Creating a Virtual, More Efficient Plant

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In today's plants, operators are faced with an ever-increasing number of servers that are used to perform various functions within a facility. Each one of those servers has an incremental burden around things like maintenance, space, power and cooling. What plant operators strive for is a reduction in the number of servers while still retaining reliability, and with each server that is removed there is a decrease in maintenance and operational costs. In addition to the sheer number of servers that they need to maintain, customers are faced with:

- Constant hardware and operating system (OS) upgrades
- Complexities in system management
- Reduced staffing levels
- Business pressures to reduce overall total cost of ownership

Enter virtualization, more specifically platform virtualization – a technology that allows multiple operating systems to share a single hardware server. When operating in a virtual environment, each OS appears to have the server's processor, memory and other resources all to itself. In reality, however, the platform virtualization layer, or hypervisor, is actually controlling the server's processor and resources, allocating what is needed to each operating system and, in turn, making sure that the guest operating systems, or virtual machines, cannot disrupt each other. Essentially, the technology allows a single server to simultaneously run multiple operating systems while ensuring that they are totally isolated from one another and from the underlying server, helping to mitigate the problems mentioned above.

Used in data centers around the world, virtualization can also be applied to industrial control systems to achieve three important things for manufacturers:

- Lower the quantity of PC hardware required
- Reduce the frequency and impact of OS and hardware changes
- Simplify overall system management

Lower the quantity of PC hardware required
In today's competitive server hardware market, vendors are constantly under pressure to continue to increase the performance of their machines. Application performance needs have certainly increased, but oftentimes the performance improvements in servers generally increase at a faster rate than applications. In some instances, this results in the underutilization of machines that potentially could be used for other tasks. While multiple applications can often be run at the same time within an OS to take advantage of this increasing capacity, it is generally not done for scope of loss reasons and to avoid conflicts from a performance or compatibility perspective with other applications.

Deploying virtualization allows multiple virtual machines each running their own OS and application stacks to be used at the same time on a single physical machine. Virtualization achieves this while guaranteeing that a given virtual machine gets exactly the amount of resources required to do its job, and ensuring that any issues with one virtual machine won't

impact another. This type of consolidation reduces the need for multiple machines and maximizes the use of hardware resources.

By improving hardware utilization, plants are able to cut down on the number of servers they require, which has a direct correlation with associated running costs. Each machine removed results in less maintenance, power, repair, energy and related expenditures.
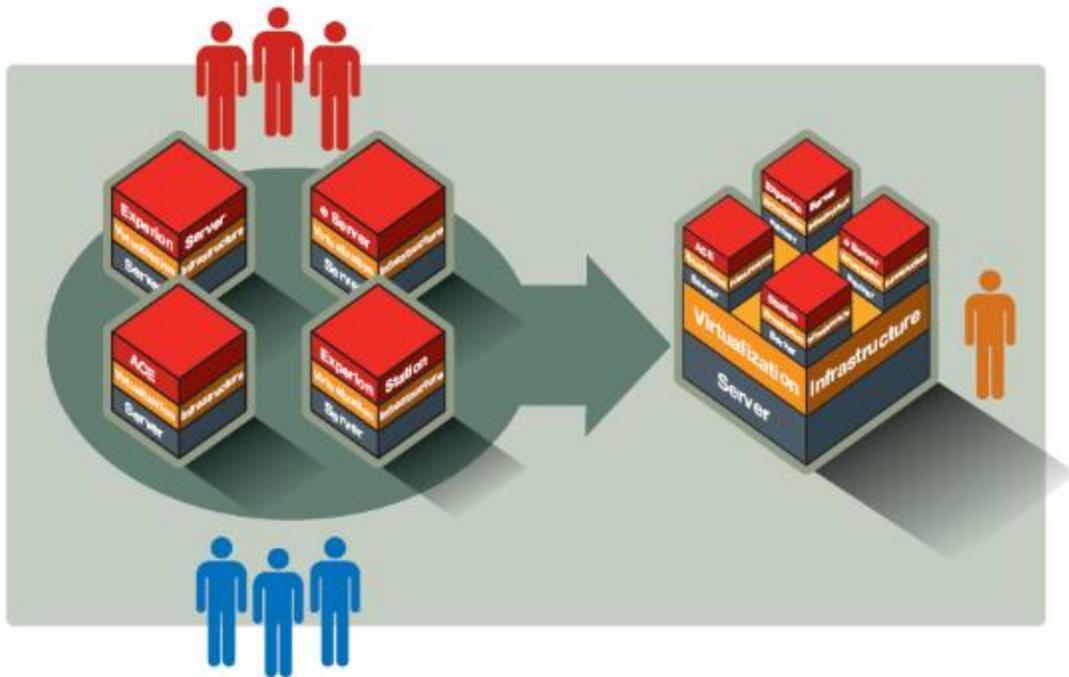
Virtualization: Do More with Less

Reduce the impact and frequency of OS and hardware changes
One of the struggles that plant operators and manufacturers consistently face is the disconnect between the fast-paced and obsolescence-driven world of hardware and operating system manufacturers and that of process control operations, which operators want to remain static. Overhauls of core assets are extremely expensive for plant managers, who don't want to be forced into change or upgrades that are not on their own terms. But in an industry where technology has to remain current, plant operators are struggling to keep up with the rate of OS and hardware change they are facing.

Additionally, plant managers often don't see a tangible benefit to their business by moving forward with OS or hardware upgrades. They are doing so for hardware reliability reasons along with the ability to receive support and security patches on the operating systems. None of these items increase a plant's output, but are merely being done to avoid downtime and ensure support. Operators see OS and hardware upgrades as an unnecessary disruption and burden.

Virtualization, though, helps reduce the strain that plants encounter by allowing end users to continue to use their existing hardware as long as it is able to provide the minimum levels of performance that an application requires of a virtual machine. By sticking with existing hardware, plants face reduced upgrade costs.

Plant operators can also stay on the same OS for longer since the ability to run on a physical piece of hardware is no longer dependent upon the underlying hardware itself, but rather runs on what the virtualization environment can support.

While change to the hardware is significantly reduced, the need to change hardware is inevitable. Virtualization significantly reduces the disruption to plant operations when this is required by avoiding the need to reinstall an OS. Additionally, through the use of more advanced virtualization features, the operating system and the applications running inside don't need to be shut down to replace the hardware. Operations can continue without interruption while a hardware replacement is taking place.

Virtualization, overall, adds flexibility for manufacturers that don't find it necessary or worthwhile to disrupt plant operation with unnecessary changes to their hardware or operating systems.

Simplify overall system management
When plant expansions or upgrades occur, it is often necessary to add new nodes to the control system. This can be accomplished without adding new hardware, if sufficient resources exist, and without having to perform fresh OS and application installations. Existing virtual machines, or templates, that have been installed with an OS have the control system application installed and configured for site needs. This saves valuable installation and configuration time and ensures a more reliable and repeatable result.

Additional system management functions include:

- Improved disaster recovery functions through snapshots that allow the control system to be instantly rolled back to known baselines in the event an issue is encountered;
- Better system performance visibility and improved diagnostics that can monitor performance, perform power operations and access the desktop of any node in the system.

A Way to Do More With Less
In lean times, operators are faced with the overarching task of doing more with less – reducing operating costs while maintaining or increasing production levels. At the same time, companies often must bring new projects online faster and at a lower cost than ever before. Manufacturers have to identify waste at every level of their operations and ensure that plants are operating as efficiently, and as cost effectively, as possible. Virtualization should be viewed as a key to helping them achieve the goal of maximizing return on investment by reducing the strain on the resources of day-to-day management. Plants can use the technology to decrease wasted server space while consolidating the physical size of their operations, mitigate the disruption that comes with hardware upgrades and make systems easier to maintain overall. With end users trying to reduce operating costs in any way that they can while maintaining a safe, productive environment, virtualization provides a solution that increases reliability and allows plants to meet their needs in an efficient, secure and cost-effective way.

About the Author:
Paul Hodge is the Honeywell product manager responsible for the Experion Server along with other Experion infrastructure items such as Virtualization and OPC. He is responsible for setting the product roadmap for his portfolio along with marketing literature, pricing and packaging. Paul has been with Honeywell for 16 years and started his career in the Honeywell service organization. During this

time he has had experience with Experion, TPS, PlantScape, SCAN3000 systems along with field instrumentation. Paul has particular interest and experience in virtualization and enjoys promoting and discovering new ways that virtualization can help solve problems for the industrial control industry. He holds an associate diploma in electrical engineering and is based in Sydney, Australia.

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