

# Ease Server Support With Pre-Configured Virtualization Systems

Manufacturers and industrial production companies are increasingly challenged with supporting the complex server environments that host their mission-critical production applications. A lack of plant- or facility-level resources, IT expertise and disciplined processes to manage servers is exposing them to high costs and significant risks – including a large installed base of aging infrastructure and legacy operating systems.

On top of this, industrial companies must manage the varying and sometimes intertwined life cycles of their controls hardware and software. Control systems return on investment calculations are often based on the projected life of the asset being five to 25 years, according to the ARC Advisory Group\* study on migration strategies in process control systems.

Component	Lifecycle
Workstation	5 years
Control strategies	Variable
Graphics	Variable
Controllers	Up to 15 years
Input/output	20 years or more
Cabling	25 years or more

(\*) ARC STRATEGIES, Process Control System Migration Strategies, by Dick Hill, Larry O'Brien, Dave Woll, February 2003

Compare this to the lifecycles of the software operating systems on which these control systems depend. For example, Microsoft® introduced Windows Vista® in 2006, Windows 7 in 2009 and Windows 8 in 2012.

The disconnect between the expected life of the control system and the operating system is a critical example of the industrial server support challenge. Additionally, the lack of disciplined processes for patching, implementing security policies or ensuring endpoint anti-virus protection has resulted in numerous facilities experiencing unnecessary downtime and lost revenue due to legacy support, viruses and security-related issues.

## Strategies for Extending the Lifecycle

Suppliers of control systems endeavor to extend the useful life of the equipment they provide, therefore prolonging the operating life of the industrial facilities in which such equipment is installed. Meanwhile, updates to operating systems and software generally are increasingly more frequent than those involving physical machines. Because of this, more manufacturers and production companies are using virtualization to prolong the lifecycle of their software.

Virtualization breaks the tight link that has traditionally existed between the software and the hardware on which it's installed. This enables industrial companies to change hardware without replacing the operating system or applications. It also allows multiple instances of an operating system with independent applications to run side by side on the same hardware platform. This package of operating systems and applications running together is known as Virtual Machines (VMs).



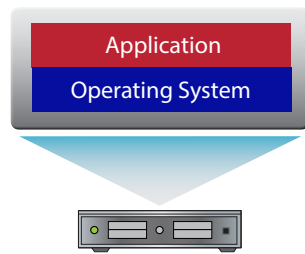


Fig. 1  
Traditional Server Approach

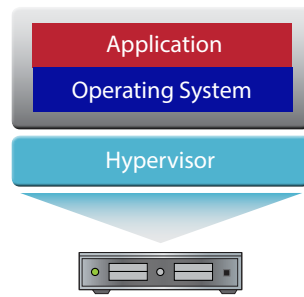


Fig. 2  
Virtualized Server Approach. The hypervisor sits between the hardware and the OS.

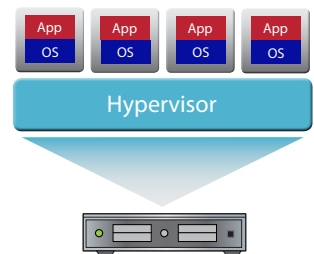
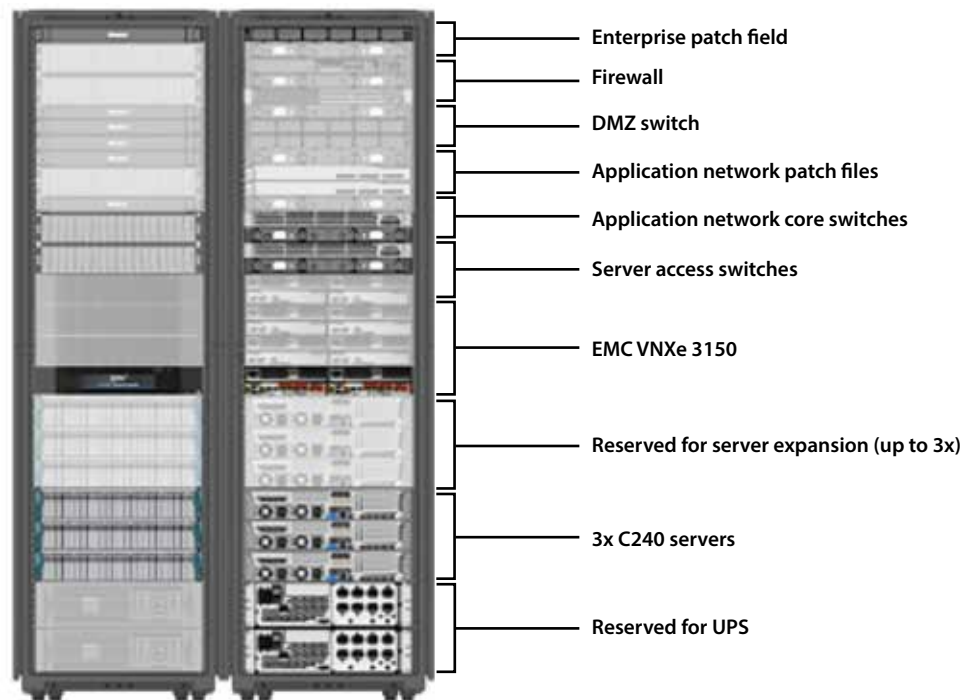


Fig. 3  
Virtualization permits hardware upgrades without replacing OS or application software. Multiple VMs can reside on a single server.

## Selecting a Virtualization Infrastructure

Producers seeking to deploy virtualization in their facilities have the option of custom building the virtualization hardware from the ground up or purchasing a pre-engineered and bundled system. Those who choose to custom build their system must not only design it but also procure equipment from multiple vendors, fabricate and test the system, and commission it. This process can be complex, costly and take several weeks.



On the other hand, pre-engineered, scalable infrastructure solutions have been developed to help businesses more quickly and easily deploy virtualization in production environments. These systems contain all the hardware and virtualization software needed to run multiple operating systems and multiple applications on virtualized servers.

These packaged solutions provide an opportunity to bring together the world's leading manufacturers and software providers from the IT market, and combine them with the knowledge and expertise of industrial automation and information companies.

## Benefits of a Pre-Engineered System

A pre-engineered solution can help ease the transition to a virtualized environment for industrial companies, saving them time and money. Instead of ordering five different pieces of equipment with five purchase orders, and then hiring the correct certified installation professionals to get them up and running, bundled systems combine equipment and engineering services from industry leaders.

***The systems are pre-configured specifically for the industrial manufacturing and production industries.***

The systems are pre-configured specifically for the industrial manufacturing and production industries. They are thermally tested and are housed in cabinets engineered with built-in power and grounding solutions to meet the most stringent standards. All equipment can be shipped pre-assembled and supported, with on-site start-up and commissioning services included as part of the overall system package.

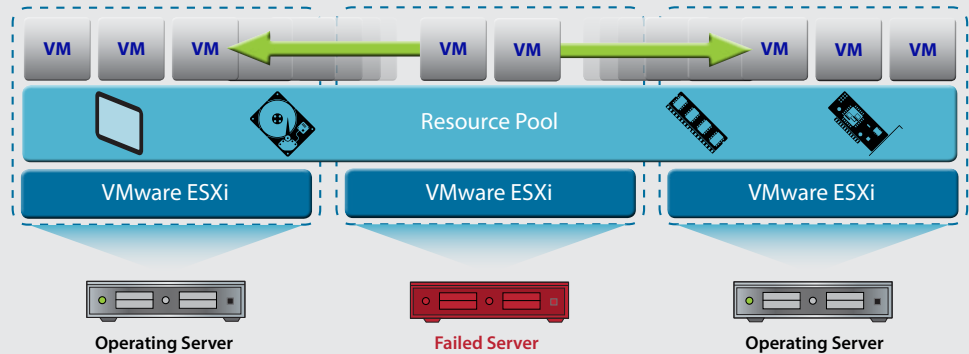
Pre-engineered systems are available in multiple server options, each solution increasing in capability to meet more complex automation demands. The solutions are scalable to support the needs of manufacturers starting out on the virtualization journey, whether they're looking to migrate a simple application or if they have a complex, multiserver, multiapplication requirement. For example, the Rockwell Automation Industrial Data Center portfolio offers the following server options:

	Single Server E1000	E2000	E3000
<b>Cabinet RU</b>	24 (optional)	24	42
<b>Compute</b>	Cisco® C240 Rack Mount Servers		
Min/Max Servers	1	2/3	3/6
Core	6	12-18 (6 per server)	18-36 (6 per server)
RAM (GB)	64	128-192 (64 per server)	384-768 (128 per server)
<b>Network</b>	2 Quad Port NICs	2 - Cisco Catalyst 3750X 24 Port	2 - Cisco Catalyst 3750X 48 Port
<b>Storage</b>	---	EMC VNXe 3150	
Usable TB Storage	2 TB	5 TB	9 TB
Total Usage Storage	3 TB	7 TB	10 TB
<b>Virtualization</b>	VMware vSphere® Standard		VMware vSphere Enterprise
View	---	10 licenses	20 licenses
<b>Operating System</b>	MS 2012 2 processors/10 calcs	MS 2012 4 processors/25 calcs	MS 2012 6 processors/50 calcs
<b>Support</b>	8x5 TechConnect <sup>SM</sup> (Upgrade available to 24x7 or remote monitoring)		
	One year HW/SW warranty		

## Features That Make Virtualized Production Systems More Reliable

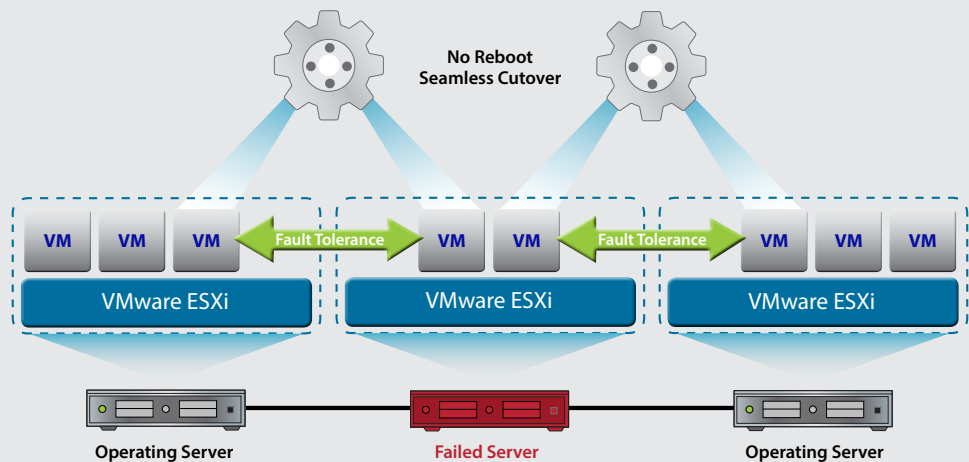
### 1. VMware High Availability

With VMware High Availability, each VMware host is monitoring the others and itself for critical failures. In the event that a failure occurs, the cluster will automatically respond and re-start the affected virtual machines on other available resources.



### 2. VMware Fault Tolerance

VMware Fault Tolerance allows a virtual machine to run simultaneously on two physical servers to help protect it from critical failures. In the event of one server failure, the virtual machine continues to run on its second server.



## Implementing a Pre-Engineered System

Prior to delivering the system, the solution provider can remotely collaborate with the customer to understand their detailed virtual infrastructure design expectations and business objectives, as well as to identify functional and informational requirements.

Once the specific expectations and requirements are determined, a detailed specification is created to serve as the basis for the virtual infrastructure topology design. This will ensure that the infrastructure design best meets system needs. The design documentation should include the hardware and software bill of materials, and the VMware® host and cluster configuration information.

The virtual infrastructure is then built and delivered to the site, packaged with all of the hardware and software required.

The on-site implementation services can include the configuration of host servers, storage, thin client hardware and management services per the design. Physical server access and virtual switches can also be configured and integrated seamlessly into the existing physical and logical network topology.

Configuration tasks may include:

- Physical installation of rack and components.
- Configuration of the host servers as a VMware HA and DRS enabled cluster.
- Configuration of the SAN for both VM storage (iSCSI) and application storage (CIFS).
- Configuration of a Windows domain.
- Creation of virtual machine templates for required operating system versions.
- Configuration of client desktop templates and pools in VMware View®.
- Creation of fault-tolerant virtual machines as required.

## Overcome Common Challenges of the Traditional Server Approach



### INEFFICIENT?

- Slow deployment process
- Lack of high availability/fault tolerance
- High capital expense



### EFFICIENCY

- Reduce design and engineering by 3-4 weeks
- Factory assembled, highly available solution
- Infrastructure as a Service becomes OpEx cost



### VULNERABLE?

- Security is an afterthought
- Aging server infrastructure
- Difficulty managing patch revision



### SECURITY

- Reduce risks while improving Overall Equipment Effectiveness (OEE)
- Centrally managed security solution



### INFLEXIBLE?

- Lack of scalable server architectures
- Production impacted by lengthy hardware lifecycle replacement



### AGILITY

- Enable scalability without purchasing new hardware
- Bring new software assets online in days, not weeks



### LOCKED IN?

- Legacy applications and operating systems incompatible with server hardware
- Varied software and hardware lifecycles



### CHOICE

- Remove hardware/software interdependency
- Freedom from 3-5 year server lifecycles

## Evolving Options to Support Virtualized Systems

Following the successful start-up of the system, solution providers may offer remote-support options, ranging from standard system support to active system monitoring and administration.

The streamlined support available with pre-engineered packages can be particularly appealing to manufacturers and production companies. Rather than contacting a different support group for multiple equipment manufacturers and software providers, an operator or technician can instead use one point of contact for the entire system.

System monitoring and administration support is a suite of managed services that can help reduce a manufacturer's costs of sustaining and supporting the myriad of complex systems and technology deployed in today's industrial environment. This service is built upon an infrastructure of advanced surveillance, knowledge management and diagnostic technologies, and can include support centers based around the world with operators fluent in multiple languages to meet today's global operating needs.

Service offerings can be specifically tailored and combined to meet each company's specific needs to help reduce costs, improve organizational performance and increase system uptime. And most importantly, these services can assist in creating dramatic cost reductions and significant improvements to operating cash flow.

### Did You Know?

Twenty percent of network intrusions in 2012 involved manufacturing, transportation and utilities.

More than 90 percent of compromises took just hours or less to perpetrate, while more than 60 percent of attacks took months – or even years – to detect.

This considerable gap between the time of attack and time of detection gives thieves and cyberattackers plenty of opportunities to access a manufacturer's trade secrets and sensitive production data or plant a virus.

More than half of the breaches took months or more to contain and, perhaps most alarmingly, only 10 percent of breaches were detected by somebody from inside the company.

Source: 2013 DBIR



Only **1** out of **10** were *discovered*  
by an internal resource...



## Four Ways Pre-Engineered Systems can Enhance Security

1. Extra space in the rack and patch panel can support demilitarized zone (DMZ) deployment.
2. Computing assets consolidated into a single location and the use of tools to manage these assets from a single console helps improve patch-deployment efficiency.
3. Secure remote access and administration can be a gateway to managing and monitoring all industrial network and automation assets.
4. Computing assets can be locked down into a single cabinet.

## 10 Actionable Steps to Enhance Industrial Security

1. Use features, such as access control lists and port blocking, to control access to various areas of your network.
  2. Use firewalls and intrusion detection/prevention systems to limit and manage network traffic, and ensure robust and reliable operations.
  3. Use antivirus and application whitelisting to protect computer assets.  
(Reference material: Achieving Secure, Remote Access to Plant-Floor Applications and Data, Publication #ENET-WP009)
  4. Establish a system patching policy to keep software up to date.  
Reference material: Computer System Security Updates, Publication #SECUR-WP002.
  5. Develop security policies to manage the “human factor” (e.g., managing and protecting passwords, managing removable media, and using personal devices).
  6. Put the Allen-Bradley® ControlLogix® key switch in run mode and then remove the key to implement a level of physical control.
  7. Use FactoryTalk® Security application from Rockwell Automation to control who is allowed to do what from where in the application.
  8. Use controller change detection and FactoryTalk AssetCentre software to monitor activities in your system.
  9. Use ControlLogix source protection to protect intellectual property.
  10. Implement physical controls, such as locking cabinets and doors, to limit access to automation equipment.
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