



# Epicor Mattec MES

## Hardware Requirements Guide

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# Introduction

Welcome to the Hardware Requirements Guide. The goal of this guide is to provide a practical approach to sizing and configuring your Mattec MES Server to obtain the best performance possible from your Epicor software. It will also help you plan for the future growth of your system.

The key to success in getting your hardware sized correctly is to define your application load correctly and then to match it with the appropriate hardware resources. Choosing a hardware architecture which can grow as your business and / or application load grows is also important.

It is difficult to accurately provide a hardware recommendation that matches your unique application usage pattern. Many customers find this guide very useful and accurate after they have followed all the steps described in the sections. There are some cases where the provided recommendations may not fully work out in your unique situation. It is therefore difficult to guarantee or imply that the hardware purchased using this hardware sizing guide will solve your unique business requirements. To improve the odds of success, we highly recommend that you work with the Mattec Professional Services Group and implement their hardware sizing recommendations.

## How to Use the Hardware Requirements Guide

This guide is divided into sections to assist you through the sizing process. During the hardware sizing process, the steps include:

1. **Plant Profile** - Determine your plant profile. To do this, go to the "Plant Profiles" section.
2. **MES Server Hardware Sizing**  
*\*Epicor recommends using physical (non-virtualized) Servers for the best performance possible.*

Locate the scenario section that is relevant to your environment. Depending on your profile from step 1, physical application server or virtual server, go to the respective sections:

- *Mattec MES using Windows/Intel Server scenarios*
- *Mattec MES using VMware vSphere scenarios*
- *Mattec MES using Microsoft Hyper-V scenarios*

3. **Other Hardware Requirements** – The requirements for other components such as the Mattec MES client PCs and the optional Qlikview Server.

## Important Comments

**Hardware Choice.** The processing demands of a database server and application server versus a file server are very different and your hardware vendor should adjust the recommended configuration accordingly. Consider other factors such as manufacturer reliability, service, and maintenance. These factors are extremely important if the machine runs into a hardware problem and you are faced with downtime.

**Expandability.** You should consider expandability when choosing server(s). For example, if you require multiple processors in the future, will the machine accept more processors? What if you find out that your business practices requires extensive I/O – can you add more disks to your system or add an external disk array? Can you add more RAM?

**Deploy the supported version of software at all times.** It is strongly recommended that you run fully supported versions of software at all times. As a practical matter, Epicor cannot support or certify releases for third party vendor software, such as Microsoft, or any other vendor software, that no longer carries mainstream support from that vendor. In other words, when the vendor phases out its

support of a particular package, Epicor's support for that same software package or version generally ends as well.

**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 does not itself support or warrant these virtual environments or the Mattec MES Software as used in the virtual environment. However, Epicor does and will continue to support its own software to the extent that any issues (performance or otherwise) experienced in a virtual environment can 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 specs with the hardware specifications mentioned in this guide. When matching hardware specs with your virtual server machine you must make sure you are not interchanging sockets with cores.

Each virtual machine instance consumes anywhere from 5-15% per virtual machine on the host machine, depending on the host machine's hardware. Please take that additional usage into consideration as well.

**Performance Tuning.** Relational databases are advanced systems that sometimes require tuning for optimal performance. One major selling point of both platforms is that the database engines are largely self-tuning. However, it can still be useful to perform some level of tuning on a database particularly in the area of database input/output operations to the physical disk subsystem. If performed by an experienced professional, this tuning can substantially improve performance on your hardware. Note that there are many considerations, outside of the scope of this guide, that are involved in maintaining the server at peak performance.

**Don't run other Applications on the Mattec MES Server.** Due to the mission critical nature of any company's Manufacturing Execution System (MES), it is recommended that you have a server dedicated to running it's software.

Running other applications on the server can degrade performance. While certain situations may be suitable for dual hosting, it is strongly recommended that Mattec MES Server run on a dedicated machine.

**SQL Server Software Installation.** In non-virtualized environments, it is recommended that SQL Server be installed on the same server as the MES Server. If this is not feasible, it is required that a high speed Ethernet connection be available between the two servers. For virtualized environments, we do NOT recommend having SQL Server on a virtualized server.

**Qlikview Software Installation.** Qlikview is an optional Analytics package that may be purchased with the Mattec MES system. The Qlikview Server software may be installed on the same machine as MES Server. As of the publication date of this document, Qlikview Server does not support Windows Server 2012. Please keep that in mind when choosing an OS for your server.

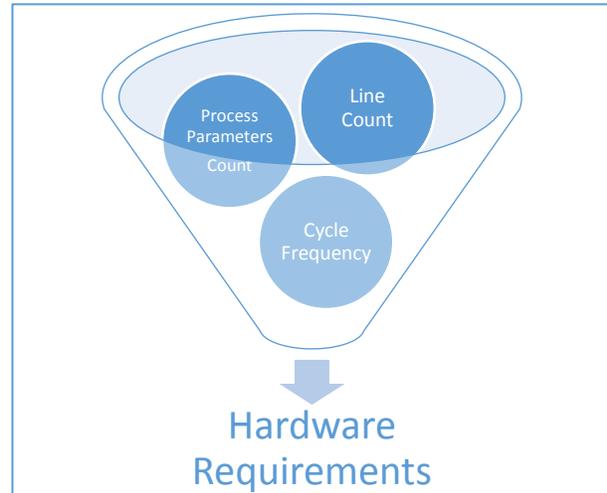
**Disaster Recovery and High Availability.** Unfortunately it is beyond the scope of this guide to cover the details of this topic. Mattec Professional Services Group is a great resource for this discussion and they will be happy to work with you to design a DR and HA solution that suits your business needs.

## Plant Profile

The objective of this section is to help you determine the plant profile. Determining this will improve the odds of purchasing the correct hardware to match your unique business.

The key to any sizing project is to understand the types of workloads involved. For Mattec MES, the biggest factor of MES Server Performance is the amount of database interaction completed for data collection. Answering the following questions will allow you to more accurately judge your server requirements:

- **How many machines** are you monitoring within your manufacturing environment? Do you expect that number to grow as your manufacturing expands?
- How **quickly** do the machines in the factory cycle?
- What is your **total number of process parameters** that will be monitored using the Mattec MES system?



The tables below give general guidelines whether your plant profile most closely resembles a small or large system. Keep in mind that the first table, Single Machine MIU Installations, represents a factory floor that has separate MIUs for the machines. The second table, Multi-Machine MIU Installations, represents a factory floor that has multiple machines on a single MIU.

### Single Machine MIU Installations

	Small System	Large System
<b>Machines</b>	10	50
<b>Cycle Frequency (units per min)</b>	0.5-6	0.5-6
<b>Process Parameters per Machine</b>	5	20

### Multi-Machine MIU Installations

	Small System	Large System
<b>Machines</b>	10	50
<b>Cycle Frequency</b>	2-600	2-600
<b>Process Parameters</b>	N/A	N/A

# Server Hardware Sizing

## [Small] Mattec MES Server

	Description
Operating System	<ul style="list-style-type: none"> <li>Windows Server 2008 x64</li> <li>Windows Server 2008R2 x64</li> <li>Windows Server 2012 x64</li> <li>Windows Server 2016 x64</li> </ul>
Database	<ul style="list-style-type: none"> <li>SQL Server 2008 x64</li> <li>SQL Server 2008R2 x64</li> <li>SQL Server 2012 x64</li> <li>SQL Server 2014 x64</li> <li>SQL Server 2016 x64</li> </ul>
Processors	<p>1 x CPU sockets with at least Xeon Four-Core</p> <p>Intel Xeon Four-Core recommendations:</p> <ul style="list-style-type: none"> <li>2.2 GHz frequency or faster</li> </ul>
Memory (RAM)	16GB DDR3-1066 (or faster) ECC
SSD - Solid State Drive storage (SAS / SATA)  (recommended)	500GB recommended. Minimum 100GB dedicated to OS and Swap Space.
Hard Disk Drive storage	500GB recommended. Minimum 100GB dedicated to OS and Swap Space.
Network	For good network performance, use 1 Gbit (or faster) network cards.
Example server make/model	Dell T320, Dell R320

## [Large] Mattec MES Server

	Description
Operating System	<ul style="list-style-type: none"> <li>Windows Server 2008 x64</li> <li>Windows Server 2008R2 x64</li> <li>Windows Server 2012 x64</li> <li>Windows Server 2016 x64</li> </ul>

Database	<ul style="list-style-type: none"> <li>• SQL Server 2008 x64</li> <li>• SQL Server 2008R2 x64</li> <li>• SQL Server 2012 x64</li> <li>• SQL Server 2014 x64</li> <li>• SQL Server 2016 x64</li> </ul>
Processors	<p>2 x CPU sockets with at least Xeon Four-Core</p> <p>Intel Xeon Four-Core recommendations:</p> <ul style="list-style-type: none"> <li>• 2.2 GHz frequency or faster</li> </ul>
Memory (RAM)	32GB DDR3-1066 (or faster) ECC
SSD - Solid State Drive storage (SAS / SATA) (recommended)	<p>500GB recommended. Minimum 100GB dedicated to OS and Swap Space.</p> <p>Recommend RAID 10 for system. OS mirrored, SQL Database striped.</p>
Hard Disk Drive storage	500GB recommended. Minimum 100GB dedicated to OS and Swap Space.
Network	For good network performance, use 1 Gbit (or faster) network cards.
Example server make/model	Dell T420, Dell R420

## Mattec MES within Virtualized Environments

### Mattec MES on VMWare vSphere 5.0

*\*SQL Server should be installed separately on a non-virtualized server.*

	Description
Host software	VMware vSphere 5.0
Guest OS	<ul style="list-style-type: none"> <li>• Windows Server 2008 x64</li> <li>• Windows Server 2008R2 x64</li> <li>• Windows Server 2012 x64</li> <li>• Windows Server 2016 x64</li> </ul>
SQL Server	<ul style="list-style-type: none"> <li>• SQL Server 2008 x64</li> <li>• SQL Server 2008R2 x64</li> <li>• SQL Server 2012 x64</li> <li>• SQL Server 2014 x64</li> <li>• SQL Server 2016 x64</li> </ul>

Virtual CPU count	<p>4 virtual CPUs</p> <p>Create a full CPU reservation to ensure that the virtual machine has dedicated access to physical CPU cores.</p> <p>It is not recommended to overcommit CPU resources.</p>
Memory (RAM)	<p>12 GB (reserved RAM)</p> <p>It is not recommended to overcommit memory resources.</p> <p>If needed, disable Memory Ballooning so that the virtual application server has a dedicated amount of RAM.</p> <p>Ensure that the RAM on the host supports ECC.</p>
Physical CPU requirements (host requirements)	<p>It is recommended that the virtualization host has one of the following CPUs:</p> <p>Intel Xeon Six-Core recommendations:</p> <ul style="list-style-type: none"> <li>• 3 GHz frequency (X5670 or faster. X5690 is highly recommended)</li> </ul> <p>Intel Xeon Ten-Core recommendations (for two-socket server motherboard):</p> <ul style="list-style-type: none"> <li>• 2.4 GHz frequency (E7-2870 or faster)</li> </ul> <p>Intel Xeon Ten-Core recommendations (for four-socket server motherboard):</p> <ul style="list-style-type: none"> <li>• 2.4 GHz frequency (E7-4870 or faster)</li> </ul> <p>Ensure that VT-x and EPT are supported and enabled.</p> <p>It is recommended to leave Hyper-Threading enabled (check BIOS settings).</p> <p>Disable Power Saving options and C-States in BIOS.</p>
Virtual hard disk	<p>Use Thick Provisioning and ensure that Eager Zeroing is in use.</p> <p>Enable Storage I/O Control (SIOC) and set the threshold to 25ms.</p>
Virtual hard disk controller	Use the Paravirtual SCSI adapter.
Guest OS virtualization software	Install and use the latest VMware Tools.
Network	<p>Ensure that the physical host has multiple physical network cards which are all utilized by the hosted virtual machines.</p> <p>Use the VMXNET3 virtual network card.</p>
Load balancing	<p>Physical load balancing appliance recommended. Software based works too.</p> <p>Use Multicast Mode if you are using Microsoft Network Load Balancing (NLB). This is recommended for stability reasons.</p>
Backup software	Image-level (snapshot) backups are not supported. File-level backups are supported.

## Mattec MES on Hyper-V Virtual Application Server

*\*SQL Server should be installed separately on a non-virtualized server.*

	Description
Host software	<ul style="list-style-type: none"> <li>• Microsoft Windows Server 2008 R2 with Hyper-V role</li> <li>• Microsoft Windows Server 2012 With Hyper-V role</li> </ul>

	<ul style="list-style-type: none"> <li>Windows Server 2016 with Hyper-V role</li> </ul>
Guest OS	<ul style="list-style-type: none"> <li>Windows Server 2008 x64</li> <li>Windows Server 2008R2 x64</li> <li>Windows Server 2012 x64</li> <li>Windows Server 2016 x64</li> </ul>
SQL Server	<ul style="list-style-type: none"> <li>SQL Server 2008 x64</li> <li>SQL Server 2008R2 x64</li> <li>SQL Server 2012 x64</li> <li>SQL Server 2014 x64</li> <li>SQL Server 2016 x64</li> </ul>
Virtual CPU count	<p>4 virtual CPUs</p> <p>Create a full (100%) virtual machine reserve to ensure that the virtual machine has dedicated access to physical CPU cores.</p> <p>It is not recommended to overcommit CPU resources.</p>
Memory (RAM)	<p>12 GB (reserved RAM)</p> <p>Select Static memory when you allocate memory to the virtual machine.</p> <p>It is not recommended to overcommit memory resources.</p> <p>Ensure that the RAM on the host supports ECC.</p>
Physical CPU (host) requirements	<p>It is recommended that the virtualization host has one of the following CPUs:</p> <p>Intel Xeon Six-Core recommendations:</p> <ul style="list-style-type: none"> <li>3 GHz frequency (X5670 or faster. X5690 is highly recommended)</li> </ul> <p>Intel Xeon Ten-Core recommendations (for two-socket server motherboard):</p> <ul style="list-style-type: none"> <li>2.4 GHz frequency (E7-2870 or faster)</li> </ul> <p>Intel Xeon Ten-Core recommendations (for four-socket server motherboard):</p> <ul style="list-style-type: none"> <li>2.4 GHz frequency (E7-4870 or faster)</li> </ul> <p>Ensure that VT-x and EPT are supported and enabled.</p> <p>It is recommended to leave Hyper-Threading enabled (check BIOS settings).</p> <p>Disable Power Saving options and C-States in BIOS.</p>
Virtual hard disk	Use Fixed Size virtual hard disks.
Virtual hard disk controller	<ul style="list-style-type: none"> <li>Use the IDE Controller option for the virtual hard disk that contains the OS.</li> <li>Use the SCSI Controller option for all other virtual hard disks.</li> </ul>
Guest OS virtualization software	Install and use the latest Integration Services.
Network	Use the Network Adapter virtual network card (and not the Legacy Network Adapter).
Load balancing	Physical load balancing appliance recommended. Software based works too. Use Multicast Mode if you are using Microsoft Network Load Balancing (NLB). This is recommended for stability reasons.

<b>Backup software</b>	<b>Image-level (snapshot) backups are not supported.</b> <b>File-level backups are supported.</b>
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## Other Hardware Requirements

### Mattec MES Client

For desktop / network clients, keep in mind that other installed applications, specifically Microsoft products, have requirements of their own over and above the requirements for Mattec MES. The MES client will perform better on workstations that have sufficient memory and processor power to run all your applications.

	Description
Operating System	Windows 7 Windows 8 Windows 10
Processor	Pentium Dual Core 2.0Ghz or higher
RAM	2 GB
Disk Space for Mattec	600 MB
Monitor	SVGA or higher adapter Color SVGA monitor with 1024 X 768 resolution
Other	Internet connection recommended for online support and downloading latest updates. Fast network connection recommended between client and MES Server. The Mattec MES Client application will work on slower networks but the performance will be better if you have a fast connection with low latency.

### Shop Floor HMI / Tablet

To run the Mattec Shop Floor HMI, we recommend using the Chrome browser. When running the Shop Floor HMI on a tablet device, we recommend the following configuration:

	Description
Operating System	Android 4.2 or higher
Resolution	1024 x 768
RAM	2 GB
Other	Chrome browser

### Qlikview Server

Dependent on the agreed upon architecture, the Qlikview Software may be decoupled from the Mattec MES Software on a separate server. For such cases, below are the requirements for the relevant hardware.

	Description
Operating System	<ul style="list-style-type: none"> <li>• Windows 7 x64</li> <li>• Windows Server 2008 x64</li> <li>• Windows Server 2008R2 x64</li> </ul>
Application	<ul style="list-style-type: none"> <li>• Qlikview 11 Server</li> </ul>
Processors	<ul style="list-style-type: none"> <li>• Multi-core x64bit Processor</li> </ul>
Memory (RAM)	8GB DDR3-1066 (or faster) ECC. More memory may be required depending on the volume of data being analyzed.
Disk Space	450MB Required
Network	For good network performance, use 1 Gbit (or faster) network cards.

# Appendix

## Testing Performance of an Existing SAN

If you have an existing SAN and want to ensure that it can deliver good performance, then you can run a Microsoft storage benchmark utility called **SQLIO**.

The following tests are designed to test various aspects of an I/O disk subsystem i.e. bandwidth (Mega Bytes/second i.e. MB/Sec), Latency (milliseconds), performance of your I/O system with desired block size (64KB) and file size and type of I/O – read or write and sequential v/s random writes. The parameters described in previous statement have a great impact on IOPS and hence they are specified exactly as needed here for testing using SQLIO. On the same machine you will get different IOPS number if you change any one parameter. So testing with Epicor recommended parameters is highly recommended.

Download SQLIO from: <http://www.microsoft.com/download/en/details.aspx?id=20163>

Instructions: The default install path on a 64-bit OS for SQLIO is C:\Program Files (x86)\SQLIO\ In the SQLIO install path, the configuration file called **param.txt** determines which drive letter SQLIO will test.

If you want to test the D-drive letter, then change the **param.txt** content to the following:

```
D:\testfile.dat 2 0x0 80000
```

### Steps to run each test:

1. Open up a Windows Command Prompt on the server that you installed the SQLIO utility. For example **START > RUN > CMD**, this opens up the Command window.
2. Change directory to the SQLIO folder, e.g. **C:\users\admin>CD C:\Program Files (x86)\SQLIO**
3. Run 3 tests below using specified parameters on each drives. Each test requires 80 Gig of free space on the respective drive.

### Test 1: Database (.mdf) drive letter

This test will test 64k random writes.

Modify the param.txt file so that it points to the database drive letter and then run the following command:

```
sqlio -kW -f8 -s900 -o8 -frandom -b64 -BH -LS -Fparam.txt
```

### Test 2: Transaction log (.ldf) drive letter

This test will test 64k sequential writes.

Modify the param.txt file so that it points to the transaction log drive letter and then run the following command:

```
sqlio -kW -f2 -s900 -dM -o8 -fsequential -b64 -BH -LS -Fparam.txt
```

### Test 3: Tempdb drive letter:

This test will test 64k random writes.

Modify the param.txt file so that it points to the tempdb drive letter and then run the following command:

```
sqlio -kW -t8 -s900 -o8 -frandom -b64 -BH -LS -Fparam.txt
```

## **Backup and Fault Tolerance UPS**

Other server considerations include:

- Backup devices
- Uninterruptible power supply and redundant components

### **Backup Devices**

It is extremely important that your business information is backed up on a regular basis. The frequency and type of backup should be discussed with your implementation team, but one or more tape / backup drives on the server can ensure a timely backup is made. It is also possible to backup to the local disk, and then copy the file elsewhere for storage. Consider off-site storage for backups as well. Test your backup scripts and restore procedures and backup files regularly.

### **Uninterruptible Power Supply (UPS) and Redundant Components**

The production server is the key to the business, and should be protected. Power outages can damage the server hardware and can occasionally corrupt the software; therefore, the server should be protected with a UPS, specifically one with server software that is capable of initiating a clean shut-down of the server. Recovery from a power outage is usually not a problem, but why take the risk.

The mission critical nature of an MES system necessitates consideration of redundant processors, network controllers, storage controllers, hot-swappable hard drives, and power supplies. You should also consider network hub/switch redundancy.

Such components contribute to a "highly-available" solution which is tolerant of most hardware failures and allow for service to be postponed to off-hours. Businesses requiring continuous availability (24 x 7) may also want to consider hot plug support for controllers, on-line spare hard drives, redundant processor power modules, and redundant hot-swappable fans to provide the highest-availability solution that can be serviced during business hours without an interruption in productivity. Network hubs, routers, and server monitors should also be considered when assessing UPS requirements.

# About Epicor

For over 20 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.

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