



Abacus[®] Software Requirements

Information Systems (IS) requirements for
configuring the Baxa Abacus TPN Order Entry
and Calculation Software



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INTRODUCTION

Baxa Corporation manufactures automated compounders and software for calculating and mixing multi-ingredient parenteral solutions. The Abacus TPN Order Entry and Calculation Software is a tool for ordering and calculating parenteral nutrition requirements. Abacus interfaces with Baxa ExactaMix® Automated Compounding Devices to provide order entry for total parenteral nutrition and other multi-ingredient parenteral solutions.

Abacus consists of three (3) main components: the client software, the database and the event-logging service. The Abacus Single-Workstation Edition (SE) is typically installed with all of these components on a single computer. The typical Abacus Multiple-Workstation Edition (ME) configuration uses a server to host the database and event logging, while a workstation computer contains only the client software.

Abacus was developed for use on systems running Microsoft® Windows® Operating Systems. It is programmed in English and is intended for use by English-speaking users. The software supports the use of international names and text; however its display is in (American) English.

This document describes the Abacus hardware and operating system requirements, interfaces and configurations to support customer installations.

DEFINITIONS/GLOSSARY

- **Access Control List (ACL):** a list of permissions attached to an object.
- **Data Pipeline:** a ReportBuilder component containing database query results. A data pipeline can be passed to ReportBuilder from its calling application or defined within the report itself.
- **Event Service:** a Baxa-developed Windows service that listens for event traffic on a specific TCP port.
- **Internet Protocol Suite (TCP/IP):** the set of communications protocols used for the Internet and other similar networks.
- **Internet Protocol (IP):** a protocol used for communicating data across an internetwork using the Internet Protocol Suite. IP version 4, the most common protocol, was deployed on 01JAN1983 and consists of 32-bit numbers expressed as four (4) octets in dotted decimal notation (example: 64.119.175.196).
- **Network Basic Input/Output System (NETBIOS):** services related to the session layer of the OSI model allowing applications on separate computer to communicate over a local area network.
- **NTFS (New Technology File System):** the standard file system of Windows NT and subsequent versions of Windows operating systems that supports ACLs.
- **Open Systems Interconnection Model (OSI Model):** a way of sub-dividing communications into smaller parts called layers. A layer is a collection of conceptually similar functions that provide services to the layer above it and receives services from the layer below it.
- **PAT file:** a text file with the extension .PAT that contains the formula or recipe of the order for use by Baxa automated compounders.

- **Port or Port Number:** an application-specific or process-specific software construct serving as a communications endpoint, identified by number.
- **ReportBuilder:** an application provided by Digital Metaphors that is embedded that allows for the creation, modification and printing of labels and reports.
- **Subnet:** a logically visible subdivision of an Internet Protocol network.
- **Thick Client (Fat Client):** a computer or client software in client-server architecture whose operation requires only periodic connection to a network or central server.
- **Transmission Control Protocol (TCP):** one of the core protocols, and one of the two original components, of the Internet Protocol Suite.
- **Well-Known Ports:** a list of port numbers reserved for privileged services that specifies the server process contact port. The well-known port list is assigned by the Internet Assigned Numbers Authority (IANA), <http://www.iana.org>, and is specified in RFC 1700. The well-known ports range from 0 to 1024.
- **Wireless Local Area Network (WLAN):** links two or more devices using some wireless distribution method, often providing a connection through an access point to the wider intra- or Internet.
- **Workgroup:** Microsoft's terminology for a peer-to-peer Windows computer network.

LICENSING

Abacus licenses are available in four (4) editions depending on the features desired.

Feature	Abacus DE (Demo Edition*)	Abacus CE (Calculator Only Edition)	Abacus SE (Single-Workstation Edition)	Abacus ME (Multi-Workstation Edition)
Maximum number of patients	2	Unlimited	Unlimited	Unlimited
Full label/report editing	No	Yes	Yes	Yes
Separate client and server machines	No	No	Yes	Yes
Maximum number of concurrent users	1	1	1	25
Interfaces with Baxa automated compounders	Yes	No	Yes	Yes

Table 1 - Licensing Features

* The demo edition license is valid for 30 days.

ABACUS SYSTEM REQUIREMENTS

Abacus operates in a client-server model. The client software runs on Microsoft Windows Operating Systems. The database resides on a Microsoft SQL Server® database platform. A separate Baxa Event Service logs user events.

ABACUS CLIENT SOFTWARE

The Abacus client software, a thick client (not web-enabled), is a Windows-compatible application that runs on the following operating system platforms:

Abacus Version	Operating System Platform
2.0	Windows 2000 (with Service Pack 3)
	Windows XP (with SP2)
	Windows 7 32-bit (using XP compatibility at SP-2)
	Windows Server 2003
2.1 (currently available)	Windows 2000 (with SP 4)
	Windows XP (with SP 3)
	Windows 7 32-bit (using XP compatibility at SP-3)
	Windows Server 2003 (with SP2)
	Windows Server 2008 (with SP1)
Future	Windows XP (with SP3)
	Windows Server 2003 (with SP2)
	Windows Server 2008 (with SP1)
	Windows 7
	Windows Server 2003 R2
	Windows Server 2008 R2

Table 2 - Client Software Operating Systems

Other Requirements:

- Microsoft .NET Framework 2.0 is a required prerequisite and is installed along with the Abacus client.
- The operating system service packs outlined in Table 2 - Client Software Operating Systems are not included with Abacus and are required to be installed before installing Abacus.
- Abacus software installation requires administrator privileges on the target computer.
- Adobe Reader® is required to view the product documentation.
- Adobe Flash Player is required to view animations in the Abacus Help and Training Module.

DATABASE

The Abacus Database is a Microsoft SQL Server database. The database server operating system must be capable of hosting one of the supported versions of Microsoft SQL Server. The supported versions of Microsoft SQL Server are as follows:

Abacus Version	Database Platform
2.1 (currently available)	SQL Server 2000 Standard
	SQL Server 2000 Enterprise
	SQL Server 2005 Express
	SQL Server 2005 Standard
	SQL Server 2005 Enterprise
	SQL Server 2008 Standard
	SQL Server 2008 Enterprise
2.2 (2011 release)	SQL Server 2005 Express
	SQL Server 2005 Standard

Abacus Version	Database Platform
	SQL Server 2005 Enterprise
	SQL Server 2008 Standard
	SQL Server 2008 Enterprise
	SQL Server 2008 R2 Standard
	SQL Server 2008 R2 Enterprise
2012 Release(s)	SQL Server 2008 Express
	SQL Server 2008 Standard
	SQL Server 2008 Enterprise
	SQL Server 2008 R2 Standard
	SQL Server 2008 R2 Enterprise

Table 3 - Microsoft SQL Server Database Platforms

BAXA EVENT SERVICE

The Baxa Event Service is a Windows service, similar to the Windows Event Viewer. This logging service writes messages from the Abacus Client Software to an event log file. The information in the log may be viewed from the Event Viewer in the Abacus Client Software.

The Baxa Event Service can be installed on any machine meeting the specifications of SQL Server or the Abacus client listed in Table 2 - Client Software Operating Systems or Table 3 - Microsoft SQL Server Database Platforms.

Baxa recommends installing this service on only one machine, and configuring all workstations to send their messages to it. This service uses TCP port 2292, by default for its communications.

PAT FILE SHARE

Upon order completion, the Abacus Client creates an ASCII text file (called a patient file or PAT file) that contains the information necessary to fill the order on Baxa compounders. The location of the PAT files is a shared network directory to which the Abacus and Baxa compounder users can read, write and modify. The shared directory may be on any file system accessible from the operating systems supported by Abacus and/or Windows XP Embedded (the operating system used by Baxa automated compounders).

HARDWARE REQUIREMENTS

CLIENT WORKSTATION

When set up with Abacus Single-Workstation Edition (SE), a single client workstation hosts all of the Abacus Components, including: the client software, the database and the event service.

When set up with Abacus Multiple-Workstation Edition (ME), typically the client workstation only hosts the Abacus Client Software.

The workstation requirements for each configuration are shown in the following table.

Configuration	Processor	Memory		HDD Space Available		Monitor		USB Port	Keyboard, Mouse, Optical Drive
	Min	Min	Rec	Min	Rec	Min	Rec		
Abacus Client, Database Server and Event Service	Pentium III compatible 2GHz or faster	512Mb	2Gb or more	5Gb	40Gb or more	1024x768	1280x1024 or higher	1 or more	Yes
Abacus Client only	Pentium III compatible 2GHz or faster	512Mb	1Gb or more	100Mb (client only)	3Gb or more	1024x768	1280x1024 or higher	1 or more	Yes

Table 4 - Client Workstation System Requirements

SERVER(S)

One or more servers may be used to run Abacus Components depending on a facility's Abacus License and network configuration. For processor and memory requirements for the Microsoft SQL Server database, see Microsoft's recommended System Requirements. (For example, for Microsoft SQL Server 2005: <http://www.microsoft.com/sqlserver/2005/en/us/system-requirements.aspx>.)

The table below shows the available space required for the Abacus Components that may reside on a server.

Component	Memory		HDD Space Available	
	Minimum	Recommended	Minimum	Recommended
Abacus Database*	N/A	N/A	2Gb	4Gb or more
Baxa Event Service	512Mb	1Gb or more	2Mb	1Gb or more
PAT File Share	N/A	N/A	2Mb	10Mb

Table 5 - Server Requirements

LABEL PRINTER

A printer capable of printing on label stock that meets the requirements of Baxa Corporation's ExactaMix Bags. Baxa recommends a direct thermal label printer from one of the following manufacturers:

- Datamax
- Zebra Technologies

REPORT PRINTER

A Windows-compatible printer capable of printing on standard printer paper.

NETWORK HARDWARE

Required hardware to support network communication may include cables, router, etc.

OPTIONAL HARDWARE

Portable media (USB flash/thumb drive, CD-R, CD-RW, DVD±RW, etc.) may be used to install the software and facilitate technical support.

INTERFACES

Figure 1 depicts the interfaces between Abacus Components.

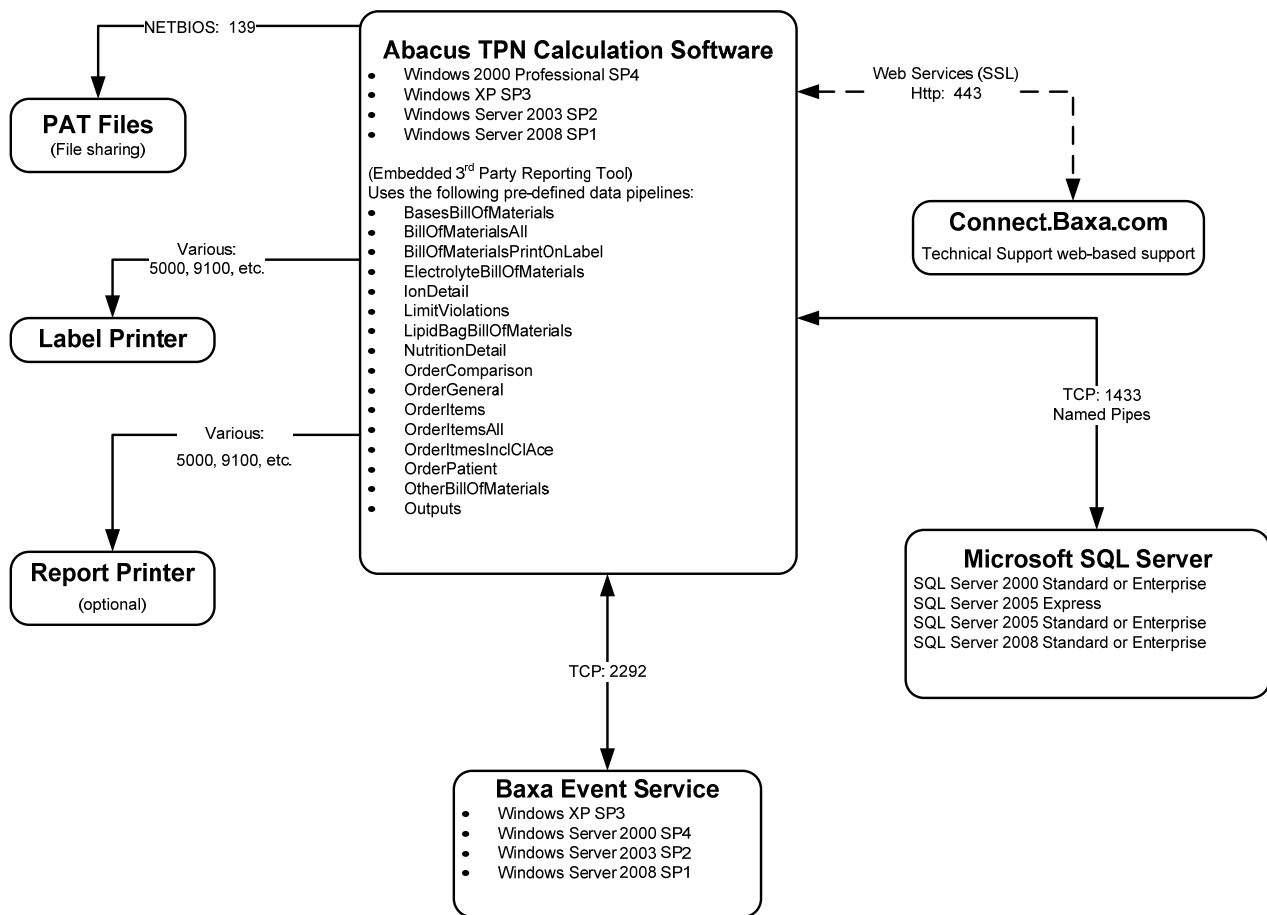


Figure 1 - Abacus Interfaces

NETWORK INTERFACE

- Minimum Cat-5 Ethernet 10Base-T, 10 Mbps on Local Area Network (LAN). 100 Base-T, 100 Mbps is recommended.*
- Internet Protocol (TCP/IP V4)
- When wireless communication is used between the Abacus Client Software and the database server, the recommended minimum WLAN standard is IEEE 802.11b.

* Abacus is a highly interactive database application and frequently transmits data back and forth between the client and the database. A faster network speed contributes to better system performance.

For best performance, the round-trip times for a packet to go across the network between the Abacus client and database server (e.g., from PING command) should have a maximum time of no more than 3 milliseconds and an average time of *less than* 3 milliseconds.

ABACUS CLIENT SOFTWARE TO DATABASE SERVER

- Named Pipes
- TCP port 1433

ABACUS CLIENT SOFTWARE TO BAXA EVENT SERVICE

- TCP port 2292

ABACUS CLIENT SOFTWARE TO PAT FILE SHARE

Upon order completion, Abacus writes a text file, called a PAT file (for the extension given), that contains the recipe of the order for use by Baxa automated compounding devices. Abacus writes PAT files to a shared network location (from which the Baxa automated compounders read).

- TCP port 139 (NETBIOS)

ABACUS CLIENT SOFTWARE TO LABEL AND REPORT PRINTERS

The Abacus Client can print to any printer available to the Windows operating system. Printer outputs from Abacus are spooled to the printer from the client application, not the database server. Printing from the Abacus application requires a local or network connection from the workstation to the printer.

ABACUS CLIENT SOFTWARE TO BAXA TECHNICAL SUPPORT

(Optional) Baxa Technical Support uses Adobe® Connect® Pro web conferencing to remotely support and troubleshoot Abacus (see the Baxa Adobe Connect Technical Bulletin). Using Adobe Connect Pro, a Technical Support representative can request control of, and when granted control, operate the Abacus Client Workstation. This platform requires a special version of Adobe Flash® Player web browser add-in that is automatically downloaded and installed. This add-in provides support for sharing screens.

Additionally, Baxa Technical Support may require the transfer of files from the Abacus workstation or Baxa compounder. Files transfer via a secure web-based file exchange site.

- TCP port 80
- TCP port 443

ABACUS CLIENT SOFTWARE TO HOSPITAL INFORMATION SYSTEMS

Abacus does not currently support HL7 or other interfaces to external systems.

SECURITY

NTFS PERMISSIONS

Abacus Client

- Read, write, modify for the entire Abacus directory for all authenticated users
- Default: C:\Program Files\Baxa\Abacus
- Read, write, modify for the RBuilder.ini (ReportBuilder configuration settings file) for all Abacus administrative users
- Default Location: C:\Windows or C:\Windows\System32

PAT file share

- Read, write, modify for the PAT file location (see above) for all authenticated users (both Abacus and Baxa multi-ingredient compounders).

SQL SERVER PERMISSIONS

The Abacus client logs in to the SQL Server database. Baxa recommends using a SQL Server login rather than Windows Authentication which prevents individual users from accessing the database directly. If the Abacus installation is used to install the database, a SQL Server user *abacus* will be created. The ABACUS.INI file within the Abacus installation directory contains the encrypted connection strings for SQL Server and the Event Service.

The SQL Server login used by the Abacus client **must have process administrator permission** for potential time-based manipulation of locks on patient data, or if the database will be restored via the Abacus client.

Individual users authenticate against a user table within the Abacus database.

CYBER-VULNERABILITY

See the Baxa Technical Paper on Preventing Cyber Attacks (www.baxa.com/help/technicalpapers).

ENCRYPTION

Abacus stores encrypted user passwords in its database. Non-database data is encrypted using a symmetric 64-bit block cipher called blowfish. The only files not encrypted are those sent to a Baxa automated compounder. These files contain the completed patient orders, and have the patient name and account number as well as a list of ingredients for compounding. Report data generated from the system using its ReportBuilder, the embedded reporting tool, may be saved in a non-encrypted file format at the direction of the user.

AUDITING/LOGGING

Each client logs, via a TCP/IP connection with a single server process, all interactions: login, logout, data entry and modifications.

PASSWORDS

Abacus allows passwords that are unique and different from the system and network passwords.

HIPAA COMPLIANCE

There are four areas addressed by the HIPAA security standards: Access Control, Audit Control, Data Integrity, and Person or Entity Authentication. The following tables discuss how Abacus addresses each of these standards. More detail is available in the Baxa HIPAA Compliance Technical Paper.

Access Control

Standard	Description	Implementation Specifications	Abacus v2.0 Support
Access Control (164.312 (a)(1))	Implement technical policies and procedures for electronic information systems that maintain electronic protected health information (PHI) to allow access only to those persons or software programs that have been granted access rights.	Unique User Identification (required)	Abacus allows customers to assign a unique name to each user for identifying and tracking user identity. Only system administrators have the ability to directly modify stored data.
		Emergency Access Procedure (required)	Abacus provides automatic mechanisms to back up the database, doing a full backup every 24 hours and an hourly differential backup. If these backup measures are not adequate, Microsoft SQL Server 2000 administrative tools can be used to modify the automatic backup schedule as desired. Customers should archive such backups to permanent storage, depending on their need. Abacus also provides customers with the capability to make manual backups as well as restore backups.
		Automatic Logoff (addressable)	Abacus implements an optional mode in which a user's session will be terminated after a predetermined time of inactivity. At installation, this mode will be enabled, but the customer will be allowed to disable this feature if it does not make sense in their environment.

Standard	Description	Implementation Specifications	Abacus v2.0 Support
		Encryption and Decryption (addressable)	<p>Abacus stores data in two places. First is the database, which is administered by Microsoft SQL Server 2000.</p> <p>If the Abacus database server is either Windows 2000 or Windows XP, the database files are not normally encrypted. This is because these files are usually protected using the file-system, so that only system administrators have direct access to them. However, the files can be encrypted if desired by using the Encrypted File System features provided by the NTFS file system.</p> <p>Second, Abacus stores its audit logs in a proprietary format. This format is encrypted, regardless of the Windows operating system used.</p>

Table 6 - HIPAA Access Control

Audit Controls

Standard	Description	Implementation Specifications	Abacus v2.0 Support
Audit controls (164.312)	Implement hardware, software, and/or procedural mechanisms that record and examine activity in information systems that contain or use protected health information	N/A	Abacus includes audit logging that records all activity in Abacus (Client), and allows an authorized user to examine this activity.
(b)			Microsoft SQL Server database server can be configured to create an audit trail at varying levels of detail as desired.

Table 7 - HIPAA Audit Controls

Integrity

Standard	Description	Implementation Specifications	Abacus v2.0 Support
Integrity: (164.312(c)(1))	Implement policies and procedures to protect electronic protected health information from improper alteration or destruction.	Mechanism to authenticate electronic protected health information (addressable)	Abacus implements this standard in several ways. First, the security mechanisms inherent in the SQL Server 2000 database are used to ensure that only users with a valid username and password are able to access or modify the database. Second, the Abacus audit trail shows all database modifications made through the software, so any changes that are not logged in the audit trail have been made from outside of Abacus. Third, regular backups are made, so any changes can be verified against previous versions of the database.

Table 8 - HIPAA Integrity

Person or Entity Authentication

Standard	Description	Implementation Specifications	Abacus v2.0 Support
Person or Entity Authentication (164.312(d))	Implement procedures to verify that a person or entity seeking access to electronic protected health information is the one claimed.	N/A	Abacus implements this standard by requiring users to provide a username/password combination in order to access any data. Audit log transactions, both read and write, are encrypted in order to ensure that the audit data is being sent between an authentic audit server and an authentic client.

Table 9 - HIPAA Person or Entity Authentication

SQL SERVER AND DATABASE SETUP

The name of the database is "ABACUS." (*Note: upper case name is required for database servers with case-sensitive collation.*) During Abacus SE installation, the database file (abacus.mdf) is attached to Microsoft SQL Server 2005 Express provided with the Abacus Software or an existing SQL Server depending on the configuration (see configurations, below). By default, the Abacus client software uses the SQL Server native client data provider to connect to the database server.

MICROSOFT SQL SERVER SETTINGS

The following table shows the Microsoft SQL Server settings required to support Abacus.

Setting	Values
Database Server Security Mode:	Either Windows Authentication or Mixed Mode. (Mixed Mode is preferred to allow SQL Server-specific login)

Setting	Values
Database Server Login Permissions:	The SQL Server login used by the application to access the Abacus database requires process administrator permission. See SQL Server Permissions.
Database provisioning:	Abacus master data file (MDF): 10 Mb, set to grow by 1 Mb, unrestricted growth Abacus transaction log (LDF): 1 Mb, set to grow by 10%, unrestricted growth

Table 10 - SQL Server Settings

PROCESS ADMINISTRATOR PERMISSION

Abacus does not use traditional SQL Server locking on records relating to patient records and orders within the database to enable a user to forcibly release a patient record locked by another user. A setting within the application preferences determines the amount of time that must have elapsed before a user may remove another user from a record. A user may also “kill” another user’s session if the maximum number of Abacus licensed users has been reached.

These features are provided through the Abacus application to a user granted administrator permission. To enable Abacus to provide this functionality, the SQL Server login account used by the application to access the Abacus database must have the process administrator role.

Note: The user has no direct access to the database server and/or process administrator activities. All functions work solely upon the Abacus database, and have no other effect on the database server or any other databases.

AUTOMATIC DATABASE CREATION

The Abacus Installation CD creates an Abacus user login account, backup jobs, supporting stored procedures and the Abacus database on the specified server.

DATABASE MAINTENANCE

When the Initial Database feature is selected, the Abacus Installation sets up two (2) scheduled tasks that perform routine database maintenance.

- Abacus Daily Backup is scheduled to run at 12:01 AM (server time), and executes the following steps:
 - DBCC CHECKDB to check the logical and physical integrity of all the objects in the Abacus Database.
 - Archive patients and orders to remove old order and patient data from the Abacus Database (see Data Archiving).
 - Call to UPDATE STATISTICS.
 - Shrink the database to remove unused space created by the archive step.
 - Full backup of the Abacus database

Abacus Hourly Backup, scheduled to run every hour on the half-hour, provides a differential backup of the Abacus database.

DATA ARCHIVING

Abacus comes with a suite of stored procedures that archives data from the SQL Server database into Microsoft Access® files. The archiving works with a preference setting defined within the Abacus client software for the number of days to keep orders before archiving.

- Patient data archives to a file named ArchivePatients.mdb.
- Order data archives to ArchiveOrdersYYYYMMDD.mdb where YYYYMMDD represents the year, month and day of the orders' administration date.
- Default archive location: C:\Program Files\Microsoft SQL Server\Archives.
 - This location is stored in the ARCHIVE_PATH column in the FACILITIES table in the ABACUS database. A DBA with database privileges can change this value either through the SQL Server Management Studio (SSMS) or any Transact-SQL interface.
- To begin the archive process, execute the ab_deactivate_patients stored procedure in the Abacus database.

MANUAL DATABASE CREATION AND SETUP

The Abacus database can be created and set up manually on SQL Server. Baxa recommends the use of a single SQL Server login which all the clients use to connect to the database. As outlined above, the SQL Server login account used to access the Abacus database must possess process administrator permission. The following steps must be followed to manually create an Abacus database:

- Create a database named ABACUS. The database name **must** be ABACUS. If the database server is case-sensitive, make the database name all uppercase. This will create a database shell. A Baxa representative will deliver a backup copy of an Abacus database that will contain the tables, stored procedures, functions and views required. All database properties are set to false with the exception of:
 - Auto Create Statistics
 - Auto Update Statistics
 - Autoshrink
 - Torn Page Detection
 - Truncate Log
- Create a SQL Server login and database user with db_owner permissions to the Abacus database. Make the login's default database Abacus. Grant the server process administrator role to the login account.
- Baxa recommends creating a maintenance plan or SQL Server Agent job to backup the database and keep it tuned and in optimal condition.
 - Check the table and index integrity.
 - Update statistics.
 - Archive patients and their orders (see Data Archiving above).

BAXA EVENT SERVICE INSTALLATION AND SETUP

The Baxa Event Service is an option within the Abacus installer. Checking this option will install and subsequently start the event service with its default settings. The default settings are listed below. These settings may be configured by modifying values in the Windows registry. (For advanced technical users only.)

Default Settings

Setting	Value
Event Log filename:	C:\Program Files\Baxa\Abacus\Events\BaxaEvents.evt
Listen Port:	2292
Max log file size:	~2MB
Max time to preserve events before overwrite:	365 days

Table 11 - Baxa Event Service Settings

Windows Registry Values

Key	Name	Type	Data
HKLM\SOFTWARE\Baxa\EventSvc	EVENTFILE	REG_SZ	C:\Program Files\Baxa\Abacus\Events\abacus.evt
HKLM\SOFTWARE\Baxa\EventSvc	MAXSIZE	REG_DWORD	0x01312D00 (20000000)
HKLM\SOFTWARE\Baxa\EventSvc	MAXTIME	REG_DWORD	0x0000016D (365)
HKLM\SOFTWARE\Baxa\EventSvc	PORT	REG_DWORD	0x000008F4 (2292)

Table 12 - Baxa Event Service Windows Registry Values

ABACUS CONFIGURATIONS

STAND-ALONE NETWORK (MINI-NET) CONFIGURATION

Abacus Single-Workstation Edition (SE)

The Abacus workstation connects to the Baxa automated compounder through a stand-alone network with connectivity provided by a router or hub. The router/hub provides the signal necessary to maintain an active connection with an ENERGY STAR-compliant network interface card (NIC). A router provides a firewall to protect the Baxa compounder from cyber-vulnerabilities (See the Baxa Technical Paper on [Preventing Cyber Attacks](#)). This configuration, shown in Figure 2, allows the Abacus workstation and Baxa compounder to attach easily to the facility network.

Abacus SE using SQL Server 2005 Express Edition

Client and database management software provided by Baxa

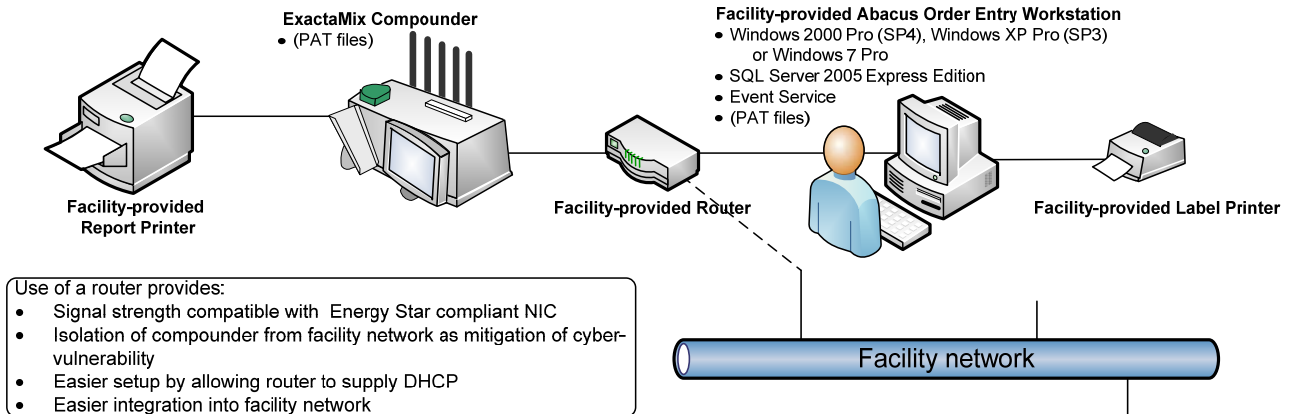


Figure 2 - Abacus Stand-Alone Network Setup

FACILITY NETWORK CONFIGURATIONS

Abacus Single-Workstation Edition (SE) or Abacus Multi-Workstation Edition (ME)

The Abacus Workstation connects to the Baxa automated compounder through the facility network. This configuration allows the Abacus Workstation, the Baxa compounder, the SQL Server database, the PAT file share and all necessary printers to communicate through the facility network.

Abacus ME using SQL Server 2005/2008 Standard/Enterprise

Client software provided by Baxa. Database management system provided by facility.

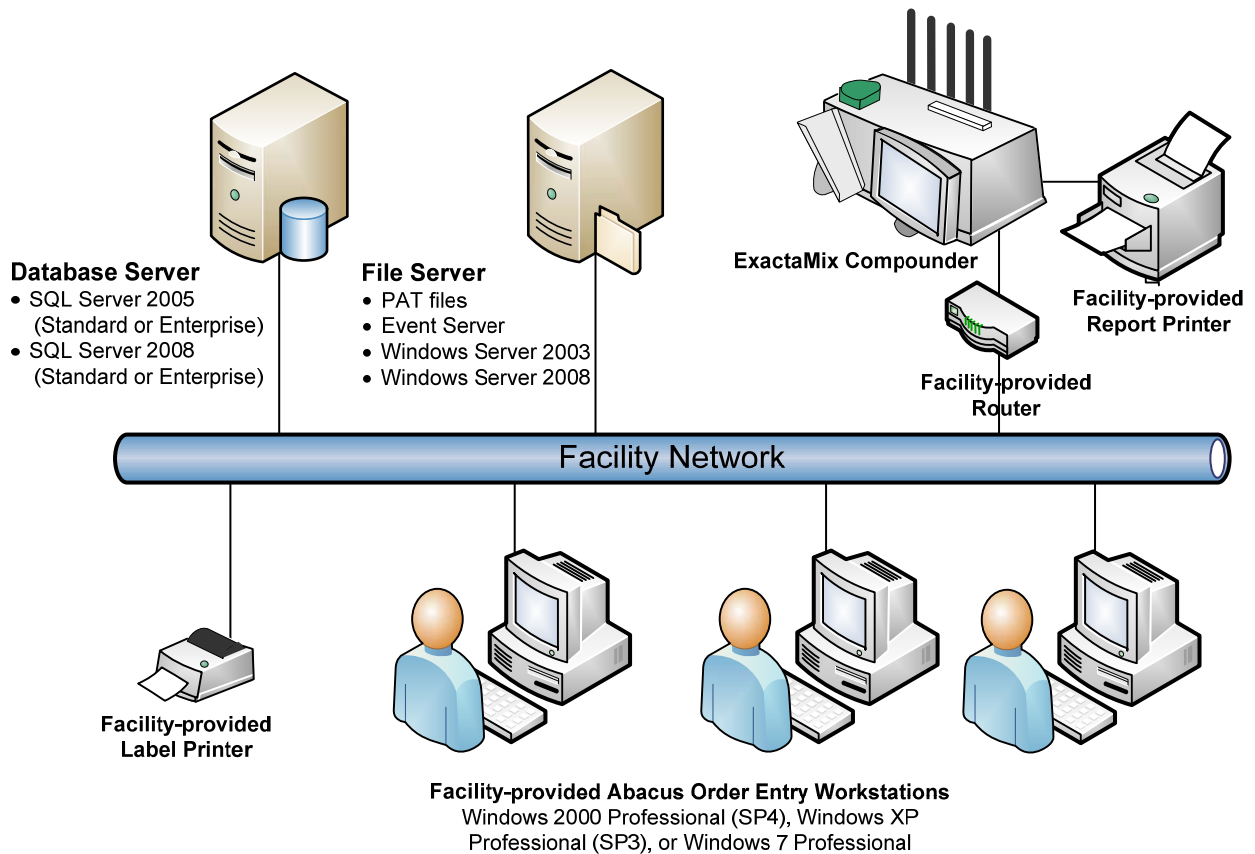


Figure 3 - Abacus Facility Network Setup

Abacus Multi-Workstation Edition (ME) Supporting Multiple Facilities

Abacus can support multiple facilities in two different configurations – one database or multiple databases.

One Database

This configuration uses one database to support more than one facility. The patients are designated to a facility through the use of nursing units and/or patient types. This configuration resembles the setup in Figure 3.

Advantages:

- Easy-to-maintain administrative functions:
 - Single database
 - Single formulary
 - Single template list
 - Single warning-limit configuration
 - Single calcium/phosphate solubility curve configuration

Disadvantages:

- All patients from all facilities are visible to all users.

- Facility-specific formulary ingredients (“cocktails”) and templates are selectable for all patients regardless of facility.

Multiple Databases

The second configuration requires a different database server for each facility. Abacus requires the name of the database to be ABACUS (database name must be all uppercase on case-sensitive servers). Therefore, either a different SQL Server instance or separate SQL Server is required for each database (facility) as shown in Figure 4.

Abacus ME using SQL Server 2005/2008 Standard/Enterprise

Client software provided by Baxa. Database management system provided by facility.

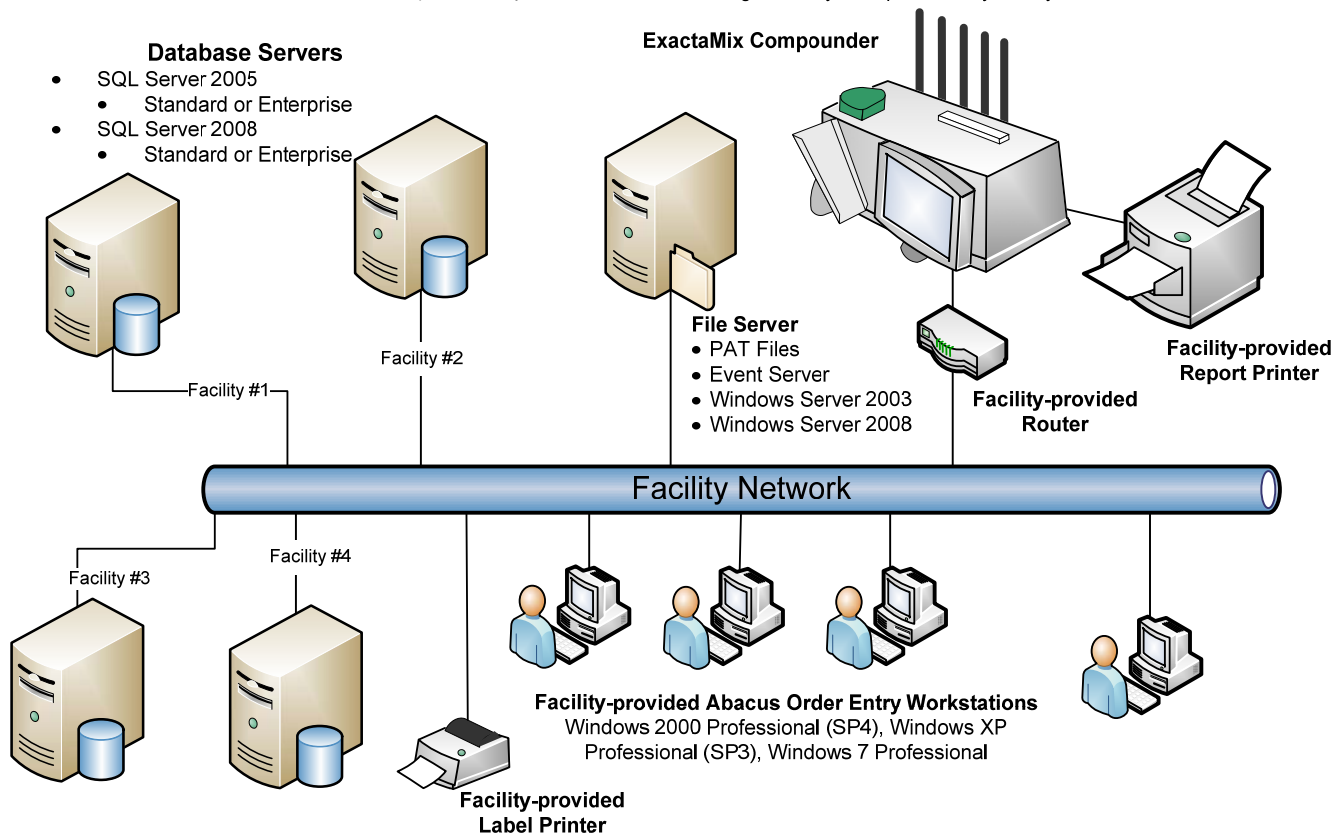


Figure 4 - Abacus Multi-Facility Network Setup

Advantages:

- Patient and order data are segregated by database. Only workstations attached to the facility’s specific database can see the patient and order data.
- Facility-specific formulary ingredients and templates are available only to those workstations attached to the facility’s specific database.

Disadvantages:

- Each database has its own formulary. Any ingredient changes necessary due to compounding requirements must be made in each database.
- Each database has its own templates.
- Each database has its own warning limit configuration.

- Each database has its own calcium/phosphate solubility curve configurations.

RUNNING ABACUS IN A TERMINAL SERVICES ENVIRONMENT

Abacus has been tested on Windows Server 2003 and Windows Server 2008 operating systems. Because Abacus runs natively on these server platforms it can be configured to run in a Citrix® or terminal services environment. When used, it is the customer's responsibility to configure the terminal services environment and ensure that Abacus performs as intended.

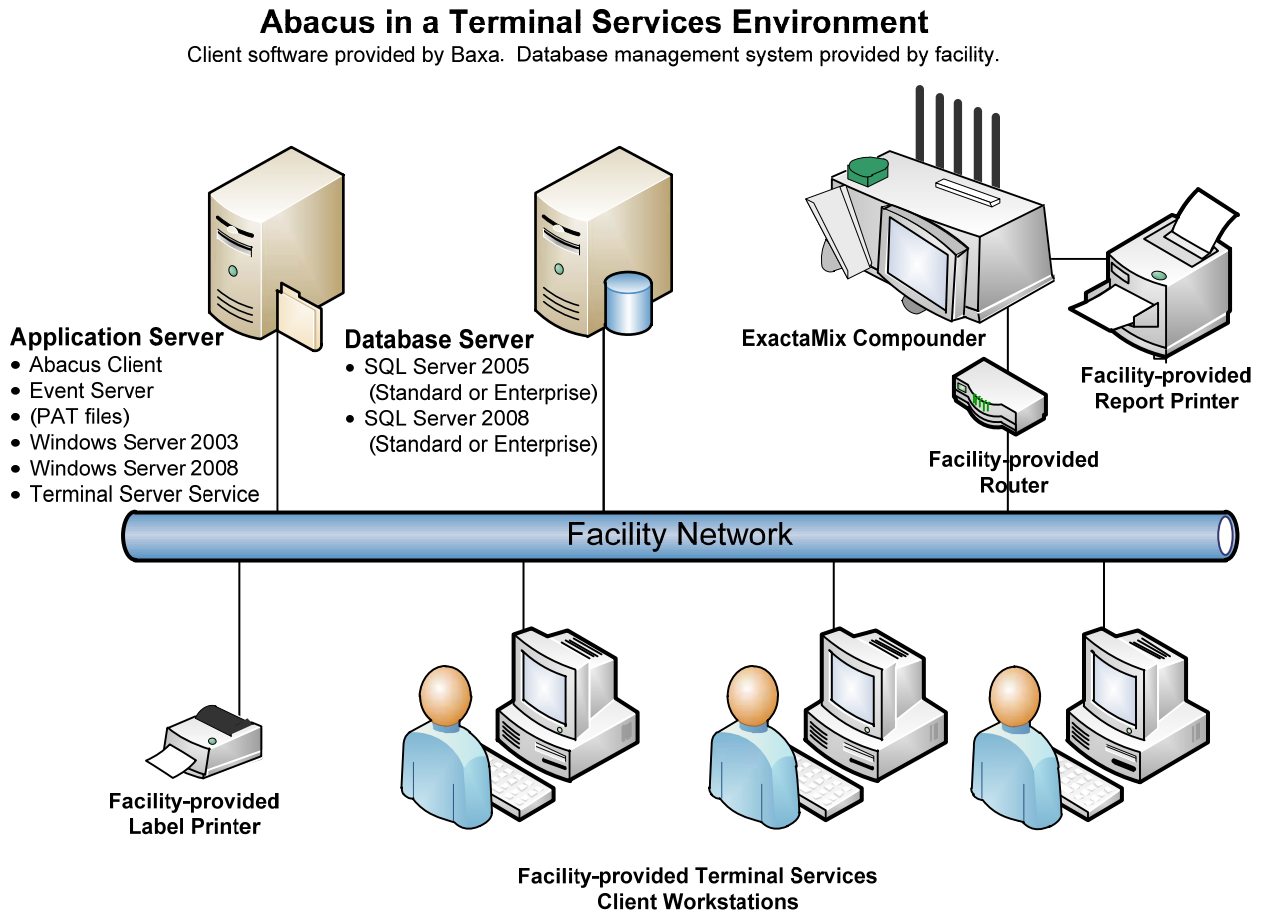


Figure 5 - Abacus in a Terminal Services Environment

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