Using Integrated Lights-Out in a VMware ESX environment

2nd Edition

Technology Brief

Abstract

This technology brief describes how Integrated Lights-Out 2 (iLO 2) and Integrated Lights-Out 3 (iLO 3) work in a VMware ESX virtualized environment. It discusses how iLO provides new ways to work within a virtualized environment, as well as conditions in which iLO may not behave as expected. We assume that you are familiar with both iLO and VMware technologies.

iLO architecture in a virtualized environment

The iLO management processor gives you advanced management and control over your servers. VMware technology lets you run multiple virtual servers on one physical server. VMware adds an extra management layer (the VMware virtualization layer) between iLO's server management and the actual data center workload on a virtual machine (VM). Figure 1 shows that while iLO interacts with the VMware virtualization layer, it does not interact directly with the operating systems and applications running in the guest VM.

Figure 1. Architectural diagram of the VMware virtualization layer and ILO
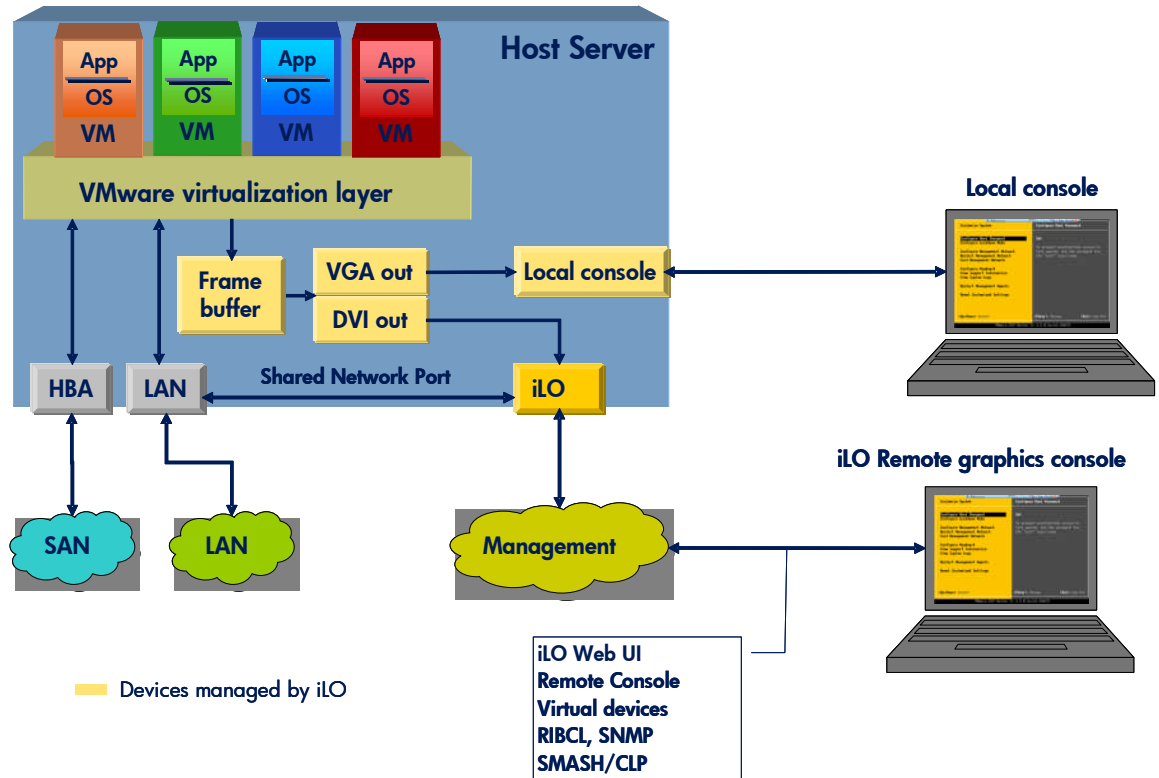
The benefits of iLO in a virtualized environment

iLO provides many of the same benefits in a virtualized environment as it does in non-virtualized environments. In a virtualized environment, managing the virtual machine host is even more critical because many workloads depend upon a single host server. iLO gives the host additional capabilities that virtual machine management software cannot provide. For example, when a host experiences a fault, or is offline, iLO can provide access to the server. VMware's vCenter Server cannot manage those situations.

iLO's role in a VMware environment is to manage the physical host, not the VMs on the host. For example, when iLO manages system power, it is managing the physical host, not the VMs.

Integrated Remote Console

iLO uses the client-based Integrated Remote Console (IRC) as the primary interface to access a server remotely. IRC offers a high-performance remote console interface for Windows clients, combining KVM, Virtual Power, Virtual Media, and record/playback functions. The IRC option for iLO 2 is an ActiveX control that runs within Microsoft Internet Explorer. For iLO 3, the control also runs in the browser and requires the .NET framework version 3.5 (Service Pack 1 is recommended).

Known issues

The iLO IRC mirrors the contents of the local display; the text-based VMware ESX management console. iLO Integrated Remote Console users cannot see any of the guest VMs. To manage VMware guests, you must employ the VMware Virtual Infrastructure Client (VI Client).

Virtual media devices

The iLO Virtual Media capability lets you mount remote media and present it to an ESX host as locally connected media. This includes floppy, CD/DVD-ROM, and ISO images. Virtual Media can provide the host with a boot image, which is useful for installations.

Mount virtual media in one of several ways:

- Using IRC, the virtual media image must be accessible on the client and is only mounted as long as the IRC console is activated.
- Using Remote Insight Board Command Language (RIBCL) scripting, users may also mount a virtual media image from any accessible web server, which does not require an active IRC client.
- A virtual media image may also be mounted with the CLI/CLP.

Using the iLO graphical web interface

Select **Virtual Media** on the Virtual Devices tab. An applet loads in support of the Virtual Floppy or Virtual CD/DVD-ROM device.

Using virtual devices

All virtual media devices add the same functionality to a VMware ESX host that they do in a non-virtualized environment. However, mounting media on a host does not automatically mean the guest VMs can see the media. You can configure VMs to see some types of iLO virtual devices by using VMware's ability to mount host devices.

Virtual CD/DVD-ROM

VMware lets you mount the ESX host's CD/DVD-ROM drive in multiple guests simultaneously. Using iLO's virtual CD/DVD-ROM feature, you can mount a virtual device to the ESX host. Then using VI Client, you can present the iLO virtual CD/DVD-ROM image to multiple guests. The virtual CD/DVD-ROM may be a physical device on your local PC or an ISO image. Note that VI Client can also mount media in a similar way. iLO gives you an alternative access method.

A unique capability of iLO Virtual CD/DVD-ROM is that it lets you provision ESX on a bare-metal server remotely.

Because virtual media is not as fast as physical media, mounting the same virtual media image to multiple VMs will depend on host system resources, the media access patterns of the VMs, and

network performance. HP has tested a virtual CD or DVD-ROM image with up to five simultaneous VMs for media-intensive activity such as an operating system install.

Virtual floppy

iLO lets you mount a virtual floppy drive to the ESX host. However, mounting this floppy to a guest VM is not supported.

Virtual folder

iLO lets you mount a local folder as a virtual USB mass storage device using Virtual Media. The Virtual Folder feature is only available within the IRC. The virtual folder is non-bootable, read-only, and the mounted folder is static. Changes to the client file are not replicated in the mounted folder. The virtual folder feature lets you access, browse, and transfer files from a client to a managed server. The virtual folder supports mounting a directory on a local or networked directory that is accessible through the client.

Even though you can mount a virtual folder to the ESX host, VMware does not currently support mounting that host's USB mass storage device into a guest.

Virtual serial port

The iLO Virtual Serial Port (VSP) function emulates a physical serial port to the ESX host and provides remote access to the ESX serial-accessible console. To do this, you need to enable VSP in the ProLiant RBSU. Currently, mounting the VSP to a VM guest is not supported.

NOTE:
While the VI Client can map and access iLO's Virtual Folder and iLO VSP features associated with VMs, the VMs are not aware of and do not have access to these iLO capabilities.

Known issues

By default the VMware ESX 4.1 host console does not provide access to USB devices. However, a host can claim access to USB devices from the virtual machines. Listed below are procedures to claim and un-claim USB devices.

Steps for the ESX 4.1 vmkernel to claim USB devices:

- Only perform these steps after a fresh install of ESX or the first time boot from visor
- Execute the command: /etc/init.d/usbarbitrator stop
- Insert USB storage device, and conduct storage operation
- Verify results with commands: esxcfg-scsidevs -l or fdisk

Steps for the ESX 4.1 vmkernel to unclaim USB devices:

- Re-Start the usbarbitrator service: /etc/init.d/usbarbitrator

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NOTE:
At this point all USB devices configured for pass thru will disconnect from the VMs and the host will be in an inconsistent state.
- Restart host or ESX server.
- Remap all USB pass through devices.

Using the Virtual Power Button with VMware

The Virtual Power Button controls power for the physical host server, not the guest VMs. The Virtual Power Button duplicates the power button on the front panel of your physical server. Turning a host off in this manner will disable all active guest VMs. Therefore, you should use the virtual power button judiciously. We recommend that you shut down hosts within VI Client before using the virtual power button. From within VI Client, users can place the host in maintenance mode. If the host is in a cluster with Distributed Resource Scheduler (DRS) enabled, the VMs will automatically migrate to the other hosts in the cluster using VMotion. Shutdown the VMs manually or use VMotion if the host is not in a cluster or DRS is not enabled before the maintenance mode operation can complete. Once the host is in maintenance mode, users may safely use the virtual power button to turn off or reboot the host.

Power monitoring, Power Regulator, and Dynamic Power Capping

iLO enables several features to perform advanced power management on a host server. This includes monitoring power use, capping power use, and improving host CPU efficiency.

VMware's DRS and Distributed Power Manager (DPM) products continuously monitor CPU use across host pools and optimize workloads on hosts. VMs may move from busy hosts to idle hosts. VMware VMotion is needed to implement VMware DRS. VMware DRS (with DPM) is included in VMware Infrastructure Enterprise edition.

DRS and DPM make workloads more energy-efficient, but they must be properly configured to work efficiently with iLO.

Power monitoring on the host

iLO lets you graphically view host power use. The iLO Power Meter readings page displays server power utilization as a graph. To access Power Meter readings, select Power Management, and click Power Meter. The Power Meter readings page has two sections: Power Meter readings and 24-hour history. VM guest workload and host functions such as ESX workload migration can affect power consumption.

Using HP Power Regulator with VMware DRS

When the host is running lower utilization workloads, HP Power Regulator manages the CPU speed and voltage to save power. By default, the Power Regulator on the host server is in 'Dynamic' mode, which automatically manages CPU states to save power. However, this setting can result in incorrect measurement of CPU utilization by VMware ESX, which can affect DRS algorithms.

Currently, we recommend that you set the Power Regulator to "OS Control" mode when running VMware ESX. In OS Control mode, processors will run at their maximum power/performance state at all times unless the OS enables a power management policy. A virtualized server is more likely to be highly utilized with multiple VMs, especially if using VMotion and DRS, which actively balance workloads. In this environment, it is better for administrators to configure Power Regulator in OS Control mode and allow DRS to manage the workloads and CPU efficiency.

Using HP Dynamic Power Capping with VMware DRS and DPM

HP Dynamic Power Capping may be used to keep a host from exceeding a user-configured power budget. This can cause a host to slow processing to stay within a power budget. Like HP Power Regulator, this slow-down can cause VMware ESX to measure actual CPU utilization incorrectly if the power cap is set too low. This incorrect measurement of CPU utilization can cause DRS to make poor workload placement decisions.

We recommend that you set the power cap to the maximum measured value or the maximum value recommended by the HP Power Advisor. This configuration does not constrain performance or distort workload decisions yet ensures that power does not exceed a budget. The HP Power Advisor for HP ProLiant DL, ML, and BL servers is available at this URL:
http://h71028.www7.hp.com/enterprise/cache/600307-0-0-0-121.html

Host Server Management

iLO gives you remote server management regardless of the OS in use. As previously noted, iLO manages the physical host in a VMware environment, not the guest VMs. Unless otherwise noted; all management functions remain unchanged in a VMware environment.

Remote Insight Board Command Language

RIBCL lets you create scripts to manage user accounts and to configure settings. These are XML commands common to most Lights-Out Management products. Sample scripts for all iLO commands are available for download from the iLO website "Sample scripts" link: www.hp.com/go/ilo.

RIBCL remains fully functional in a VMware environment. This lets you use RIBCL scripting together with VI Client to mount a virtual media image to guest VMs.

Simple Network Management Protocol (SNMP)

You can configure iLO for proactive management by allowing SNMP trap delivery to HP SIM. You can configure up to three TCP/IP addresses to receive SNMP alerts. Typically, you configure one address to be the same as the TCP/IP address of the HP SIM server console, while the others can be backup monitoring consoles.

This lets HP Insight Management agents running on the VMware ESX console send SNMP traps to HP SIM. iLO acts as a pass-thru for these traps. The agent generates the trap, hands it off to iLO, which transmits the trap on the iLO management network link to HP-SIM or another SNMP-aware monitor.

System health status

The system health status represents the host server's internal health indicator, if supported by the server hardware. It summarizes problems with fans, temperature sensors, and other monitored subsystems in the server. Again, this is applicable to the host only, not the VM guests.

Shared Network Port

The iLO Shared Network Port (SNP) feature lets you access iLO using a physical network connection shared with the ESX host. The ProLiant server SNP implements a sideband connection between the main NIC and iLO. This sideband connection maintains a second (and separate) MAC address. Thus, iLO and the server's NIC each have their own separate MAC and IP addresses.

Known issues

Because iLO is active even when the host server is powered down, some situations can cause a loss of connectivity to iLO when the host power state changes. In particular, some switch configurations can change link states when the host powers off due to interactions between the host NIC and the switch port. Because iLO is dependent upon the same physical link, these changes can affect iLO.

Embedded health

The iLO "System Information" tab displays the system's health; in this instance that is the host server running VMware ESX, not the guest VMs. Many of the features necessary to operate and manage components of the HP ProLiant server have moved from the health driver to the iLO management processor. These features are available without installing and loading the health driver for the installed OS. iLO monitors these devices when the server is powered on during server boot, OS initialization, and operation. Monitoring continues through any unexpected OS failure.

The Health System Summary displays the state of monitored host-platform subsystems at a glance, including overall subsystem status and subsystem component redundancy. The subsystems can include fans, temperature sensors, power supplies, processors, memory, and NICs.

The embedded health capabilities perform correctly in a VMware environment. However, recognize that iLO is monitoring physical characteristics of the host, not the guest VMs.

Insight Control for VMware

Insight Control for VMware vCenter (IC4VC) provides in-context access to HP iLO functionality. If either HP SIM or VMware Distributed Power Management (or both) are configured with iLO access information, IC4VC obtains its data from these sources.

The VMware vCenter administrator can set up iLO credentials for an individual ESX host system by using information obtained from the IC4VC configuration and properties pages.

Once the VMware vCenter administrator configures the ESX host to iLO mapping with correct credentials, IC4VC begins collecting data including system health, configuration information, integrated management log, and system logs from iLO and presents this information in-context to a vSphere client for the given ESX host.

In addition, IC4VC provides direct launch links from a vSphere client to iLO web administration and remote console allowing the VMware vCenter administrator to launch directly into iLO pages without prompting for login credentials.

For HP BladeSystem servers, IC4VC utilizes iLO to identify the chassis' Onboard Administrator, leading to simplified setup and manageability. Refer to the "HP Insight Control VMware vCenter User Guide"
http://h20000.www2.hp.com/bc/docs/support/SupportManual/c02030875/c02030875.pdf for details.

Summary

With few noted exceptions, iLO is fully functional in a virtualized environment. Access to critical management functions and health information on the host server continue to be available in a virtualized environment through iLO and the VI Client.

It is important to understand that iLO manages and monitors the physical host server in a VMware environment, not the guest VMs. While all status indicators and actions apply only to the host, those indicators and actions can significantly affect all guests VMs operating on the host server.

For more information

For additional information, refer to the resources listed below.

Resource description	Web address
ProLiant server VMware support matrix	http://h71028.www7.hp.com/enterprise/cache/505363-0-0-0-121.html
HP Integrated Lights-Out 2 User Guide for Firmware 1.75 and 1.77	http://h20000.www2.hp.com/bc/docs/support/SupportManual/c00553302/c00553302.pdf
HP ProLiant Integrated Lights-Out 3 v 1.00 User Guide	http://bizsupport1.austin.hp.com/bc/docs/support/SupportManual/c02063196/c02063196.pdf
Insight Control for VMware vCenter User Guide	http://h20000.www2.hp.com/bc/docs/support/SupportManual/c02030875/c02030875.pdf
iLO product page	www.hp.com/go/ilo
HP Integrated Lights-Out Management Processor Scripting and Command Line Resource Guide for HP Integrated Lights-Out versions 1.82 and 1.91 and HP Integrated Lights-Out 2 versions 1.1x, 1.2x, 1.3x, 1.70, 1.75, and 1.77	http://h20000.www2.hp.com/bc/docs/support/SupportManual/c00294268/c00294268.pdf
HP ProLiant Integrated Lights-Out 3 v 1.00 Scripting and Command Line Guide for HP ProLiant Integrated Lights-Out 3 version 1.00	http://bizsupport2.austin.hp.com/bc/docs/support/SupportManual/c02063192/c02063192.pdf

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