



Running Epicor[®] ERP on VMware vSphere[™]

December 2010

DEPLOYMENT AND TECHNICAL CONSIDERATIONS GUIDE

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Introduction

This document provides direction to those interested in running Epicor 9.05.600C (or newer) on VMware® Infrastructure 3 or VMware vSphere™ 4. It provides basic information on the architecture of Epicor ERP as well as the value of utilizing the VMware platform. The document also includes results of recent testing done jointly by VMware and Epicor, where the performance and functionality of Epicor ERP on VMware virtual infrastructure are characterized. Finally, the document outlines some best practices for utilizing the two product sets together in your datacenter. The tests have been done for the following configurations of 10, 30, 50 and 100 users. The reason for selecting these user counts is that we are focusing on 100% virtualization for both Epicor ERP servers and database servers and we want to have best practices documentation for how to scale this further to support same number of users as on physical servers.

VMware and Epicor Overview

VMware (NYSE: VMW), the global leader in virtualization and cloud infrastructure, delivers customer-proven solutions that significantly reduce IT complexity and enable more flexible, agile service delivery. VMware accelerates an organization's transition to cloud computing, while preserving existing IT investments and enabling more efficient, agile service delivery without compromising control. With more than 190,000 customers and 25,000 partners, VMware helps organizations of all sizes lower costs, preserve freedom of choice, and energize business through IT, while saving energy—financial, human, and the Earth's.

For over 25 years, Epicor has been a recognized leader dedicated to providing leading edge enterprise software solutions to midmarket companies around the world. With over 20,000 customers, Epicor delivers end-to-end, industry-specific solutions that enable companies to immediately improve business operations and build competitive advantage in today's real-time global economy. Epicor's comprehensive suite of integrated software solutions for Customer Relationship Management, Financials, Manufacturing, Supply Chain Management, and Services Execution and Control provide the scalability and flexibility to support long-term growth. Epicor's solutions are complemented by a full range of services, providing a single point of accountability to promote rapid return on investment and low total cost of ownership.

Epicor ERP Overview

Epicor Internet Component Environment (ICE) is a fully n-tier application, with a .NET™ client working against a .NET interface layer to an application server containing the application business logic. Since the client is abstracted from the application by a .NET interface layer, the architecture supports the possibility of using any .NET-compliant smart client against the interface, and therefore the application as a whole.

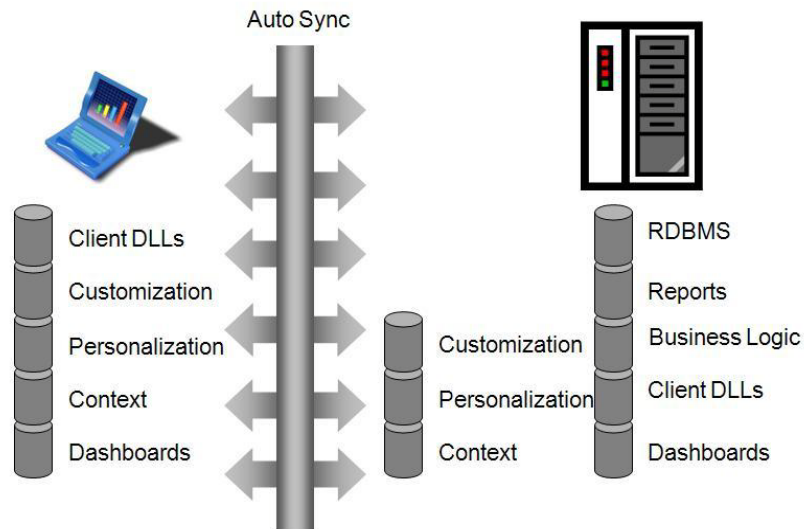


Figure 1. Epicor ERP deployment architecture

VMware Virtual Infrastructure

VMware's leading virtualization solutions provide multiple benefits to IT administrators and users. VMware virtualization creates a layer of abstraction between the resources required by an application and operating system, and the underlying hardware that provides those resources. A summary of the value of this abstraction layer includes the following:

Consolidation: VMware technology allows multiple application servers to be consolidated onto one physical server, with little or no decrease in overall performance.

Ease of Provisioning: VMware virtualization encapsulates an application into an image that can be duplicated or moved, greatly reducing the cost of application provisioning and deployment.

Manageability: Virtual machines may be moved from server to server with no downtime using VMware vMotion™, which simplifies common operations like hardware maintenance and reduces planned downtime.

Availability: Unplanned downtime can be reduced and higher service levels can be provided to an application. VMware High Availability (HA) ensures that in the case of an unplanned hardware failure, any affected virtual machines are restarted on another host in a VMware cluster.

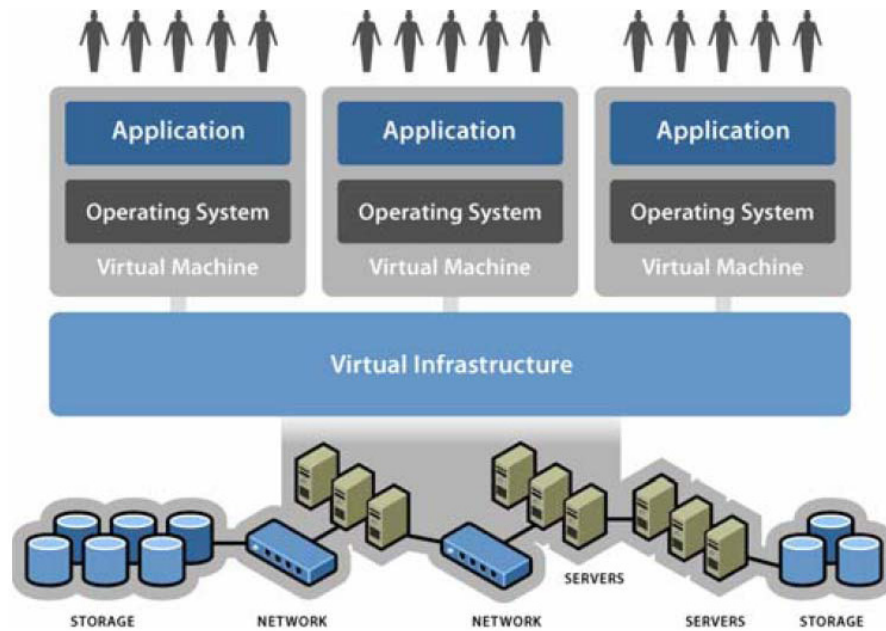


Figure 2. VMware vSphere Virtual Infrastructure

Epicor ERP Architecture and Deployment Strategy

Epicor has long been recognized as a leader in technology innovation, not just investing in technology for technology's sake, but to deliver far reaching business benefits to our customers businesses. Epicor understands that modern business software needs to be intuitive, compliant, and super productive to meet both existing and future needs. For more than five years now, Epicor has been designing and building enterprise business software from the ground up, using service-oriented architecture (SOA) standards. Technology is the foundation that most businesses use to execute on their objectives. At the same time, it is important that technology does not overwhelm a business but operates seamlessly and effectively in the background.

Today, Epicor business architecture provides a rich user experience, affording opportunities for greater user collaboration and productivity. Offering new levels of extensibility and scalability provides a technology asset that meets a company's requirements today, yet remains flexible enough to accommodate opportunities in the future. This unique blend of tools and technology constitute the business architecture we call Epicor Internet Component Environment (ICE) Business Architecture.

Epicor ICE Business Architecture merges the flexibility of Epicor *True SOA*™ with the collaborative and self-evident nature of Web 2.0 concepts to create a resource that's highly productive for users and ready for the benefits of mass business interaction and participation. Epicor *True SOA* (figure 2) features service-orientation of both server and client logic. The Epicor Everywhere™ Framework, which is a by-product of SOA at the client, is a unique technology that ensures a single source of tagged XML metadata can generate rich user experiences for Microsoft® Windows®, Web Browsers and Mobile devices.

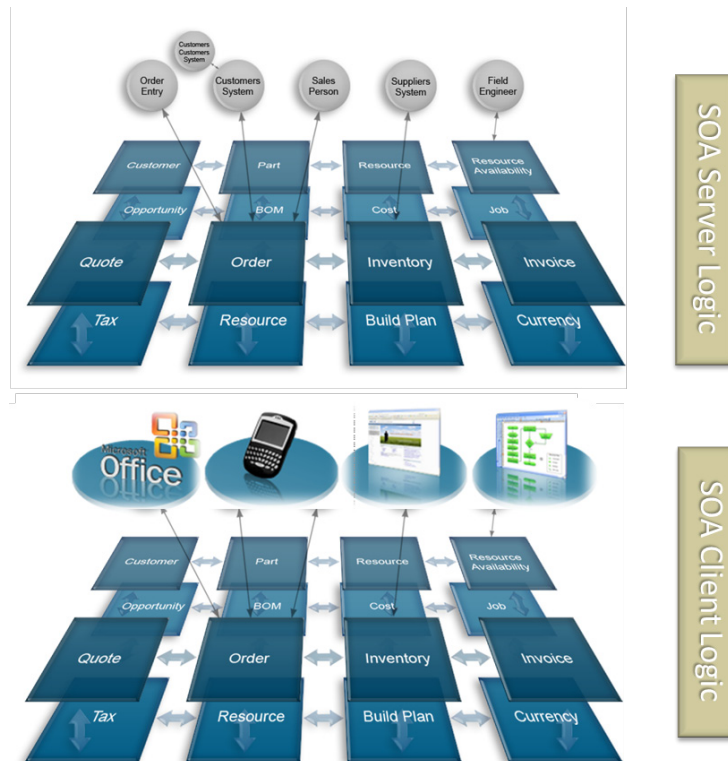


Figure 3. Epicor ICE Business Architecture

Overview

The following section describes the key elements of the Epicor ICE technology stack. Because most customers will use the applications that are built on Epicor ICE Business Architecture as they are delivered out-of-the-box, the following elements will never become visible to them. However, to some customers, the following layers allow for the flexibility, extensibility, and scalability that may become essential to optimizing their use of the system.

Figure 3 illustrates the Epicor ICE framework layers on the server. It is these separate layers that allow Epicor ICE applications to be run on different operating systems, hardware, and database platforms. The data server and application server components allow Epicor application engineers to develop solutions without being preoccupied with scalability or multiple database issues. In essence, the Epicor ICE framework that runs on Microsoft SQL Server® with Windows Server 2003/2008 is identical to the solution that runs on Progress® RDBMS with UNIX or Linux.

1. Individually Addressable Components
2. Customizable
3. Open Standards (XML & Web Services)
4. Configurable BPM
5. Engines for Global Operations
6. Distributed or Local Data Scenarios

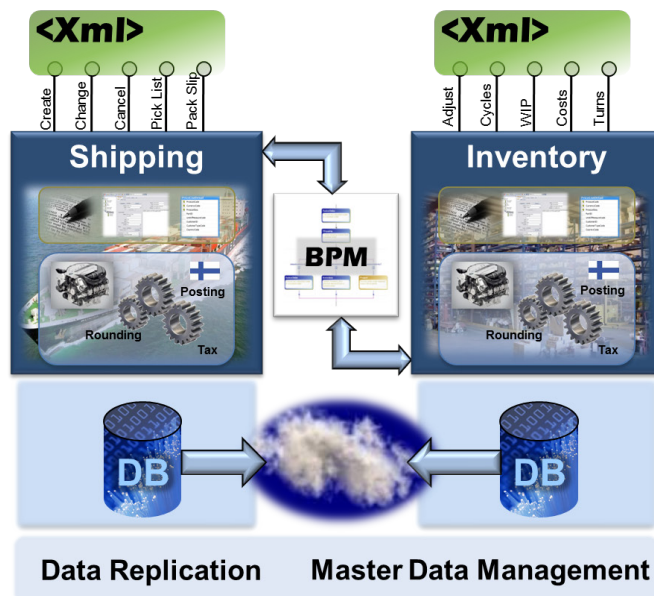


Figure 4. Epicor ICE Framework

Application Server

The application server layer exists to encapsulate all of the business logic rules and provide a single point of entry to all application logic irrespective of the interface layer. The application server is platform-independent and can be deployed on Windows, UNIX, or Linux platforms. It supports multiple interfaces, among them Web services, HTML Web access, and Microsoft .NET.

Epicor ICE application servers allow for scalability and are location transparent—they can be deployed on multiple physical servers in any location. This allows for load balancing where processor intensive applications (such as finite scheduling) can be located on their own dedicated application servers so they do not slow down normal users and also allow processes to run faster. As companies grow, additional application servers can be added to accommodate that growth.

Database Server

The database server enables Epicor applications built on ICE to run on a number of databases with a single application code set. Epicor ICE currently supports the Progress RDBMS and Microsoft SQL Server databases. The database server supports the full capabilities of each database. The database server offers users advanced scalability, availability, performance, and data integrity features (for example, record locking, transaction processing, and roll back recovery).

Distributed Deployment

Epicor ICE is distributed-deployment capable. Web services' granular logic creates choice and accessibility, producing a myriad of deployment scenarios. Epicor ICE offers the flexibility to deploy functionality locally or remotely, matching the distributed or centralized pattern of physical business operations. The platform is deployable through a corporate intranet, and over the Internet, and Virtual Private Networks (VPN) whereby the Web server runs an installation of Epicor ICE with component interfaces configured and optimized to match the deployment profile. Secure global access from anywhere, anytime to Epicor ICE business logic provides simplified multichannel device access with greater interface flexibility and IT management ease.

Application Web Services

Software business services made available as application Web services allow for advanced workflow orchestration and dynamic integration between applications, without costly and time-consuming programming. By reducing implementation times using industry standard interfaces, Web services can accelerate the return on software investment for midmarket companies. With Web services, the four walls of the enterprise do not limit integration. Rather, businesses can integrate processes with customers and suppliers up and down the entire value chain, beyond the firewall, improving inter-enterprise collaborative capabilities. This integration can be achieved without having to understand the specifics of how suppliers, partners or customers built their own IT systems. Integration is no longer a fragile, hard-coded binding of specific versions of specific systems, such as EDI. Rather, integration using Web services produces a secure plug-n-play interaction with customers, suppliers, partners and employees where business processes can be brought together dynamically without private networks or proprietary interfaces to not only cut costs but also create digital assets that drive revenue and profits.

N-Tier Scalability

The Epicor ICE Business Architecture creates deployment choices to achieve efficient scalability across unlimited numbers of machines; choices that are not available to most client/server ERP applications. Many client/server ERP applications have few deployment options and are limited to only one or two servers. Not being able to scale outward to more servers creates a performance bottleneck for client/server applications. The bottleneck can only be removed and performance improvements realized when the client/server application is moved to a “bigger box.”

Implementing a bigger box solution is an extremely expensive process and performance gains are limited by Moore’s Law with each implementation (Computing power doubles approximately every 18 months). On the other hand, Epicor ERP applications scale easily by adding application servers, deploying services on separate servers, or implementing multiple database servers—making Epicor ICE easy to load balance and grow as performance needs increase.

Replication Support

Epicor ICE also offers Replication Server support that can efficiently replicate all database transactions from the Application Server. Epicor Replication Server is designed to offload processing from the main Application Server and supports the following functions:

- Offline reporting and inquiries, such as trackers
- Offline access to archived as well as live data
- Offline ad hoc queries (including those from Epicor Portal and Epicor Information Worker)
- Offload external system processing (Mobile Connect, Sales Connect, etc.)
- Aggregated database holding records from multiple companies across multiple servers
- Data transfer for Epicor Enterprise Performance Management (EPM) or other Business Intelligence (BI) solutions
- One to many, many to one, and many to many configurations

Replication Database Support

Epicor Replication Server supports three different types of replication databases:

- **Functional Reporting:** This type of database is a complete installation of Epicor ICE that is used for offline reporting and retrieval of archived data. All trackers, reports and other forms are functional, but the database will not allow updates via forms or Web services. This is the only type of replication database that supports Business Activity Query (BAQ) execution, so it is used to support Epicor Portal BAQ views and Epicor Information Worker.
- **Ad Hoc Reporting:** This type of database comprises a selected sub-set of tables defined by the publishing servers and by filters on the subscriber(s). It may be used for ad hoc reporting (for example via SQL Reporting Services™ or Crystal Reports®) and for Epicor Portal views that are defined directly against the database (but not via BAQs).
- **DataMart:** This type of database is used to support Epicor EPM functions.

Epicor ICE replication architecture includes fast data capture based on file triggers and includes the ability to replicate multiple company data from multiple servers and selective table synchronization.

System Tools

Epicor ICE offers a series of system facilities and tools to enable the effective management of Epicor applications, extending to system security, document management, advanced software development, software deployment, and product documentation.

Centralized Administration Console: This feature delivers a single management area for your Epicor system, which removes redundancy and in so doing boosts user productivity, accuracy and efficiency.

System Monitor: Schedule tasks to be run in the background on a one-off or regular basis (for example, daily, weekly, or monthly). Tasks can be jobs such as MRP or reports and forms. Reports and forms can be frozen at a point in time so the data can be referenced in the future.

Integrated E-mail: Automatically e-mail employees, suppliers, customers, and partners from the system based on key actions. Attach documents so the recipient need only click on the attachment to drill into the associated transaction. Separation of Epicor ICE from Epicor Applications Epicor ICE business architecture is developed separately from Epicor enterprise business applications, allowing each to be modified and updated in isolation from the other and potentially under differing release cycles. Epicor ICE framework components have been extracted from application source control and have their own build and delivery schedules resulting in a more robust application development environment that allows staged delivery of Epicor ICE to application developers using the Epicor ICE software development kit (SDK).

Multiple System Agents: Epicor ICE gives the ability to run Multiple System Agents. This feature allows customers to set up multiple defined areas for generation of reports and processes. Application servers can now be located on many different physical servers to distribute the processing load, or remain on just a single physical server. Multiple System Agents also allows for greater flexibility in system tuning and security configurations. Epicor also provides the ability to execute reports on alternate databases. A System Agent can be expanded to have connection information for alternate database servers. This allows a user to log in once and run reports using data from an alternate reporting database, thereby offloading reporting overhead from the main transactional database.

Virtual Deployment of Epicor Applications: Virtualization is an abstraction layer that decouples the physical hardware from the operating system to deliver enhanced IT resource utilization and flexibility. There are various non-Epicor software products available that can be used to build your virtual deployment. Epicor itself does not support or warrant these virtual environments or the Epicor Software as used in the virtual environment. However, Epicor does and will continue to support its own software to the extent that any issues experienced in a virtual environment can also be reproduced by Epicor in a non-virtual environment.

When designing the virtual server infrastructure, please ensure that you are matching the virtual machine's specifications with the hardware specifications described in this guide. When matching hardware specifications with your virtual server machine you have to make sure you are not interchanging sockets with cores. For example, when sizing recommends two sockets (physical CPU) and each socket should be quad-core, this means eight vCPUs (virtual CPUs) for your virtual server software.

Each virtual machine instance consumes anywhere from 5-15% overhead per virtual machine on the host machine, depending on the host machine's hardware. Please take that additional usage into consideration as well, virtualization technology such as VT-x and EPT should always be used and when even newer technologies comes this will greatly enhance performance for the Host machine to run virtualized instances.

Epicor ERP Test Process and Results

With Epicor's support for VMware vSphere, many customers are very interested in deploying their solution on the VMware platform. Given the mission-critical nature of the application suite however, they need to ensure that the combined solution delivers the required scalability and performance.

The primary objectives of testing were to determine Epicor performance characteristics and show that Epicor can scale linearly and be run more resiliently on VMware virtual infrastructure.

The joint tests were also designed to provide answers a common set of questions, and to derive and document a set of best practices that can be used by our customers.

Specifically, key areas under investigation were:

- Scalability of the Epicor ERP suite on the VMware vSphere platform.
- Impact on users of VMware vMotion and DRS operations.
- Effectiveness of load-balancing scenarios.

Overall, the results were very positive. In summary, the following objectives were confirmed:

- Scalability:
 - Application servers scale well horizontally.
 - Excellent scalability from 10 to 100 concurrent users (with increased number of application servers as the user count scales up).
- Load balancing:
 - As expected, load is distributed across virtual machines. (Free load-balancers do a good job assuring distribution across multiple virtual machines).
- VMware DRS/vMotion
 - DRS kicked in to distribute load across ESX servers.
 - No negative response time impact with vMotion and DRS.

To characterize the performance of Epicor ERP (version 9.05.600C) on VMware virtual infrastructure, performance tests were carried out jointly by VMware and Epicor. The following sections describe the configuration tested, the testing process and the results.

Hardware and Software Configuration

The following section provides details on the hardware and software used in the testing.

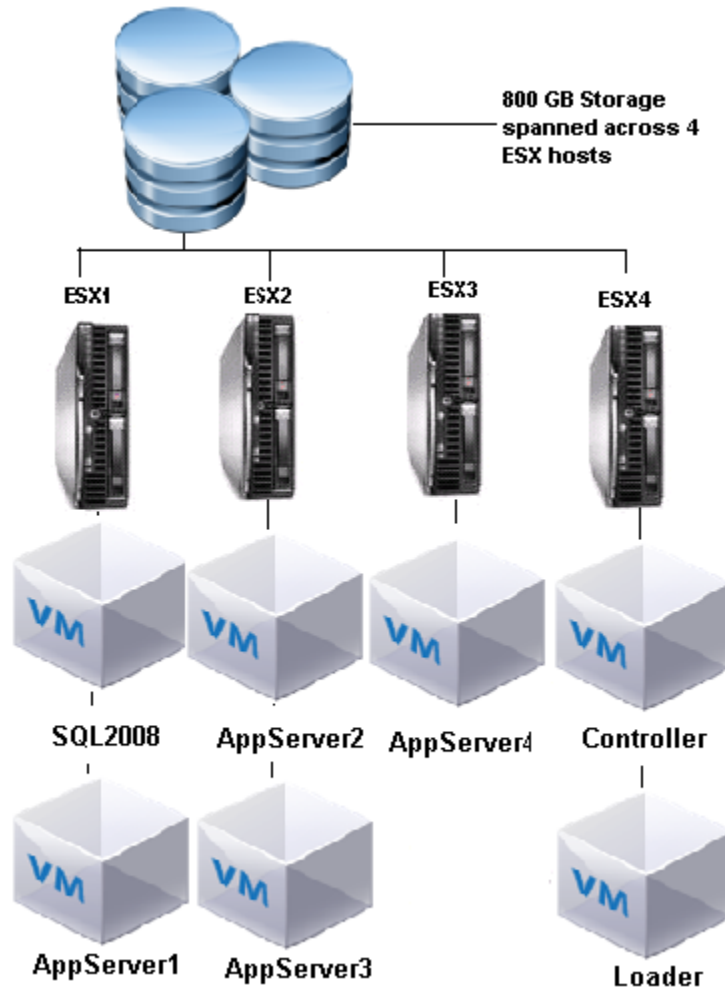


Figure 5. Epicor Test Configuration

The following table describes the configuration of ESX host servers and storage in the Epicor test configurations.

Table 1. ESX Host Hardware

HARDWARE	CONFIGURATION
HP Proliant BL460c G6 (Nehalem Boxes)	Three HP Proliant BL 460c G6 servers. Each server is equipped with: <ul style="list-style-type: none"> • Intel® Xeon® Nehalem CPU L5520 2.3 GHz • Sockets: 2 • Number of Cores per Socket: 4 • Hyperthreading: Enabled • 48 GB RAM • 3 X 1 GB NICS per ESX host – Intel NC364T
HP Proliant DL360 G5	One HP Proliant DL360 G5 with Intel Xeon CPU L5420 2.5 GHz <ul style="list-style-type: none"> • Sockets: 2 • Number of Cores per Socket: 4 • 48 GB RAM • 3 X 1 GB NICS per ESX host – Intel NC364T
Storage	NetApp FAS3140: <ul style="list-style-type: none"> • 28 disks, 15K RPM • RAID DP • 1 Gbps Hardware iSCSI Qlogic 4060c Adapter

Table 2 lists the software used for the Epicor solution running on VMware virtual infrastructure.

Table 2. Software Installed for Epicor testing on VMware Infrastructure

INSTALLED SOFTWARE	
VMware	VMware vSphere ESX 4.1(vSphere) Build 260247
Microsoft	<ul style="list-style-type: none"> • Windows 2008 Enterprise R2 64 Bit with NLB on AppServers • Microsoft SQL Server 2008 64 bit • Visual Studio® Team System (VSTS)
Epicor	Epicor ERP 9.05.600C

Virtual Machine Configuration

The following table describes the configuration of virtual machines running on ESX host servers in the Epicor test configurations.

Table 3. Virtual Machine Configuration

VIRTUAL MACHINE	HARDWARE CONFIGURATION
Four virtual machine instances of AppServers	<ul style="list-style-type: none"> • 4 vCPUs • 8 GB memory • Ethernet card(1 Gbps Network) • (1 x 70 GB) and (1 X 45 GB) storage • vmdk only
One Database virtual machine	<ul style="list-style-type: none"> • 4 vCPUs • 8 GB memory • Ethernet card • (1 X 80 GB), (2 X 50 GB) and (2 X 20 GB) storage • vmdk only
One Controller virtual machines	<ul style="list-style-type: none"> • 4 vCPUs • 8 GB memory • 1 Ethernet card • (1 X 70 GB) storage • vmdk only
One Loader virtual machines	<ul style="list-style-type: none"> • 4 vCPUs • 8 GB memory • 1 Ethernet card • (1 X 55 GB) and (1 X 20 GB) storage • vmdk only

Workload Used

The workload is based on Microsoft VSTS 2008. The workload consists of the following transaction scripts (Table 4) that provide the relevant workload operations provided.

Table 4. Epicor Testing Workloads

SCRIPT NAME	EXECUTION FREQUENCY	PERCENTAGE OF WORKLOAD
Sales Order	2 per minute	20%
AR Invoice	2 per minute	20%
AP Invoice	1 per minute	10%
PO Entry	5 per minute	20%
WIP Report	2 per minute	5%
Stock Status Report and other reports	2 per minute	5%
Cust Shipment entry	2 per minute	15%
Job Entry	4 per minute	5%

Observed Test Results

Six tests were conducted with 10, 20, 30, 40, 50 and 100 users. Each test was calibrated for different Epicor application specific components like Invoice Entry, Sales Order Entry, PO Entry and many more. The calibration was done in terms of number of instances of each component that were executed for a specific set of users. Table 5 shows the AppServer distribution.

Table 5. AppServer User Distribution for Epicor Testing

TEST	USERS	APP SERVERS
1	10	1
2	20	1
3	30	2
4	40	2
5	50	2
6	100	3(NLB)
vMotion	100	3(NLB)
DRS	100	3(NLB)

The CPU utilization shown in the graph below (figure 6) represents the aggregate CPU utilization across one or more application servers. While the total utilization was not high, the use of multiple application servers provided capacity for use in the case of spikes on the workload activity.

For the 100-Users test, AppServers were configured with Network Load Balancing (NLB) software which is a clustering technology included in the Microsoft Windows 2008 Advanced Server and Datacenter Server operating systems to enhance the scalability and availability of mission-critical, CP/IP-based services, such as Web, Terminal Services, virtual private networking, and streaming media servers. This component runs within cluster hosts as part of the Windows 2008 operating system and requires no dedicated hardware support. To scale performance, Network Load Balancing distributes IP traffic across multiple cluster hosts. It also ensures high availability by detecting host failures and automatically redistributing traffic to the surviving hosts.

CPU Utilization Versus Number of Users

Figure 6 shows aggregated CPU utilization at different user levels.

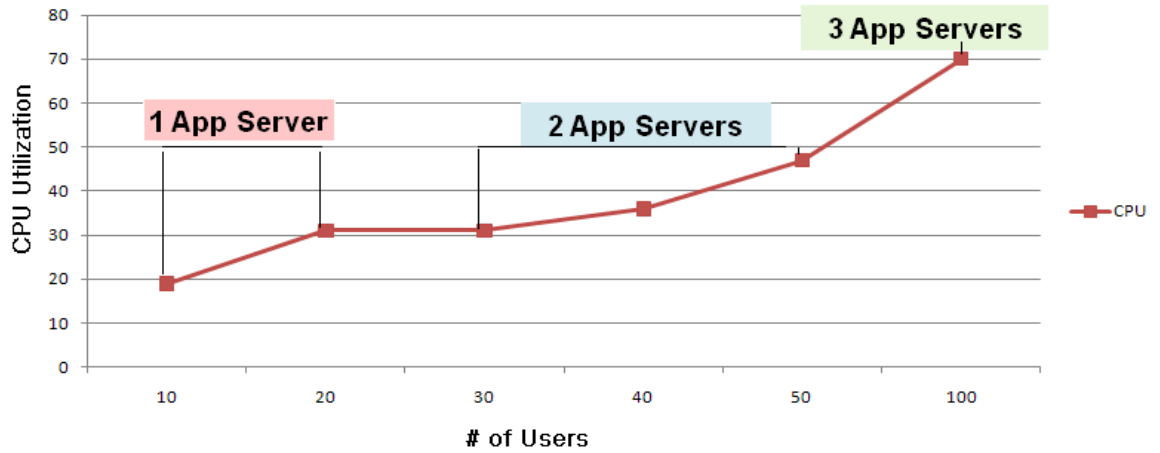


Figure 6. (Aggregated) Utilization # of Users

Figure 7 shows execution time of various business transactions consistently within acceptable values.

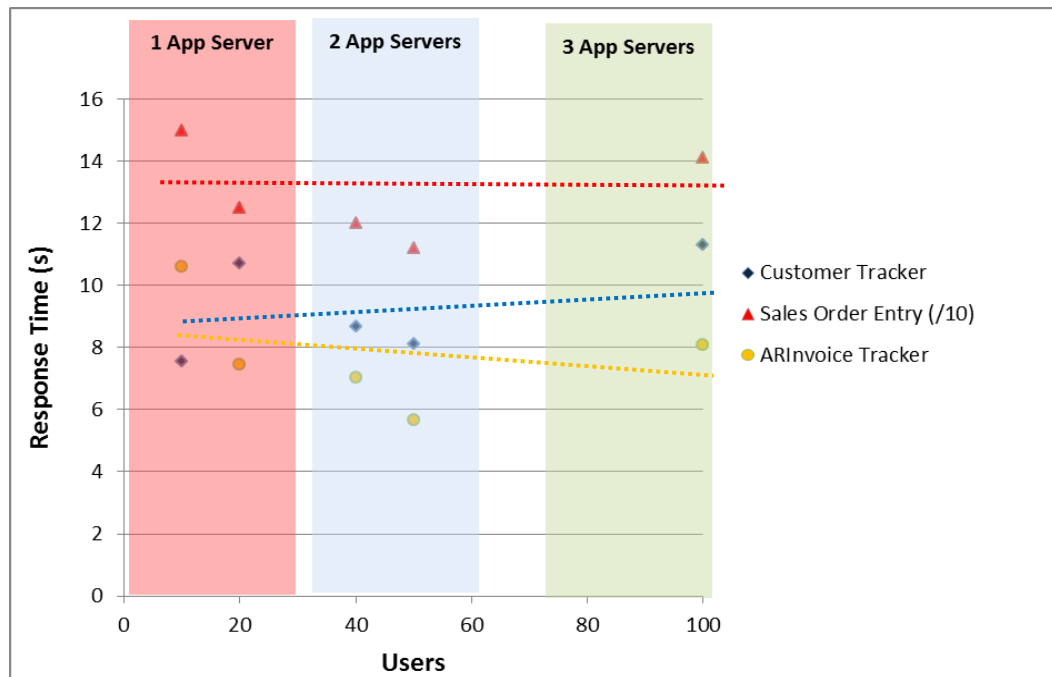


Figure 7. Epicor Execution Times for Different Numbers of Users

Additional VMware Feature Testing

VMware vMotion

VMware vMotion enables the live migration of running virtual machines from one physical server to another with zero downtime, continuous service availability, and complete transaction integrity. This capability makes hardware maintenance possible at any time of the day and does not require clustering or redundant servers. VMware vMotion makes it possible to move online workloads as required from one ESX host machine to another in order to maintain service levels and performance goals. The scope of this test is to check the migration of AppServer virtual machine.

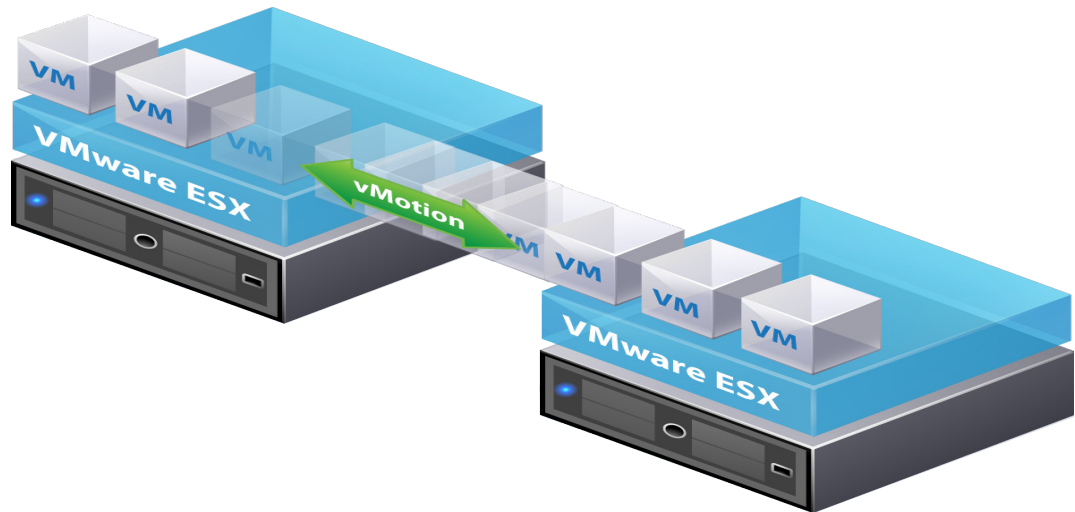


Figure 8. Migration of Appserver Virtual Machines with VMware vMotion

The VMware vMotion test was done with 100 Users and the goal was to check if all the components of the Epicor Application continue to work during vMotion migration. The vMotion migration was completed in 110 seconds with no failures, indicating that user activity could continue successfully during any vMotion events. No negative impact on transaction execution time was observed during vMotion events.

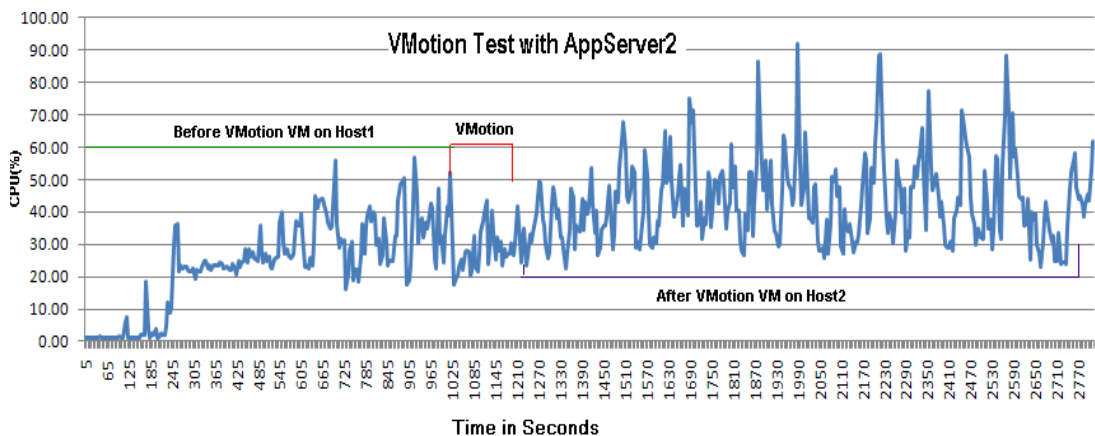


Figure 9. VMware vMotion Test Results

Execution Times measured for different test scenarios are listed in Table 6 below.

Table 6. Test Scenario Execution Times

SCENARIO	TOTAL TESTS	AVG. TEST TIME (SEC)
APInvoiceEntry	12	90.9
ARAgging2File	13	5.69
ARInvoiceEntry	12	51.5
ARInvoiceTracker	28	8.08
BAQCalls	41	12.2
CreateJobFromSO	10	67.3
CustomerShipmentEntry	12	80.8
CustomerTracker	15	11.3
JobEntry	10	40.4
KanBanReceipt	7	26.7
PartMaintenance	15	10.2
PartTracker	13	12.2
POEntry10	9	131
SalesOrderEntry	10	141
StockStatus	14	5.26
SystemMonitor	664	1.27
TimePhaseMtl	15	3.34
WIPReconciliation	14	3.78
Total	914	702.92

VMware Distributed Resource Scheduling (DRS)

Distributed Resource Scheduling (DRS) is an automated load balancing technology that takes advantage of vMotion to migrate virtual machines among a set of ESX hosts. VMware DRS provides automatic initial virtual machine placement on any of the hosts in the cluster, and also makes automatic resource relocation and optimization decisions as hosts or virtual machines are added or removed from the cluster. VMware DRS can also be configured for manual control, in which case it only makes recommendations that you can review and carry out.

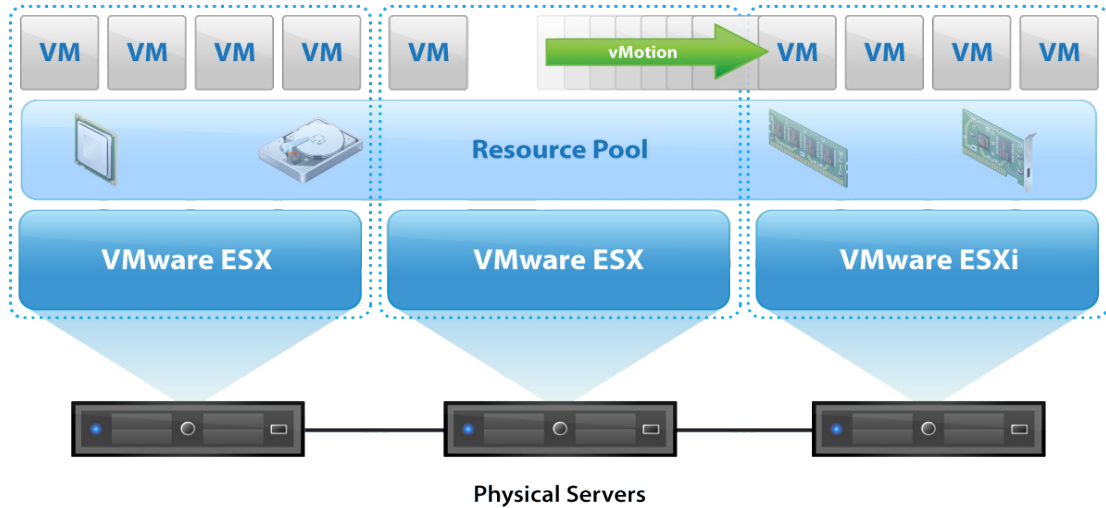


Figure 10. Automatic Load Balancing with VMware DRS

VMware DRS was tested with 100 Users to check if all Epicor components continue to work when VMware DRS is triggered and the virtual machines move between different Hosts. VMware DRS was configured to automatic mode with the default aggressiveness setting enabled. One of the ESX hosts was configured with Appserver3 and AppServer4. After VMware DRS was triggered it was observed that AppServer2 was migrated from Esx2 to Esx3 and there were no failures reported, as with the earlier vMotion tests.

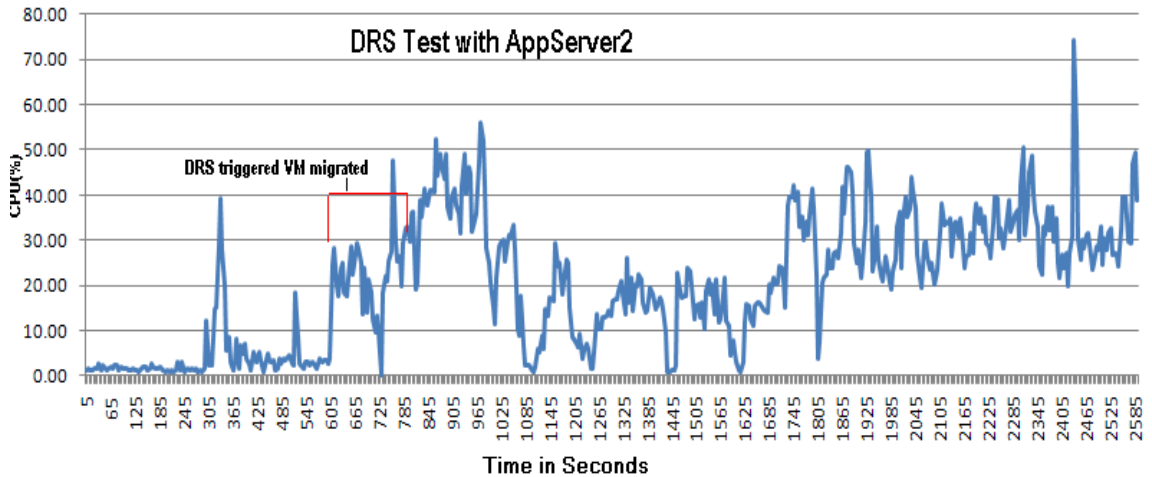


Figure 11. VMware DRS Test Results

Execution Times measured for different test scenarios are listed in Table 7 below.

Table 7. Test Scenario Execution Times

SCENARIO	TOTAL TESTS	AVG. TEST TIME (SEC)
APInvoiceEntry	13	95.2
ARAgging2File	12	4.45
ARInvoiceEntry	11	51.1
ARInvoiceTracker	27	8.93
BAQCalls	40	14
CreateJobFromSO	10	78.2
CustomerShipmentEntry	12	82.7
CustomerTracker	14	13.4
JobEntry	10	50.6
KanBanReceipt	9	35.2
PartMaintenance	13	13.3
PartTracker	14	13
POEntry10	10	128
SalesOrderEntry	11	140
StockStatus	13	4.46
SystemMonitor	675	3.46
TimePhaseMtl	14	9.29
WIPReconciliation	12	9.37
Total	920	754.66

Deployment Best Practices

Here are some of the best practices derived from configuration and testing of the Epicor ERP application in a VMware virtual infrastructure environment

- It is recommended to use Intel-based Nehalem or AMD-based Shanghai processors which have the Hardware-Assist capabilities which help in memory management operations.
- When using Intel-based systems, ensure that the BIOS settings enable Hyperthreading, VT, and EPT options on all ESX hosts.
- Use Eager zeroed disks for better IO performance. This can be done using the VMware vmkfstools command:

```
vmkfstools -w abc.vmdk
```
- To decrease disk latency it is recommended that you use Fibre Channel Adapters and configure proper RAID configuration with sufficient spindles.
- Install VMware tools on the virtual machines. The VMware Tools package provides support required for shared folders and for drag and drop operations. Other tools in the package support synchronization of time in the guest operating system with time on the host, automatic grabbing and releasing of the mouse cursor, copying and pasting between guest and host, and improved mouse performance in some guest operating systems.
- For more than one AppServer, it is recommended to have NLB configured on the AppServers to achieve proper load balancing. Network Load Balancing enables high performance and failover protection, especially in comparison with dispatcher-based load balancers.
- Consider using server-class network interface cards (NICs) for the best performance and configure paravirtualized vmxnet3 adapters for better network throughput.
- It is recommended that virtual machines dependent on each other be configured on same ESX host and same vSwitch. This will reduce traffic flow through the wire and avoid unnecessary CPU and network overhead. An example would be having SQL Server and one of the APPS on the same ESX host.
- Disconnect or disable unused or unnecessary physical hardware devices, such as:
 - COM ports
 - LPT ports
 - USB controllers
 - Floppy drives
- Optical drives (that is, CD or DVD drives)
 - Disconnecting or disabling devices will help free up interrupt resources. For example traditionally, some devices, such as:
 - USB controllers, operate on a polling scheme that consumes extra CPU resources. Lastly, some PCI devices reserve blocks of memory, making that memory unavailable to ESX.

Epicor Reference Architecture Designs

Figures 12 and 14 show Epicor reference architecture designs for 10-User and 100-User workloads respectively.

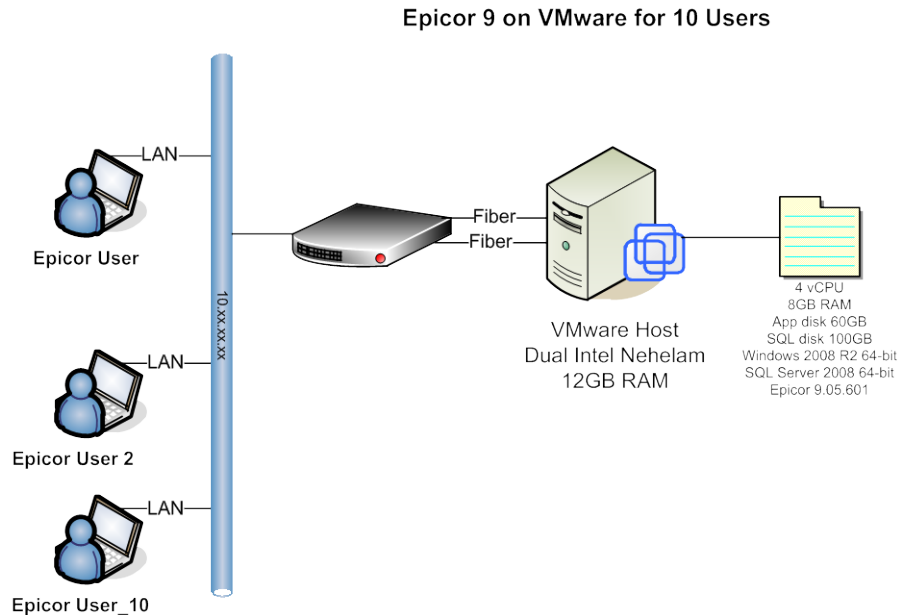


Figure 12. 10-User setup of Epicor ERP on VMware Virtual Infrastructure

In this case, all applications are installed in a single VMware environment; the deployment has average user loads during the day, and does not create significant load requirements on reporting or analysis.

If you add additional users which have more load, but still have average reporting usage, you can separate SQL Server and reporting operations from the application to maintain performance levels. When you use network load balancing, you can preferably use VMware cloning to replicate application setup across servers and gain significant performance improvements. In the same way reporting and SQL functions can be scaled out with additional servers.

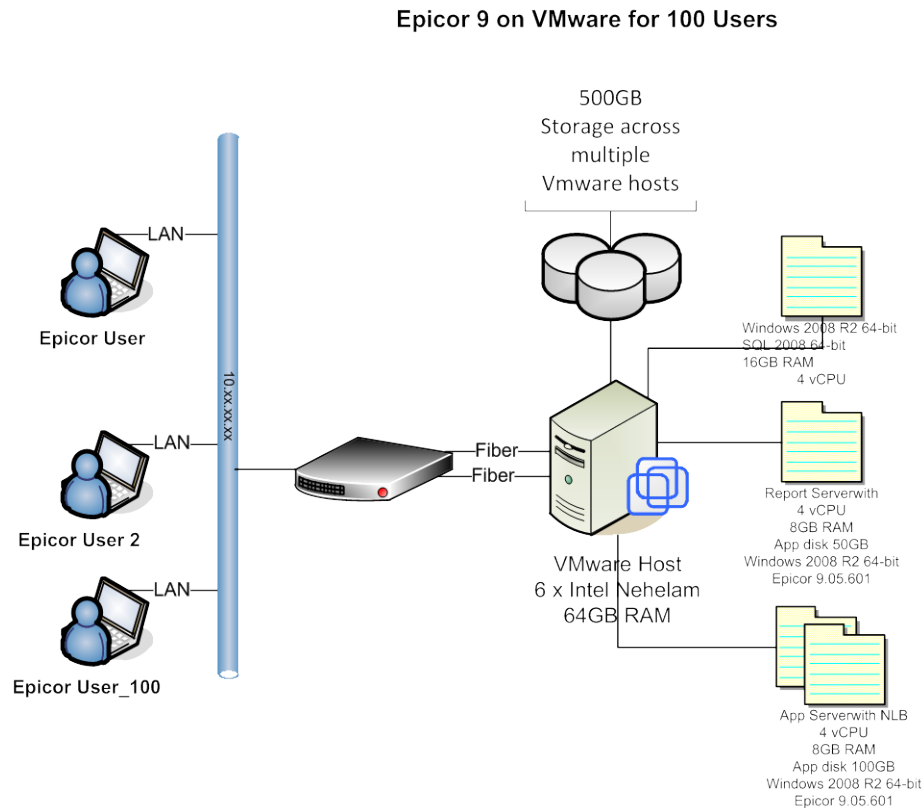


Figure 13. 100-User Setup of Epicor ERP on VMware Virtual Infrastructure

What these best practices examples show is also how to scale further and be able to add more users or, if there is significant load on SQL Server or reports, what you can do if there is a lot of reporting that is running at the same time is add then more report servers. If there are more users, then more application servers can be added to the NLB cluster. In our testing, we have used the built in Microsoft Network Load Balancing and received very good results, but if you need to scale further an F5 switch would be even more effective due to that it can distribute load more effectively. We were conducting tests over multiple VMware hosts to see differences and we can see that it can be beneficial to have multiple hosts when splitting reporting servers and application servers so they run on different host servers. In this whitepaper, we run Microsoft SQL Server virtualized, but this can also be considered to run none virtualized if it used heavily and if you have enough RAM and CPU it could be better to run directly on the machine.

Epicor Application and Database Configurations

The following table describes recommendations for Epicor 9.05 Application and SQL Server 2008 database configuration based on number of users. (Minimum recommendations satisfy typical usage requirements.)

NOTE: SQL Server 2008 is the version compatible with Epicor 9.05 Service Pack. Using 64-bit SQL Server is highly recommended. Epicor Technical Solutions can also help you figure out the best hardware configuration to run your business.

Table 8. Epicor 9.05 Application and SQL Server 2008 Database Recommendations

CONFIGURATION	10 USER – 20 USERS	30-50 USER	100 USER
Operating System of Appserver and SQL Server machine	Windows 2003 / 2008 Server R2(64-bit)	Windows 2003 / 2008 Server R2 (64-bit)	Windows 2003 / 2008 Server R2 (64-bit)
Split SQL and Appserver box	No	Yes	Yes
# of Appservers	1	2	3
Appserver – RAM GB	8	8	8
Appserver – vCPU	4	4	4
Appserver – Disk space GB	60	60	100
# of machines in NLB (or load balancer) for Appserver which services the client/interactive request	1 (No NLB)	1 (No NLB)	2 (Use NLB)
# of machines in NLB (or load balancer) for Appserver which processes and reports	0 (Report appserver runs on same box as main appserver)	1 (no NLB, dedicated Report appserver to run reports and large processes like posting and MRP)	1 (No NLB, dedicated Report appserver to run reports and large processes like posting and MRP.) Add one more report appserver and NLB if heavy reporting is part of business requirement.
SQL Server – RAM in Gigabytes	8	16	16
SQL Server – vCPU	4	4	4
SQL Server – Disk for Epicor DB (in GB)	50-100	50-100	100-200
SQL I/O should be very fast and should have less than 5ms latency at any given point. Slow I/O will result in slow performance.			

CONFIGURATION	10 USER – 20 USERS	30-50 USER	100 USER
VMware host location	Keep all virtual machines on the same ESX host and same vSwitch on the ESX host.	Try to keep all virtual machines on the same ESX host and same vSwitch on the ESX host. Report appserver can be on another box, if your ESX host cannot support all virtual machines. Try to keep the interactive appserver on the same host as SQL Server.	Try to keep all virtual machines on the same ESX host and same vSwitch on the same ESX host. Report appserver can be on another box, if your ESX host cannot support all virtual machines. Try to keep the interactive appserver on the same host as SQL Server.
ESX Host Hardware	Intel Nehalem or AMD hardware-assist processors. VT-x and EPT technology a must	Intel Nehalem or AMD hardware-assist processors. VT-x and EPT technology a must	Intel Nehalem or AMD hardware-assist processors. VT-x and EPT technology a must
ESX VMware OS	ESX 4.1 and above	ESX 4.1 and above	ESX 4.1 and above
VMware features	No overcommitting RAM and CPU. Host the VMware file on fast disks	No overcommitting RAM and CPU	No overcommitting RAM and CPU

Technical Support

Epicor's commitment to deliver high quality business solutions means that our customers depend not only on our applications, but also on our experience in supporting those solutions around the world. Epicor stands behind all of its products with a world-class technical support organization, capable of serving our global customer base.

We are able to offer this support through our worldwide Epicor support centers located in Minneapolis, Monterrey, Bracknell, Budapest, Moscow, KL, Melbourne.. The support teams consist of certified application specialists who work alongside certified technical consultants. Further information, documentation, discussion forum and other useful resources are available on the Epicor Customer Web Site, <http://epicweb/epicor.com>

We strive to develop solid, long-term business partnerships with our customers. Epicor's support analysts are not only specialists in our products, but they also understand the ongoing business needs of our customers. To ensure our staff is up-to-date, they are regularly trained and monitored to ensure they pass our internal certification standards. Our goal is to continue to fine-tune and improve our support systems to enable us to provide the support you need to keep your organization as productive as possible. We continually monitor our performance with incident questionnaires as well as more general customer satisfaction surveys.

Advanced Technology

Epicor Technical Support uses advanced telecommunications technology to ensure you connect with the right person quickly to resolve your application related issues. When you call into any of our support centers, our Automatic Call Distribution System quickly routes your call to the appropriate support analyst. Our call tracking system gives our analysts instant access to your records and our extensive knowledge base of information, so they can quickly provide you with answers and solutions. Epicor Technical Support also utilizes the latest technology in troubleshooting tools such as WebEx™ to resolve tough customer issues in a timely manner. Our support centers cover over 20 languages, fluently, using native speakers where possible.

Epicor Software Corporation Support Statement

Epicor Software Corporation will support customers who run Epicor Software Corporation products on supported Operating Systems, irrespective of whether they are running in VMware environments or not. Epicor Software Corporation supports Operating Systems, not specific hardware configurations. Accordingly, VMware operates as a hardware abstraction layer.

VMware supports a set of certified Operating Systems and Hardware, and the customer and VMware will be responsible for any interactions or issues that arise at the Hardware or Operating System layer as a result of their use of VMware.

Epicor Software Corporation will not require clients to recreate and troubleshoot every issue in a non-VMware environment; however, Epicor Software Corporation does reserve the right to request our customers to diagnose certain issues in a native certified Operating System environment, operating without the virtual environment. Epicor Software Corporation will only make this request when there is reason to believe that the virtual environment is a contributing factor to the issue.

Any time spent on investigation of problems that may, in the sole opinion of Epicor Software Corporation be related to VMware, will be handled in the following fashion:

- 1) Epicor Software Corporation will provide standard support to all Epicor Software Corporation products.
- 2) If a problem is encountered while Epicor Software Corporation is running in a VMware environment, the client may be required to recreate the problem on a non-VMware server unit, at which time Epicor Software Corporation will provide regular support.
- 3) The client can authorize Epicor Software Corporation to investigate the VMware related items at normal time and materials rates. If such investigation shows that the problem is VMware related, the client may contract Epicor Software Corporation to provide a software change to resolve the issue if such a resolution is possible.
- 4) Regardless of the problem type or source, if the problem is determined to be a non VMware related issue - time spent on investigation and resolution will be covered as part of regular maintenance, and support will be provided as usual.

The Customer Center

Self-service support via the Internet can be challenging. That's why Epicor has designed a specific portion of our Web site for our Customers. Epicor's Technical Support Web site (epicweb.epicor.com) includes access to the latest software updates and patches as well as a discussion forum. Furthermore, we will soon be launching a secure, documented online-chat system to further improve our ability to answer your queries quickly, while allowing you to break off to work on other tasks while the chat session is underway.

Product Downloads

Product patches and service packs are regularly published to the Customer Center where they are available for download to customers with a valid maintenance contract.

Conclusions

Overall, testing results show that running Epicor ERP (9.05.600C) on VMware Infrastructure performs well. Furthermore, it has potential to reduce cost, increase service levels and simplify the manageability of the application.

It's essential that all of the advanced capabilities of virtualization feature here are used and that when new virtualization server capabilities as made available are used in order to increase the performance of Epicor ERP in a virtualized environment.

It's equally important that you follow hardware recommendations for the number of CPUs, RAM size, and disk performance to get expected performance results.

Resources

Customers can find more information about VMware and Epicor products via the links listed below:

VMware Resources

- VMware official Web site:
<http://www.vmware.com/>
- VMware Infrastructure 3 and vSphere 4 product Web site:
http://www.vmware.com/products/data_center.html
- VMware download Web site:
<https://www.vmware.com/download/>
- VMware support Web site:
<http://www.vmware.com/vmtn/>
- VMware Performance Tuning Paper:
http://www.vmware.com/pdf/Perf_Best_Practices_vSphere4.1.pdf
- System Compatibility Guide for a complete list of compatible hardware:
http://www.vmware.com/pdf/vi41_systems_guide.pdf
- Storage/SAN Compatibility Guide for a complete list of compatible storage devices:
http://www.vmware.com/pdf/vi41_san_guide.pdf
- I/O Compatibility Guide for a complete list of compatible networking devices:
http://www.vmware.com/pdf/vi41_io_guide.pdf

Epicor Resources

- Epicor Official Web site:
<http://www.epicor.com>
- Epicor Customer and Partner Portal Website:
<https://epicweb.epicor.com/Pages/default.aspx>
- Epicor Compatibility Matrix:
<https://epicweb.epicor.com/resources/MRCCustomers/Epicor%20Compatibility%20Matrix.xlsm>
- Epicor Solution Overview
<https://epicweb.epicor.com/resources/MRCCustomers/Epicor-Solution-Overview-BR-ENS-0210.pdf>
- Epicor Business Architecture Suite Brochure:
<http://www.epicor.com/MRCDocumentLibrary/Epicor-Business-Architecture-BR-ENS-0310.pdf>
<https://epicweb.epicor.com/resources/MRCCustomers/Epicor-Business-Architecture-BR-ENS-0310.pdf>

