Ovation™ Virtualization

Features

- Simplifies maintenance and increases flexibility

- Requires fewer computers and control hardware

- Extends system life with simple upgrades

- Increases availability and accessibility

Overview

Virtualization of advanced platforms, such as Emerson's Ovation™ Distributed Control Systems, plays an important role in reducing time, cost, and risk in plant operations. Ovation virtualization provides full functionality incorporating many components of the control system into a virtual environment. This allows one or more physical host servers to simultaneously run multiple instances of operating systems and applications. Virtualization benefits include:

- Increased system longevity by insulating operating systems from hardware changes.
- Optional High Availability functionality, which increases systems' fault tolerance to hardware problems.
- Improved system performance.
- Reduced hardware footprint and lower maintenance costs.
- Increased configuration flexibility.
- Higher productivity levels.

Ovation users can confidently capture the value of virtualization with a fully tested and supported Ovation virtualization solution for control systems and simulators.

Virtualization with Standard Availability

With virtualization, Ovation components can run as virtual machines, greatly reducing the amount of hardware used on a typical system. Virtualization with standard availability is ideal for simulator systems, operator training systems, and controls application development systems. High availability functionality is not required, and virtual machines are stored locally on one or more host servers.

Users can access the Ovation virtual machines through a separate Remote Desktop Protocol (RDP) network from small form factor thin clients. Host infrastructure is managed over a dedicated infrastructure network using a dedicated Management Console.

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A typical Standard Availability deployment is shown in Figure 1, where multiple workstations are combined on one or more servers.
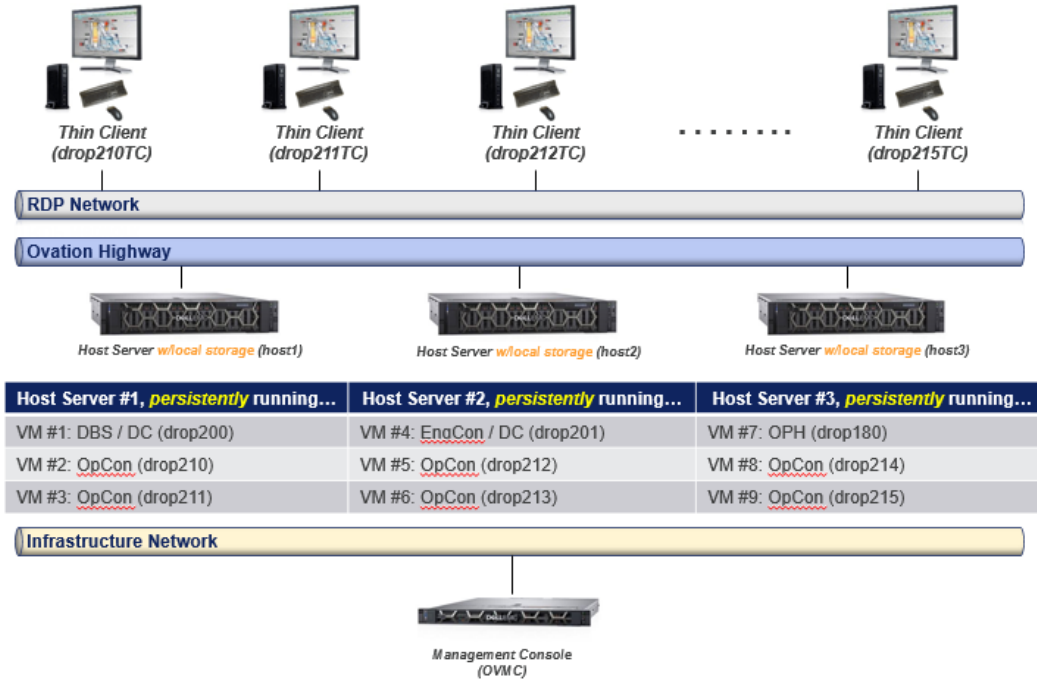

Figure 1. *Standard Availability system architecture.*

Virtualization with High Availability

With virtualization, Ovation components can run as virtual machines, greatly reducing the amount of hardware used on a typical system. Virtualization with high availability is ideal for control system implementations and requires two or more host servers. In this configuration, users can either store virtual machines centrally on a shared Storage Area Network (SAN) device or store them locally on host servers using Virtual SAN technology.

Users can access the Ovation virtual machines through a separate Remote Desktop Protocol (RDP) network from small form factor thin clients. Host infrastructure is managed over a dedicated infrastructure network using a dedicated management console.

For control applications, Emerson recommends the implementation of high availability virtualization for critical applications.

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Traditional Virtualization with High Availability

Traditional virtualization with high availability functionality, depicted in Figure 2, requires the use of a shared SAN device, which hosts storage for all virtual machines on the system.
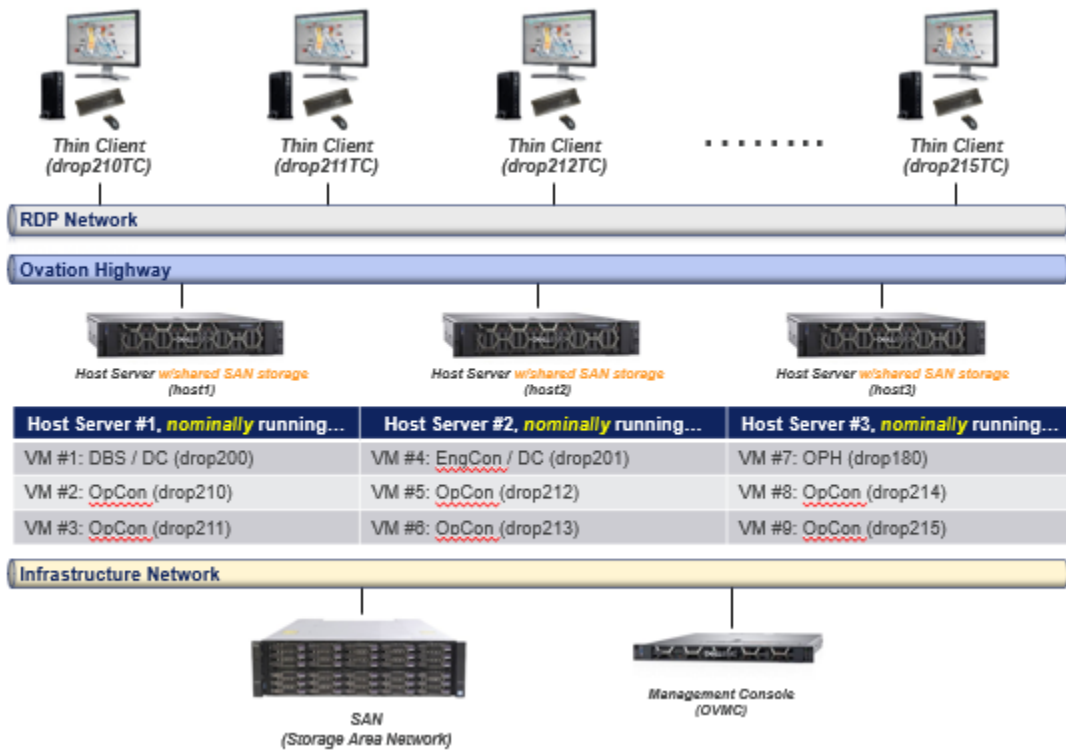

Figure 2. *Traditional Virtualization system architecture with High Availability.*

Hyperconverged Infrastructure (HCI) Virtualization with High Availability

Virtualization with Hyperconverged Infrastructure (HCI) combines the host computer and storage resources as shown in Figure 3. Eliminating the need for a physical SAN, the system supports high availability functionality. Using a separate storage network and proprietary protocol, the storage area on the host is connected and viewed as one large storage device, simplifying management down to a single dashboard. Hyperconverged Infrastructure (HCI) virtualization also provides better scalability, easier deployment, and increased redundancy.
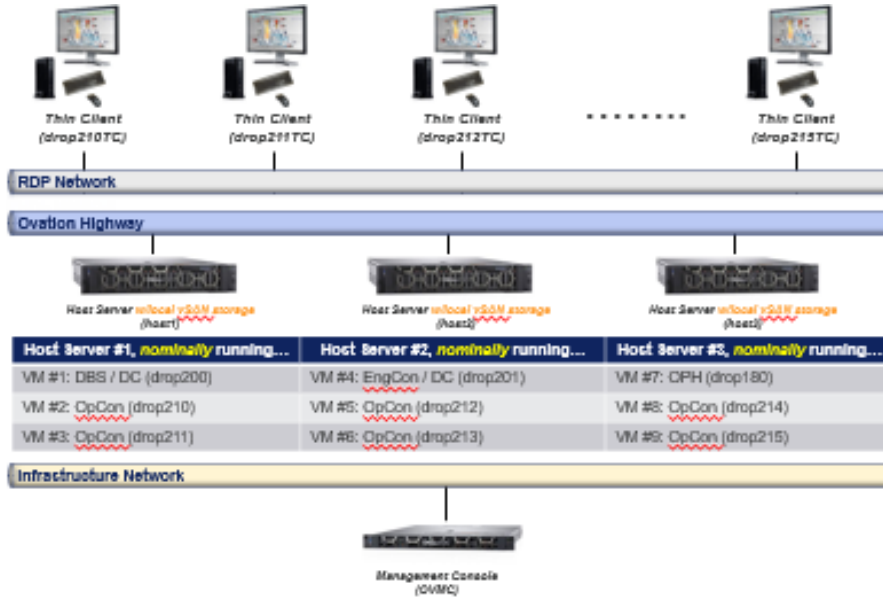

Figure 3. Hyperconverged Infrastructure (HCI) Virtualization system architecture with High Availability

High Availability system architecture – failures

With High Availability virtualization systems, in the event of a host failure, affected virtual machines automatically restart on a surviving host server within minutes of the failure. View an example of this situation in Figure 4, where physical host 1 experiences a failure.

If host 1 fails, the running virtual machines become unavailable for a short period of time. However, the affected virtual machines automatically restart within a few minutes on the two remaining host servers. The virtual machines initially running on physical hosts 2 and 3, the Controllers, and the I/O on the Ovation network continue running normally. (See Figure 5.)
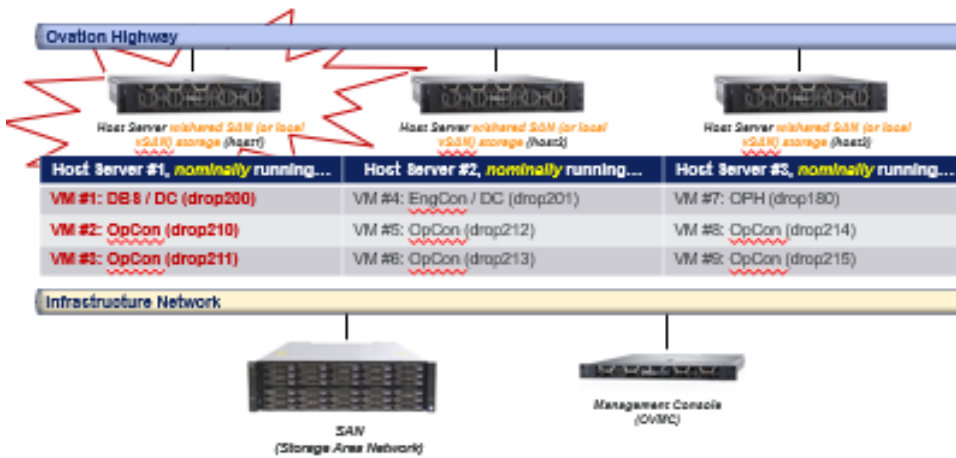

Figure 4. High Availability system architecture – Host Server 1 failure

If Host Server 1 fails, virtual machines reboot on one of the available hosts.
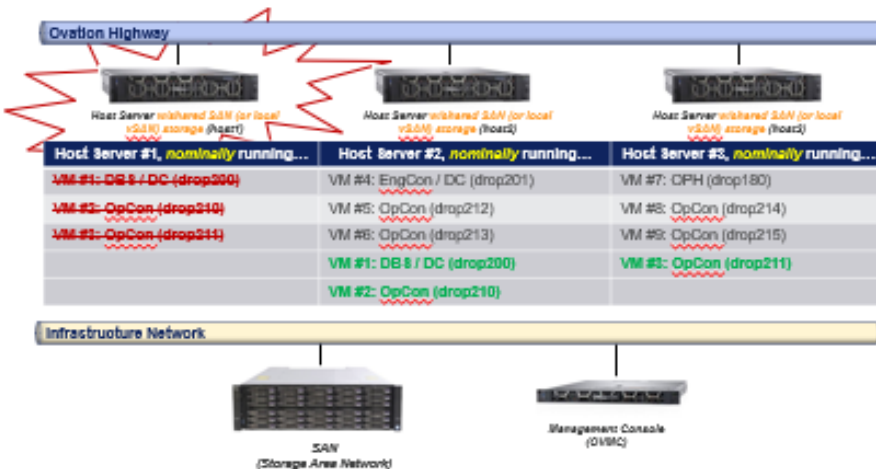

Figure 5. High Availability system architecture – Host Server 1 failure and virtual machine recovery

Implementation Options

With virtualization, Ovation components can run as virtual machines, greatly reducing the amount of hardware used on a typical system. Ovation virtualization solutions can be installed in a standard, secure configuration consisting of three host machines or optionally implemented with two host machines (for HCI only). The optional version allows smaller systems to run more efficiently and allows larger systems to save money and physical space.

The optional configuration utilizes VMware Workstation Pro to run a VMware specialized virtual machine to act as a third host that serves only to handle the fault tolerance voting mechanism and prevent "split-brain" situations. These situations occur when two nodes are deemed as primary instead of primary and backup. This configuration removes the need for an expensive 10 GB network switch as well as the licensing and hardware costs of a third host.

By utilizing two robust servers with additional hardware per server instead of the standard three, the optional configuration maintains redundancy while reducing overall system size and cost. Additional hardware includes an additional processor, more memory, and additional solid-state drives (SSDs) or hard disk drives (HDDs).
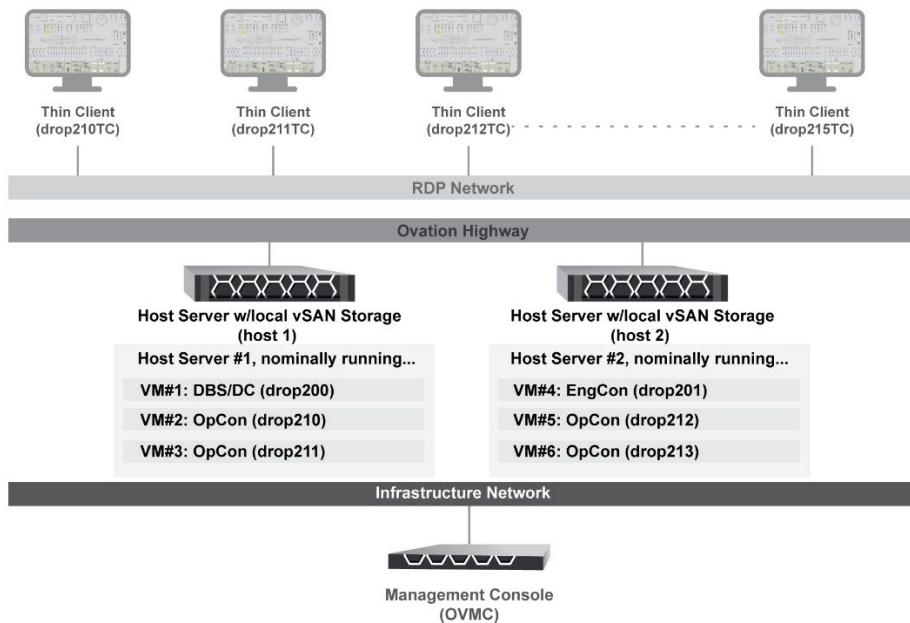

Figure 6. Optional configuration of Hyperconverged Infrastructure (HCI) Virtualization system architecture with High Availability

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Benefits

Increases flexibility and productivity

Virtualization offers simple setup and maintenance of multiple systems for control development, testing, and training.

Virtualization supports multiple systems with the same virtualization infrastructure.

Combining systems and functions results in cost-effective troubleshooting, easier modifications, upgrades to existing applications, and more productive operator training.

Fewer computers and control hardware needed

Virtualization consolidates workstations on a smaller quantity of host servers to reduce computer hardware, installation, maintenance costs, power consumption, and system footprint size.

Extends system life with simplified upgrades

Virtualization allows users to update Ovation hardware and software independently, which provides flexibility in system upgrades. Users can benefit from the latest software release versions while deferring hardware upgrades to an asynchronous schedule.

Increases availability and accessibility

Users can access Ovation workstations in a virtual environment from any thin client or Windows® PC with a remote desktop connection. No single failure causes the user to lose access to any of the workstations on the network because virtualization decouples the hardware from the software. This allows flexibility in deploying or viewing Ovation graphics within a site.

Licensing

Ovation systems implemented with virtualization require the same Ovation licenses necessary for a traditional physical system. Each virtual machine requires a license like any standard physical workstation.

Emerson virtualization systems can support either Microsoft Hyper-V products or VMware products. However, due to licensing restrictions, Emerson recommends the sole use of Hyper-V products.

Microsoft® Windows® Operating System (OS) licensing

The Ovation virtual machines require Microsoft Windows Server licenses, which include Hyper-V. Due to licensing restrictions, Emerson recommends using only Microsoft Server products for virtualization. These products are easier to license and are more cost-effective over the life of the control system.

Additional required licenses include Microsoft server Client Access Licenses (CALs) for device connections, Microsoft Remote Desktop Services CALs (RDS CALs) to support connections from thin clients to Windows-based virtual machines, and Microsoft Windows Datacenter to support the use of Microsoft Virtual SAN technology.

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VMware® product licensing

If using VMware, the Ovation virtual machines require VMware product licenses. The following VMware licenses are required for virtualization:

- VMware vCenter Server
- VMware ESXi™
- VMware vSAN™ (only required for HCI)

Virtualization requirements

Virtualization Software Required
▪ VMware vSphere® Standard*
▪ VMware vCenter® Server Foundation*
▪ VMware vSAN Standard*
* *Annual maintenance support also required*

Windows Software Required (recommended)
▪ Microsoft Windows Server (version depends on Ovation release level) *
▪ Microsoft Client Access License
▪ Microsoft Remote Desktop Service Client Access License
* *Includes Microsoft Hyper-V*