



Cisco and Rockwell Automation Point of View

Plant-Floor Virtualization—Driving Security and Efficiency for Consumer Packaged Goods Companies

When you connect your plant floor systems and workstations to the Internet, you open a potential leak to your intellectual property. A consumer packaged goods (CPG) company's recipes are its crown jewels and can be hacked by a disgruntled employee over the enterprise network or even by global organized crime. According to the Trustwave Global Security Report, the food and beverage industry was the number one target for cyberattacks in 2011—and that's typical for the years since.

The failure to keep plant-floor workstations and process software in sync is a frequent cause of downtime and security breaches. You may experience mismatches that shut production down, just as a PC can freeze when you try to run a new-generation application on an old-generation operating system (OS). These limitations can also inhibit flexibility. So, too, can legacy, siloed manufacturing environments that do not permit you to flexibly—and quickly—retool production lines in response to rapidly changing consumer demand.

And what about traceability? Without the ability to identify product defects rapidly at various manufacturing phases and quickly adjust the process, your potential liability increases. Especially as the number of damaged units continue to flood into the market.

Virtualizing Production Networks

How do you keep control? Many leading CPG companies are now deploying plant-floor virtualization which moves the software that runs processes and manufacturing back to the data center. Building on the convergence of operational technology (OT) and IT networks, virtualization is now on the cusp of widespread adoption. And what virtualization has done for enterprise networks, it's starting to do for industrial networks (Figure 1).

In place of PCs and workstations, floor personnel use thin clients. Plant-floor OSs and manufacturing execution systems (MESs) reside centrally in the data center and you can update them centrally, making it much easier to keep them current with patches and upgrades. You can also keep them in phase with hardware much more easily.

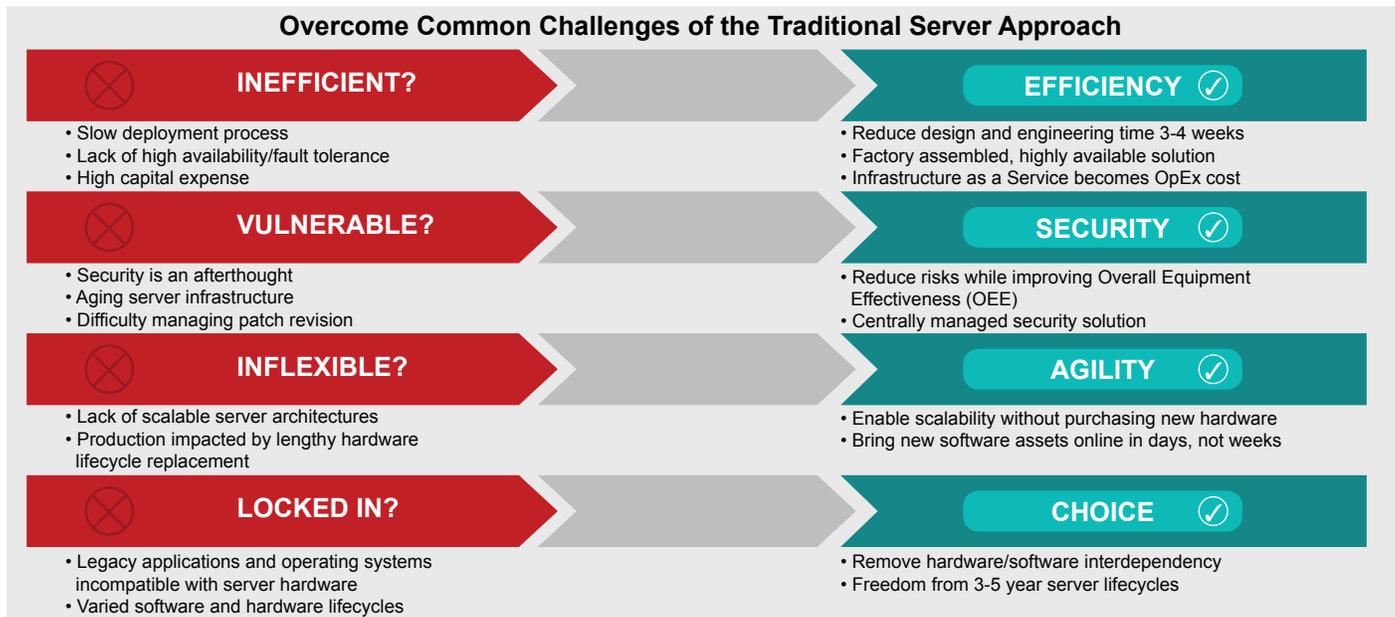
“When a leading CPG company audited plant downtime due to security issues, it found 27 instances of work stoppage in the first 7 plants it audited. The cost in lost productivity? Over \$5 million. It then succeeded in drastically reducing outages and downtime, and one of its critical tools was plant floor virtualization.”

Randal Kenworthy, Practice Director,
Manufacturing and Energy at
Cisco Systems

A well-designed and implemented virtualized plant floor can provide:

- **Better security:** patched and compliant plant floor control devices
- **Choice:** Remove software and hardware interdependency
- **Agility:** more flexibility to modify plant operations
- **Increased overall equipment effectiveness (OEE):** increased uptime and better plant floor performance

Figure 1. Virtualization Trumps Traditional Server Approach



How Virtualization Solves Plant-Floor Problems

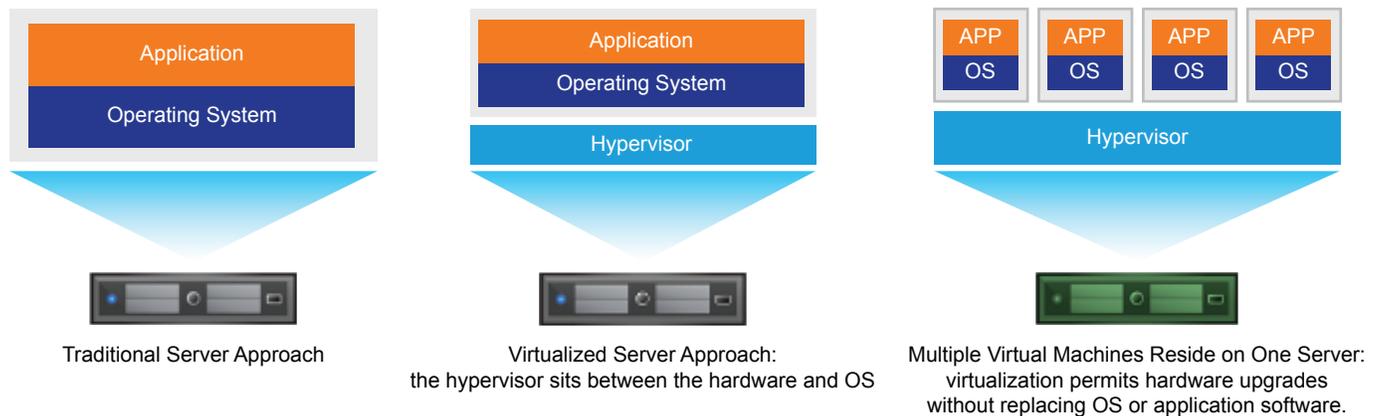
Lifecycles for hardware and software differ more often than not. Hardware may have lifetimes of a few to 15 or more years. But operating systems may change every few years, and companies may not update all their PCs and HMI systems simultaneously or at all. And they may not keep up with patches, upgrades, and security policies. Too often, the result is freezes, downtime, and lost revenue.

Virtualization breaks the tight link that traditionally exists between software and hardware. Manufacturers can change hardware without replacing the OS or MES, and other applications. Virtualization also allows multiple instances of an OS with independent applications to run side by side on the same hardware platform. You can also centralize failover practices and policies.

Figure 2 illustrates the transformation. With virtualization, multiple versions of applications and OSs can run on the same physical server in harmony. Because the hardware and software aren't tied to each other, each can be upgraded independently of the other.

Lack of flexibility is another issue. Physically locating MES systems in plant-floor workstations can create barriers if engineers want to move part of a process elsewhere on the floor to make the process more efficient. For example, to move a cooking vessel or its feeds to different locations they may have to move or change connections to the workstation or move the workstation itself, or connect parts of the process to a different workstation. Freedom to move manufacturing steps around the plant-floor is crucial to lean manufacturing and to Six Sigma efforts that focus on continuously improving processes.

Figure 2. The Transition from Traditional to Virtualized Servers



Two Paths to Virtualization: Build It Yourself or Buy Pre-engineered

If you decide virtualization makes sense for your operations, you have two choices: custom building a system yourself or buying one that's pre-engineered and bundled with the necessary components.

Custom building usually takes a lot of time. After you decide what systems you need, you must evaluate competing products, prepare different purchase orders, coordinate delivery times, handle the onsite startup, and commission the equipment, and then integrate, configure, and test everything.

You can have a pre-engineered solution up and running more quickly. Pre-engineered virtualization solutions developed for the plant-floor contain all the hardware and virtualization software needed to run multiple operating systems and multiple applications on virtualized servers in the data center, replacing aging, isolated plant-floor desktops with thin clients.

Pre-engineered solutions can bring together expertise from world-leading IT companies and industrial automation companies. With both IT and manufacturing in its DNA, a pre-engineered solution can bridge the two worlds easily.

On the production side, the plant-floor equipment has been tested and hardened where necessary. And it's housed in cabinets with built-in power and grounding that meets stringent factory-floor standards.

On the IT—data center side, a pre-engineered solution can provide a continuum of capabilities to suit your present and future needs. The equipment is shipped preassembled and supported with onsite startup and commissioning services included as part of the overall system package.

The pre-engineered virtualization solution can help improve:

- **Efficiency**—Reduce design and engineering time by 3 to 4 weeks by replacing capital expenditures (CapEx) with operational expenses (OpEx) using plant-floor applications provided as infrastructure as a service (IaaS).
- **Security**—Security policies, practices, and defenses are managed centrally, rather than on individual workstations on the floor.
- **Agility**—Bring new production software online in days not weeks.
- **Choice**—Remove hardware / software interdependency restrictions from operations.

The Industrial Data Center

Cisco and Rockwell Automation have teamed up to bring you the Industrial Data Center, the only pre-engineered virtualization solution now available. The Industrial Data Center includes Rockwell Automation factory automation expertise and networks along with Cisco leading data center and IT network knowledge.

The solution includes Cisco Unified Computing System™ (Cisco UCS®) C240 Rack Mount Servers; Cisco Quad Port Network Interface Cards or Cisco Catalyst 3750X Switches; VMware virtualization systems, and EMC storage.

Cisco UCS simplifies traditional computing architectures, dramatically reducing the number of devices organizations must purchase, deploy, and maintain. It delivers end-to-end optimization for virtualized environments and can support traditional operating systems and applications in physical environments. With Cisco UCS, you can accelerate time to productivity while also working more securely, with greater protection of data center infrastructure and assets.

Rockwell Automation expertise ensures that the Industrial Data Center can, where necessary, accommodate conditions on the plant-floor, such as vibration, high temperatures, presence of fluids (even caustic ones), and possible EMI and RFI. The system is also scalable to meet the needs of diverse operations.

In addition, the industrial Data Center has provisions specifically for security including:

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

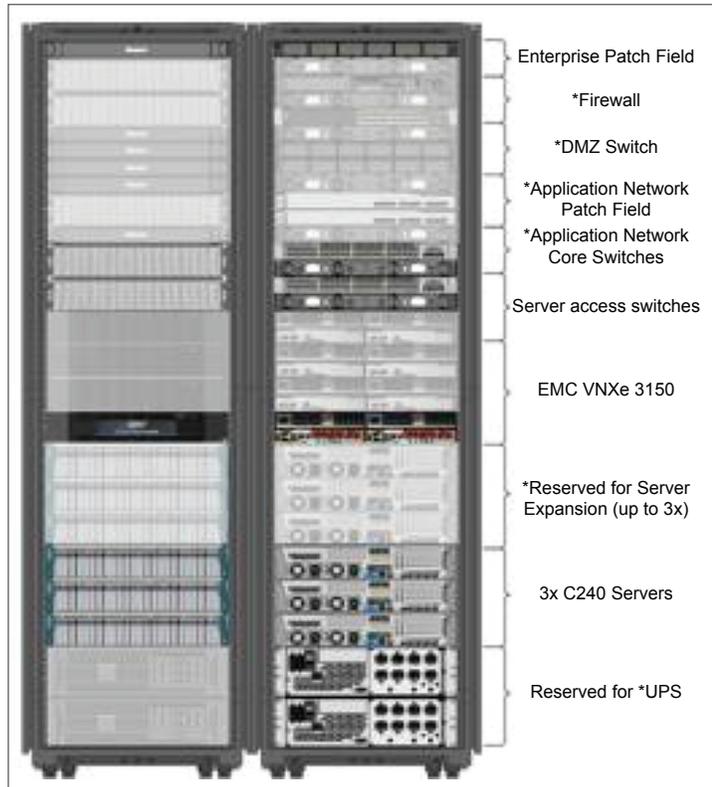
Before Rockwell Automation delivers the system, a dialog to understand your business objectives and expectations from a virtualized infrastructure takes place. Rockwell Automation experts also identify functional and informational requirements.

Next, Rockwell Automation creates a detailed specification which serves as the basis for the virtual infrastructure topology design, to help ensure an infrastructure design meets both IT and OT requirements. This specification includes both hardware and software bill of materials including scalable options based on requirements. Table 1 lists some of the options. Lastly, Rockwell Automation builds, delivers and installs the tailored system.

Table 1. Design Options for the Integrated Data Center

	Single Server E1000	E2000	E3000
Compute	Cisco® C240	Rack Mount	Servers
Min/max servers	1	2/3	3/6
RAM (GB)	64	128-192	384-768
Network	2 Quad Port NICs	2 Cisco Catalyst 3750X 24-port	2 Cisco Catalyst 3750X 48 Port
Storage	EMC VNXe 3150 3 TB	EMC VNXe 3150 7TB	EMC VNXe 3150 10 TB
Virtualization	VMware vSphere® Standard	VMware vSphere® Standard	VMware vSphere Enterprise
Operating system	MS 2012 2 processors/10 calcs	MS 2012 4 processors/25 calcs	MS 2012 6 processors/50 calcs
Support 8x5 TechConnectSM (upgrade available to 24x7 or remote monitoring) One year HW/SW warranty			

Figure 3. Rockwell Industrial Data Center



Configuration tasks Rockwell Automation performs 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 virtual machine storage (iSCSI) and application storage (CIFS)
- Configuration of a Windows domain
- Creation of virtual machine templates for required OS versions
- Configuration of client desktop templates and pools in VMware View
- Creation of fault-tolerant virtual machines as required

Customized Virtualization to Meet Your Business Goals

Every manufacturing environment is unique. Cisco and Rockwell Automation have the experience and the expertise.

Find out how Cisco and Rockwell Automation can help your plant be more secure and more productive.

For more information, visit:

- Rockwell Automation Industrial Automation Security: <http://www.rockwellautomation.com/rockwellautomation/products-technologies/security-technology/overview.page?>
- Rockwell Automation Industrial Data Center: <http://www.rockwellautomation.com/rockwellautomation/services/network-services/industrial-data-center.page>
- Rockwell Automation and Cisco Systems Strategic Alliance: <http://www.rockwellautomation.com/rockwellautomation/sales-partners/strategic-alliances/cisco-systems.page?>
- Cisco: Visit the Cisco Data Center and Virtualization website, or contact your local Cisco account manager or Randal Kenworthy at rkenwort@cisco.com.

Manufacturing: A Tempting Target for Malware



Did you know that 20 percent of network intrusions in 2012 involved manufacturing, transportation, and utilities? According to the Verizon 2013 Data Breach Investigations Report, while over 90 percent of intrusions took just hours or less to perpetrate, more than 60 percent of attacks took months—or even years—to detect. That’s much more time than needed for cybercriminals to access a manufacturer’s trade secrets and sensitive production data or to install malware on its systems. In addition, only 10 percent of breaches were detected by someone inside the company.

Case Study: Large Consumer Packaged Goods Company

Challenge: Incompatible software on the company’s industrial PCs used for plant-floor equipment (HMI) meant a constant struggle to keep the PCs updated with critical security patches. Plant-floor operators had little knowledge of how to maintain and manage the PCs. With a lack of standards across plants, staff wasn’t able to apply PC patches or, if they did, they applied them inconsistently.

Solution: The customer deployed a virtualized HMI architecture based on Cisco UCS. The solution provides a standardized architecture across the plant. Plant operators can now provide consistent and up-to-date images, even with diverse requirements across the plant floor.

Results: Plant downtime has dropped considerably. The standardized architecture means patches are handled more consistently across a compatible environment. Software testing cycles and disaster recovery testing time have gone from days and weeks to hours. Because line workers are using retrofitted touchscreens on similar PCs, they experience the same physical environment. Greater efficiencies mean the company is able to reduce the number of data centers in the plant from three to two.

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Rockwell Automation is a leading provider of power, control and information solutions that enable customers to get products to market faster, reduce their total cost of ownership, better utilize plant assets, and minimize risks in their manufacturing environments.

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