescribing |
| | 32-bit or 64-bit OS | 64-bit OS only | 64-bit OS only | 64-or 32-bit OS | 64-or 32-bit OS |

Large - 250 to 1000 concurrent users

This is often an ASP or thin client environment running under Citrix or Windows Terminal Server with multiple Database servers and multiple Web sites.

| | | | | | | |
|------------------------------------------|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| |  |  |  |  |  |  |
| Large - Recommended configuration | Citrix Server(s) and thin clients | Database 1 Database 2, Analytics, MIK | Application Server Service Layer (JBoss) one instance per DB Web Site(s) | Optional Data Exchange Server: Centricity Clinical Gateway (one or more instances) | Data Exchange Server Data Transfer Station(s) - minimum one per DB dedicated eSM server for ePrescribing | Additional Databases as needed |
| | | 64-bit required | | 64- or 32-bit OS | 64- or 32-bit OS | 64-bit OS only |

Database Server

The following recommendations provide satisfactory performance for Centricity Practice Solution including its options. The requirements for satisfactory performance of other software may be higher.

Database Server refers to the Windows server hosting Centricity Practice Solution and SQL Server, where all clinical and practice management data is stored.

Database Server hardware

These hardware recommendations are based on user loads with Centricity Practice Solution and Centricity Clinical Content (CCC) forms installed.

!!! In earlier versions, the Centricity Practice Solution application Web site might also be installed on the Database Server or a separate Web server.

With the shift from IIS to Java-based Web services, application Web sites are hosted on a separate Application server with Service Layer and JBoss Application Server components. Hosting Database and Application servers separately is GE's recommended configuration.

Combining Database and Application server is supported for environments with 1 - 25 concurrent users only. Additional limitations apply. See [Application server / Data Exchange server on page 17](#), for details.

Server Setup installs application Web sites to the location of JBoss/Service Layer automatically during install/upgrade.

Database hardware requirements vary considerably depending on the size and complexity of your implementation. To precisely compute the memory needed for a dedicated Centricity Practice Solution Database Server, use the Excel spreadsheet, *Calculating Hardware Requirements for Centricity Practice Solution* available on the Centricity Practice Web site.



The spreadsheet is available in the same folder as this document. Wherever this documentation library is located, the path is `./guides/calculating_hardware_requirements_cps.xls`.

**Processor speed,
RAM, disk space**

Choose the fastest processor within your budget that is not less than the recommended value. CPU selection is based on number of concurrent users.

Disk setup is also based on number of concurrent users, number of patients (Electronic Medical Record), and high-frequency disk access.

RAM recommendations are minimum requirements. Use the spreadsheet *Calculating Hardware Requirements for Centricity Practice Solution* to fine-tune disk space and RAM requirements for your environment.

| Users | Processor | RAM | Disk space |
|--------------|----------------------------|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 to 25 | Single Quad Core Xeon 5520 | 6 GB | Mirrored 146 GB SAS (RAID 1) |
| 26 to 125 | Single Quad Core Xeon 5520 | 12 GB | 6-Disk 146 GB SAS (RAID 1) See <i>Calculating Hardware Requirements for Centricity Practice Solution</i> (spreadsheet) to determine number of disks. |
| 126 to 250 | Single Quad Core Xeon 5520 | 24 GB | See <i>Calculating Hardware Requirements for Centricity Practice Solution</i> (spreadsheet) to determine number of disks. |
| 251 to 500 | Single Quad Core Xeon 5550 | 24 GB | See <i>Calculating Hardware Requirements for Centricity Practice Solution</i> (spreadsheet) to determine number of disks. |
| 501 to 1000 | Two Quad Core Xeon 5550 | 36 GB | See <i>Calculating Hardware Requirements for Centricity Practice Solution</i> (spreadsheet) to determine number of disks. |
| 1001 to 2000 | Two Quad Core Xeon 5650 | 48 GB | See <i>Calculating Hardware Requirements for Centricity Practice Solution</i> (spreadsheet) to determine number of disks. |

!!! Base box must support the number of CPUs required.

Dedicated Database Server required

At least one database server dedicated to Microsoft SQL Server is required to run the Centricity Practice Solution database. This server cannot be a domain controller or Remote Desktop Services/Citrix server.

While a small amount of file and print server activity can occur on the Database Server, use a separate server for other networked applications. Take advantage of Windows Server options for maximizing throughput for applications.

Planning for Centricity Advanced ePrescribing

Increased space requirements

Implementing Advanced ePrescribing increases transaction log generation initially to as much as 120 GB over your previous rate due to formulary loads. Database space requirement will increase by up to 30 GB immediately with an annual growth rate of around 10 percent (up to 3 GB).

Performance impacts

If average utilization (CPU, I/O) on your database server is above 50 percent, implementing Advanced ePrescribing can impact overall server performance.

Contact Centricity Services to evaluate your database server implementation.

Disk and database file layout

Follow these recommendations for disk and database file layouts:

- Locate database log files on a mirrored disk set (RAID 1).
- Locate all other database files on a separate RAID 1+0 disk set. At least 2 spindles/disks per 50 users, minimum 4 disks. This assumes greater than or equal to 100 I/Os per disk pair.

!!! For 125+ users, locate tempdb on its own RAID 1+0 disk set.

- Allow one tempdb data file per processor core. Set tempdb data files to 100 MB with 10% autogrowth in size.
- Use enterprise-class solid-state drives (SSDs) (Intel X25-E or better) to simplify I/O configuration. SSDs provide considerably more IOPS (input/output operations per second) per device than traditional spindles by a factor of 10x to 20x.
 - **Up to 124 users:** 2 SSD devices RAID 1, or 3 devices minimum in RAID 5 (add more as needed for capacity and RAID level).
 - **125+ users:** 4 SSD devices in RAID 5 minimum, add more as needed for capacity and RAID level.
 - **500+ users:** 5 SSD devices in RAID 5 minimum, add more as needed for capacity and RAID level.



See the *Calculating Hardware Requirements for Centricity Practice Solution* spreadsheet in the same folder as this document. The path is `./guides/calculating_hardware_requirements_cps.xls`.

- Wherever possible, locate these files on separate drives:
 - transaction log
 - tempdb data files (one per processor)
 - Windows page file
 - SQLServr.exe



It is better to have many smaller spindles than a few large ones.

Recommended for higher performance and reliability

- **Disk arrays:** SAS or Fibre Channel RAID 1+0 disk arrays (Disk Mirroring with Striping) increase disk performance and reliability and lower CPU utilization. Storage area networks (SANs) provide flexibility, but still require dedicated disks and heads/filers/controllers. Striping RAID groups vertically across heads scales better than dedicating one or more entire disk arrays to a single head.
- **Page file space:** Ensure that page file space equals the greater of these values:
 - # of concurrent users * 1 MB RAM
 - 2X Total RAM

Locate page file space on different physical disk drive(s) from those containing Centricity Practice Solution database.
- **Redundancy:** For maximum reliability, use a redundant server for virtually instantaneous recovery if the primary server fails. For more information, contact your GE technical consultant.
- **Optimize server memory usage:** Windows Server includes a setting for optimizing how Remote Desktop Services utilizes server memory and maximizes throughput for applications. This is set as part of the installation/upgrade process.
- Use enterprise-class solid-state drives (SSDs) for all database files other than backup.

Network interface cards/switches

Systems and network cabling should be installed and configured by trained computer professionals. For Remote Desktop Services/Citrix environments, plan to engage a Citrix Gold Reseller for installation and ongoing support of the terminal server environment.



Do not use Network Hub devices for network connectivity.

- **Switches:** For maximum throughput, use 1000Base-T or greater switches
- **Network card:** Dual-port 1 GB Ethernet (1000Base-T) network card
- **Wiring:** Ethernet twisted pair CAT-5 compliant wiring, CAT-6 for gigabit
- **Remote Desktop Services/Citrix:** While the ICA/RDP protocol is highly compressed, make sure your network has sufficient bandwidth to carry the traffic your environment requires. See [Impact of network infrastructure on page 29](#).

For printers, monitors, UPS, and other hardware options and requirements, see [Other server/workstation hardware on page 31](#).

Database Server software

The following software is required to support Centricity Practice Solution and its options.

Operating system

- Microsoft Windows Server 2008, Standard Edition or Enterprise Edition, R2, SP1 required

Database limits

Windows Server 2008 Enterprise Edition, R2 is required only for systems with greater than 32GB of RAM.



For important server configurations see one of the following:

- [Installing Centricity Practice Solution](#)
- [Upgrading to Centricity Practice Solution](#)

for details on configuring SQL Server for maximum performance and up time.

Microsoft Windows Server 2008 R2 supports multiple databases. One per processor core, up to 500 concurrent users TOTAL per server.

Database engine

- Microsoft SQL Server 2008 R2 Standard or Enterprise Edition (9.5.1 and higher)

Web browser

The following versions support operation of Centricity Practice Solution.

- Microsoft Internet Explorer 8.0

Network protocol

TCP/IP only

Other database/Web server software

The following applications are required on your Database Server or web server to support the Centricity Practice Web site:

- SQL Server Utilities (needed on a Web server to communicate with Database Server)
- XML 6.0

Software interfaces

If you plan to exchange data with external systems or applications, LinkLogic folders are installed on the Data Exchange Server or Data Transfer Station.

- **EMR (for clinical data exchange):** Install Data Transfer Station (DTS) on a dedicated workstation/server. See [Application server / Data Exchange server on page 17](#).
- **PM:** Install MIK interfaces on the Database Server (Recommended) or on a dedicated workstation/Data Exchange server.

JBoss application server (Optional)

In small environments (up to 25 concurrent users only), you can install and run the Service Layer on the database server. Service Layer includes the JBoss application server and one or more Centricity Practice Solution Web sites.

Application server / Data Exchange server

This specification is for additional servers that MAY be required at larger sites to host the following components:

- Required Service Layer components, including JBoss and application Web sites.
- Optional applications and services supporting data exchange with external systems, including LinkLogic and Data Transfer Station, MIK (Millbrook Integration Kit), Centricity Clinical Gateway with Cloverleaf interface engine, eScript Messenger (eSM) server for Centricity Advanced ePrescribing.



Hardware specifications for a single server hosting combined Application and Data Exchange components is also included.

Application Server/Data Exchange Server hardware requirements

Basic hardware requirements for a server to host Service Layer or Data Exchange components are identical. To host all components on a single server, see increased requirements for “Combined Application and Data Exchange server” in the table.

Processor, RAM, disk space

| Server | Processor | RAM | Disk space |
|-------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Application server (Service Layer) 1-500 users | Single Quad Core Xeon 5550 | 8 GB | Minimum 36 GB of free disk space (after operating system installation). Other installed components may require additional space (see below). |
| | 501 - 1000 users | Xeon 5670 (6 core) | 16GB |
| | 1001 - 2000 | Xeon 5670 (12 core) | 32GB |
| Data Exchange server | Single Quad Core Xeon 5520 Quad processor-based or higher recommended for high data exchange transfer rate. See “High data transfer rate considerations” . | 4 GB or more | Minimum 36 GB of free disk space (after operating system installation). Other installed components may require additional space (see below). Total page file space should equal 2X physical RAM. Use SAS disk drive (10-15, 000 RPM+) if hosting LinkLogic network shared folders. |

Optional software space requirements

Several optional software components require disk space on this server.

| This application... | Does this... | Requires this space... |
|------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|
| Centricity Clinical Gateway | May be required for integration with other Centricity applications or to support an orders export (ORM HL7 message) implementation. | Up to 2 GB This does not include space required for archiving messages. |
| Data Transfer Station | Automates clinical data transfers to and from external systems via LinkLogic and (optionally) Centricity Clinical Gateway. | Up to 520 MB (300 MB for DTS, 220 MB for page file space) |
| Data Transfer Station AND Kryptiq eScript Messenger System (eSM) | Kryptiq Corporation recommends installing eSM (32-bit only) to a dedicated server. Optionally, where a low volume of ePrescribing transactions is expected, you can install eSM on the same machine with the DTS configured to handle ePrescribing HL7 messages, as long as sufficient disk space is provided for increased processing. | 250 GB, RAID 1 |
| MIK (Millbrook Integration Kit) | Microsoft Windows service that automates the exchange of information between various medical information systems and Centricity Practice Solution - Practice Management. While MIK can be installed to a Data Exchange server, GE recommends you install it to the database server where Server Setup application is located. Running MIK on a separate machine requires SQL Native Client and optionally the client (for easy error management). | 25 MB |
| Service Layer | Handles application tasks between user workstations and the database server. | 575 MB |
| JBoss, Apache Web Server | Provides Web services between the database and clients and hosts application Web site. | 175 MB |
| Additional Service Layer instance | For multi-database implementation | 400 MB |

| | |
|-------------------------|-----------------------------------|
| Network | Gigabit (1000Base-T) preferred. |
| Network protocol | TCP/IP only |
| Internet | High-speed connection recommended |

High data transfer rate considerations

The Data Transfer Station message transaction rate (TPH) is influenced by the size of the database server DTS communicates with. For a data exchange transfer rate exceeding 1800 message transactions per hour, GE recommends a Quad processor-based or higher server with proper disk configuration to maximize DTS performance.



Transactions per hour (TPH) measures patient-related messages processed per hour. Tests were performed with one patient-related message per import file. This is the preferred method of data import. TPH rate is also influenced by other factors:

- Number and speed of database server processors
 - Memory on the DTS and database server
 - Network speed
 - DTS hard disk drive speed and throughput
 - Server disk drive speed and configuration (stripe or hardware RAID)
 - Data Exchange server throughput speed
-

Application server software

Operating System ■ Windows Server 2008 R2 SP1

Service Layer ■ **JBoss 4.3 Application Server with 64-bit JVM**, a Java EE edition 5 compliant platform. This includes the Apache Tomcat Web server, Java Development Kit (JDK) 1.5, and Java Runtime Environment (JRE) 1.5. Service Layer also includes GE services to handle database and interface communications for the Service Layer and Centricity Practice Solution.

Supported JBoss version required

GE provides the correct version of JBoss on the installation media. If you already have JBoss, the only supported version is one obtained from Red Hat under a support and maintenance agreement. The tag must be **4.3.0 GA Build SVNTag=JBPAPP_4_3_0_GA date=200801031548** or higher.

The tag is written to the JBoss boot.log. For example:

```
11:24:57,090 INFO [Server] Starting JBoss (MX
MicroKernel) ...
11:24:57,090 INFO [Server] Release ID: JBoss [EAP] 4.3.0.GA
(build: SVNTag=JBPAPP_4_3_0_GA date=200801031548)
```

Downloadable or open-source versions of JBoss do not support the Service Layer. If you already have a JBoss infrastructure based on the open-source version, you must establish a separate instance with the supported version.

Web browser The following versions support operation of Centricity Practice Solution.

- Microsoft Internet Explorer 8.0

Data Exchange Server software

- Operating System**
- Windows Server 2008 R2
 - Windows Vista Business or Enterprise
 - Windows 7 Professional or Ultimate

Contact Centricity Services for latest qualified service pack information.

Database engine (PM only) Microsoft SQL Server 2008 for MIK installation (PM-only implementation)



GE recommends installing and running MIK on the Database Server. If you run MIK on a separate workstation class machine, the SQL Native Client is required.

Network connection limits

Windows workstation operating systems (XP Professional and Vista) support a maximum of 10 network resource connections into the workstation. Each interface / LinkLogic station deployed consumes one resource connection. (Socket interfaces are exempt.)

If you plan to use multiple interfaces without sockets or more than six LinkLogic stations, GE recommends Windows Server 2008 R2 for the operating system.

LinkLogic LinkLogic interfaces with Data Transfer Station to automate data exchange with other systems through files and TCP/IP socket connections. Ideally, LinkLogic should be installed on a Data Exchange server, and the LLOGIC folder shared on the network to be accessible to multiple Data Transfer Stations.

Data Transfer Station Data Transfer Station works with LinkLogic to automate data exchange with other systems through files and TCP/IP socket connections. One or more DTS can be used by clinics to automate data transfer operations and balance the transfer load. For best results, GE recommends you install each DTS instance to a separate qualified workstation or server.



You can only run one instance of DTS as a service per machine. Running DTS as a service is a configuration that automatically restarts the DTS in the event of a crash or other system restart.

MIK The Millbrook Integration Kit (MIK) is a Microsoft Windows service that automates the exchange of information between various medical information systems and Centricity Practice Solution - Practice Management. It uses the MS-HUG ActiveX for Healthcare messaging systems.

GE recommends you install MIK to the Database server where the Server Setup application used to manage MIK is located. You can optionally install MIK to a Data

Exchange server or a dedicated workstation and configure and manage MIK remotely from Server Setup on the Database server.



If you install MIK to a machine other than the Database server, also install the SQL Native Client and the Centricity Practice Solution client to the machine so you can check data files and troubleshoot problems.

For hardware requirements for a MIK server/workstation, see [Application Server/Data Exchange Server hardware requirements on page 17](#).

CCG

Centricity Clinical Gateway, CCG 8.x includes ServiceMix ESB and Cloverleaf 5.5 MB interface engine as installed components.

Separately licensed Cloverleaf interfaces (sites) include:

- Orders Export (standard ORM message HL7 interface)

If you have a CCG implementation supporting other GE products and interfaces such as Centricity Imaging, contact Centricity Services or your Value-Added Reseller for guidance in integrating your implementations. GE does not recommend running all Cloverleaf interfaces on the same machine without testing for performance and version compatibility between Cloverleaf and the actual interfaces.

eScript Messenger

Centricity Advanced ePrescribing requires Kryptiq eScript Messenger 3.2 (eSM) server on a dedicated server or for small implementations on a Data Exchange server or another dedicated machine of the same class.



See Kryptiq documentation for latest, detailed configuration requirements and instructions.

Web browser

The following versions support operation of Centricity Practice Solution.

- Microsoft Internet Explorer 8.0

Client workstation

Workstations are deployed to run the Centricity Practice Solution client application. The client running on the individual workstation is also known as a *thick* client.

Client workstation hardware

The following equipment recommendations provide satisfactory performance for Centricity Practice Solution client application including its options. Requirements for satisfactory performance of other PC software may be higher.

| | |
|--------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Processor | Single dual core 2Ghz or faster |
| RAM | 4 GB |
| Virtual memory/ page file space | 1.5X physical RAM |
| Disk space | 36 GB or larger hard disk This recommendation assumes the workstation will be used only for the operating system, Centricity Practice Solution and other GE software, and SQL client software. Centricity Practice Solution requires 850+ MB for the client application, Integrated Faxing, SQL Server client and services, with a minimum 300+ MB for page file space for Windows XP Professional/Vista. Formulary Editor v6.0 and its database require an additional 300 MB. To use less disk space, load one formulary at a time and compact the database regularly. |
| Video card | Scheduling workstations only. A video graphics card is required for workstations running the Scheduling module. The amount of video memory required depends on a combination of factors that varies considerably from site to site: <ul style="list-style-type: none"> ■ Resource (provider) columns displayed - this includes columns for canceled or overbooked appointments. ■ Time slots per day - shorter appointments mean more slots. ■ Concurrent open instances of the schedule module - having multiple provider schedules open at the same time multiplies total columns/slots. ■ Running other non-GE applications concurrently with Centricity Practice Solution on the workstation. |

Here are some estimates of video RAM required in different environments:

| Simple configuration, moderate usage... | Requires this RAM... |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| Fewer than 8 resource columns, typically viewing one instance at a time. (No change in requirements between PM 2004 to Centricity Practice Solution 8x or 9x. However, if you have performance issues, consider upgrading to an 256 MB card.) | 128 MB |
| Fewer than 8 resource columns, typically viewing several instances at a time. | 256 MB (with 4 GB system RAM) |
| High-usage configurations require more RAM. Example: 50+ resource columns, 48 10-min appointments per 8-hr day, displaying multiple schedule template instances. | |
| 4 concurrent instances (maximum) | 512 MB |
| 5 concurrent instances | 1 GB |
| 7 concurrent instances | 2 GB |
| !!! A separate video graphics card required. On workstations with “integrated” or “built-in” video graphics support, performance may suffer because RAM available for video/graphics processing is shared with the operating system. | |

| | |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Network | Gigabit (1000Base-T) preferred |
| Protocol | TCP/IP only |
| Internet connection | High-speed connection recommended for accessing Web-based Problem and Medication reference and downloading product updates and documentation. |
| Modem | DSL/cable or other high-speed fax/modem Modems may be needed for faxing or remote access by providers and other users not directly connected to the server. |
| Other hardware | For printers, monitors, UPS, scanners, and other hardware options and requirements, see Other server/workstation hardware on page 31 . |

Client workstation software

Operating system (32-bit recommended)

Workstations are deployed to run the Centricity Practice Solution client application. The client running on the individual workstation is also known as a *thick* client. The following operating system software and other components are approved/required for Centricity Practice Solution client workstations.



GE does not recommend 64-bit operating systems for the workstation client. This configuration provides no advantage to the application and does not universally support peripheral devices such as cameras, scanners, and printers).

However, an instance of the Centricity Practice Solution client application and Data Transfer Station can be installed and run on a database server running on a 64-bit operating system.

- Windows 7 Professional or Ultimate
- Windows Vista Business or Enterprise, SP1
(Business version includes Tablet extensions)



Windows 7 Home, Windows Vista Home, Basic, and Premium versions commonly included on new workstations are not supported.

- Windows XP Professional, SP3
- Windows XP Tablet PC Edition 2005, Version 2002, SP3



Microsoft Windows Server is supported for Data Transfer Station, and hosted Remote Desktop Services/Citrix.

Other required components include:

- Microsoft .NET Framework v1.1, v2.0, and v3.5, SP1

Web browser

The following versions support operation of Centricity Practice Solution.

- Microsoft Internet Explorer 8.0

Reports

Crystal[®] Reports Professional XI R2 by SAP BusinessObjects. Reports included in Centricity Practice Solution are written in this version. You must use this version to modify them. For more information about reports, see [Reports and inquiries](#) in the [System Planning and Requirements for Centricity Practice guide](#).

Customized factory reports created in or converted to Crystal Reports v10.0 should open without issues in Crystal Reports Professional XI R2. Custom reports created in earlier versions may require additional steps to convert.

For more information about Crystal Reports and help with migrating older reports, go to <http://www.sap.com/solutions/sapbusinessobjects/index.epx>.



Do not install Crystal Reports Professional XI R2 to a workstation where the Centricity Practice Solution client is installed. The client application supports an optional integrated version of Crystal Reports for custom business reporting. If you run a separate instance of Crystal Reports on the workstation, you will see an error each time you open the application.

| | |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CardioSoft | CardioSoft must be installed on the same workstation as the CPS client. For CPS 9.5 and earlier, only 32-bit platform CardioSoft installations are supported. |
| Word processor | Microsoft Word® 2007 or higher is required for some reports on workstations. |
| OCR not supported | GE does not support Optical Character Recognition. However, you can scan documents and store the acquired images directly to a patient chart. You can also annotate the scanned images. |
| Faxing | Biscom's Faxcom® 3.0 is the verified fax solution for Centricity Practice Solution Integrated Faxing. See also Integrated Faxing (Chart) on page 33 . For the latest detailed fax server requirements and configuration information, go to http://www.biscom.com . |

Browser/mobile access

Centricity Practice Solution is available as a web application running on a device with internet access. Browser/mobile access enables secure, remote access to patient charts. It does not allow access to the full functionality of Centricity Practice Solution.

Web browsers

Windows platforms

- Internet Explorer version 8
- Mozilla Firefox 3.x

Mac OS X

- Safari 4

Mobile devices

Mobile devices should have a touch screen, 64 MB of RAM, and a minimum resolution of 240x320. Supported devices are:

- Apple iPhone™ , Safari for iPhone V4
- Apple iPod touch™ , Safari for iPhone V4



Due to the limited memory of mobile devices, Safari may hang while downloading a large document. Press and hold the Home button for 10 seconds to Force Quit Safari. Restart Safari to continue.

Remote Desktop Services/Citrix Server/Client

Terminal servers are deployed to serve multiple (thin) clients to terminals or workstations. Hosting the application using Terminal Server with or without Citrix on a 64-bit platform supports more sessions than a 32-bit platform. The 32-bit scalability is limited by memory constraints.

Refer to the [System Requirements and Planning](#) guide for additional information about planning and implementing Centricity Practice Solution in a Remote Desktop Services/Citrix environment.

Remote Desktop Services/Citrix Server software

Operating System

Citrix XenApp™ environment

- Windows 2008 Server R2, Standard/Enterprise/Datacenter Edition, with Citrix XenApp (Presentation Server) 6.0 SP2 (64-bit)

Microsoft Windows Remote Desktop Services environment

- Windows 2008 Server R2, Standard/Enterprise/Datacenter Edition, with RDP 6.1 or higher

Connection load balancing

Connection load balancing is only available in Citrix; it is not available in Windows Remote Desktop Services running RDP, where connection load balancing is handled outside Remote Desktop Services through a combination of hardware and software. Contact your Microsoft representative for details.

Remote Desktop Services/Citrix server hardware

The following hardware requirements apply to both Windows Remote Desktop Services and Citrix XenApp environments.

For information about planning and configuring Remote Desktop Services/Citrix environments, see the [System Requirements and Planning](#) guide

Processor Choose the fastest processor within your budget that is not less than the recommended value. CPU selection is based on the number of concurrent users. The following recommendations are based on user loads with Centricity Practice Solution and Centricity Clinical Content (CCC) forms installed.

| Operating system | Concurrent users | Recommended minimum |
|------------------|------------------|---------------------------------------------------------------------------------|
| 64-bit | up to 40 users | 2x Quad Core Pentium Xeon X5355, 2.66 GHz, 2x4 MB Cache, 1333 MHz FSB or higher |

RAM

| Terminal Server OS: | Memory required |
|-------------------------|-----------------|
| 64-bit server OS memory | 16 GB |

!!! Make sure the server supports the amount of RAM required. Less RAM is available on smaller servers with fewer configuration choices.

Optimize server memory usage

Server memory usage is optimized as part of the installation. Refer to Testing the Citrix client installation in your Centricity Practice Solution install or upgrade guide.

Page file size Application Server RAM size X 2

Disk space 16 GB for Microsoft Windows Server Remote Desktop Services with Citrix XenApp (Presentation Server)

Mirrored 146 GB SAS HDD (or larger) in a RAID 1 configuration

+ 600 MB for Centricity Practice Solution
+ page file size (2x physical RAM)

This assumes that Centricity Practice Solution and the page file reside on the same disk drive as the Remote Desktop Services Server operating system.

Network Gigabit (1000Base-T) preferred.

Improve performance and reliability

- **Disk arrays:** SAS or Fibre Channel RAID 1 disk arrays increase disk performance and reliability and lower CPU utilization.
- **Hardware level RAID 1 (disk mirroring):** RAID 1 provides fault tolerance and performance. If a hard drive fails, the server keeps running. The drive can be replaced without having to rebuild the server.

Reduce overhead

A software RAID configuration requires the operating system to keep track of the raid configuration, creating overhead. Using a hardware RAID configuration, the operating system sees drives in the array as one drive. All the RAID processing is independent of the Remote Desktop Services/Citrix operating system.

Impact of network infrastructure

The Remote Desktop Services/Citrix environment is sensitive to network traffic. So your network infrastructure also influences how many concurrent users Remote Desktop Services/Citrix can support. When there is insufficient network bandwidth for the server to handle requests by users, the server becomes slow and unstable. The more resources the server spends on re-transmission of user tasks, the fewer resources the server has for new application processing.

Remote Desktop Services/Citrix with no users creates very little network traffic. Network traffic results from users connecting to other resources through Remote Desktop Services/Citrix. Access to resources, such as Microsoft Windows, or UNIX, through Remote Desktop Services/Citrix requires high network bandwidth.

Remote Desktop Services/Citrix client

- | | |
|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PC | <ul style="list-style-type: none">■ Citrix® ICA® Client (Win32) v11.2 configured for 1024x768 High Color (16-bit, 65536 colors) or greater display resolution.■ Microsoft® RDP client: v6.1 or higher (with Windows Server) |
| Thin client terminal | <ul style="list-style-type: none">■ ICA 3.0 / RDP 5.0 compliant device. Any ICA 3.0 / RDP 5.0 compliant device with 1024x768 High Color (16-bit, 65536 colors) or greater display resolution should provide satisfactory performance. |

Unsupported configurations/features in Remote Desktop Services/Citrix

The following configurations and Centricity Practice Solution features are either not supported in a Remote Desktop Services/Citrix environment or require additional steps or workarounds to use

- Hosting the application via Terminal/Citrix services on the dedicated Database server.
- Installing and running the demo (training) database of Centricity Practice Solution on the Remote Desktop services/Citrix server. Instead, install and run on a supported thick client or server class workstation. See [Client workstation software on page 25](#).
- Centricity Clinical Gateway. Install and run on a supported thick client workstation or Data Exchange server. See [Data Exchange Server software on page 21](#).
- Data Transfer Station (DTS), Encounter Form Editor, Formulary Editor. Run these applications on a thick client.
- Capturing images in the application, including Photo IDs, directly from digital cameras, scanners, or Webcam devices.



Image capture is supported with digital cameras that are connected to terminals through USB connectors (with remote drives enabled).

Webcam devices are not TWAIN-compliant and do not support low-level USB redirection. You must acquire webcam images on a thick client. For more information, see [Acquiring and attaching images to charts](#) in the [System Planning and Requirements for Centricity Practice Solution](#).

- Running Remote Desktop Services/Citrix while hosting Dragon speech recognition software locally creates conflicts between Dragon and Chart hot keys. The correct configuration is to host both Centricity Practice Solution and Dragon software in Citrix or Windows Remote Desktop Services on the same server. See also [Running speech/handwriting recognition software](#) in [System Planning and Requirements for Centricity Practice Solution](#).
- Running multiple versions of Centricity Practice Solution on a single server. See [Running multiple versions of the application](#) in [System Planning and Requirements for Centricity Practice Solution](#)

Other server/workstation hardware

Monitors **Color SVGA Display:** Minimum resolution 1024 x 768 - Small Fonts, High Color (16-bit, 65536 colors) or greater.



Higher resolution is required for image capture, viewing, and annotation.

Uninterruptible power supply (UPS)

To avoid data corruption during power brownouts, connect the Application server, the Data Exchange server, and the Database Server, and concentrators to a UPS with at least 15 minutes of full load backup power.

Set the UPS to shut down the server automatically after a specified period. During an extended power outage, this gives users time to log out before the server shuts down.

- **Servers:** minimum 15 minutes emergency full load backup power
- **Workstations:** recommended 5 minutes emergency full load backup power
- **Data Exchange server/DTS:** Power management software recommended to shut down the DTS safely in the case of an extended power failure.

Printers

- **Recommended:**

Mid-range laser printers. Some reports require laser printers. GE has tested the application on mid-range laser printers from HP. Some low-end printers do not have a large enough printable area. For additional information, contact Centricity Services or your Value-Added Reseller.

Dot-matrix printers. For printing forms with carbons

- **Required:** Microsoft Windows Server-based printing

Additional printers will be required depending on the size and requirements of the clinic/enterprise. Printer locations should support workflow plans. While a small amount of print server activity can occur on the dedicated Database Server, consider a separate server for print services.

- **Application printable area limits:** Centricity Practice Solution printing functions are supported on any printer capable of handling a printable area of 8 inches by 10.6 inches on letter-sized paper.
- **Crystal Reports printable area limits:** The Crystal Reports driver used in Centricity Practice Solution supports page margins of 0.17 inches top, 0.25 inches left / right sides, and 0.23 inches bottom for letter paper size by default.

Photo ID and image capture

GE supports any TWAIN-compliant digital video device, digital camera, or scanner that plugs into a USB port. The application captures still images directly from the device in .BMP or .JPG formats. Images can also be acquired from file system image files, or by copying and pasting from another application.

For information about using cameras in Remote Desktop Services/Citrix environments, see [Storing images in the application database on page 34](#).

!!! For best results, test image capture solutions with the application prior to purchase. On Microsoft Vista operating system, a webcam device must be Vista compatible. And, depending on your device, additional setup is required to use a webcam. Refer to your installation or upgrade guide.

DVD/CD-ROM

16x-speed or faster DVD/CD-ROM drive

Required on the Remote Desktop Services/Citrix server to install the server operating system.

Modem

Modem DSL/cable or other high-speed fax/modem

Modems may be needed for faxing or remote access by providers and other users not directly connected to the server.

Backup system

Tape drive for backups or backup system from another server with access to the Database server, Remote Desktop Services/Citrix server, Application server, or Data Exchange server.

Backups are recommended after installing or upgrading to facilitate quick recovery if hardware problems occur or disk drive data is lost.

Surge protection

Power surge protector for each machine to protect against voltage variations.

Other

AC power, network, keyboard, and display extension cables may be required for optimal workstation placement.

Integrated Faxing (Chart)

Biscom's FAXCOM® fax solution is verified with Centricity Practice Solution. Integrated Faxing permits users to fax prescriptions and other information directly from charts. For detailed fax server configuration and the latest supported versions for Centricity Practice Solution, go to <http://www.biscom.com/ge/index.htm>.

For detailed installation instructions, contact your Biscom representative. To configure Centricity Practice Solution for Integrated Faxing, in online help click F1 on the Administration > System > Faxing screen.

Operating system

Integrated Faxing runs in Citrix/Remote Desktop Services environments and is supported by the following operating system:

- Windows Server

Supported software versions

- FAXCOM CV v6.1.5
- FAXCOM CV Client v9.4.1.0 or higher
- FAXCOM CV+ Server v5.05.1320 or higher
- FAXCOM Suite for Windows v9.4.1.0 or higher

To use Integrated Faxing, install at least one Biscom FAXCOM® fax server on your network in a secure environment.

Hardware

- Minimum Pentium 4 or better
- 1 GB RAM
- 80 GB hard drive
- PCI Express
- Fax modem or intelligent fax board

Chassis must accommodate the fax board. CV boards are ~7" long; CV+ boards are ~12" long.
- Dedicated fax server recommended for more than 25 users or multiple fax lines.
- If your clinics are geographically distant or located in more than one state, consider a least-cost routing configuration, which will require more than one fax server. For more information about least-cost routing and fax server configurations, go to the GE Fax Solution page at <http://www.biscom.com/ge/index.htm>.

Important features and system settings

The following features and system settings impact memory requirements and system performance.

Enabling Chart clinical auditing features

Enabling all available auditing features significantly increases database storage and growth requirements, possibly by a factor of 2 or greater. Consult Centricity Services or your Value-Added Reseller when enabling auditing features.

Storing images in the application database

You can add image attachments to a chart document and store them in the database, including still images from a digital camera or video camera or scanned documents images.

Disk space requirements for images vary considerably. To calculate your organization's requirements, use the Excel spreadsheet *Calculating Hardware Requirements for Centricity Practice Solution* available on the Centricity Practice Web site at <http://centricitypractice.gehealthcare.com>.



The spreadsheet is available in the same folder as this document. Wherever this documentation library is located, the path is `./guides/calculating_hardware_requirements_cps.xls`.
