

HP iLO Federation



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Introduction

Two common tasks that enterprise data center administrators face is the ability to quickly deploy new bare-metal servers, and efficiently update firmware and software on these same servers. The amount of time required to perform these tasks, especially in large data centers, can be lengthy.

To help address customer challenges HP is introducing iLO Federation, a new enabling technology that will lead to significantly faster performance, greater scalability, and simpler operation across all facets of server management. For example, essential server management tools such as HP Smart Update Manager (HP SUM), once enabled by iLO Federation, will see dramatic increases in tool performance. In the future, other management products such as HP Insight Cluster Management Utility (CMU) and HP OneView will also deliver significant improvements in speed, scale, and simplicity of use.

This white paper introduces the reader to iLO Federation, the underlying technologies, and the core set of capabilities available today. In addition, this document looks at how iLO Federation continues to make HP Servers the best managed in the industry.

Managing large IT infrastructures with a traditional model

Today's enterprise IT infrastructure administrators face management problems directly related to scale-out environments that continue to be managed with existing tools not designed for these environments. These problems include how to communicate with 1000s of servers in order to discover, modify, and migrate these systems in a timely manner, using server data that is current and relevant. Typical management environments are based on outdated hierarchical models and present a single point of failure.

Monitoring and managing server status in large data center environments with traditional methods, such as the use of 'hosts' files¹ or ping sweeps (using direct interrogation)², require too much time. Server status information can be inaccurate by the time it's reported. Ping sweep approaches to iLO discovery and software updates require one to two minutes per server. This mean that in large server farms essential management tasks can take days. In addition, direct interrogation is used to discover additional devices which might not be on the same subnet. These conditions allow many existing solutions to cross network boundaries. This IT infrastructure discovery solution doesn't scale well.

Administrators have typically managed large infrastructures by using scripts and a Dynamic Host Configuration Protocol (DHCP). Current approaches also use trust systems that typically employ back doors or impose the burden of a public key infrastructure (PKI) to configure secure communication. These approaches are limited in their ability to scale and deployment complexity. iLO Federation eliminates the need for adjusting scripts during server migration and data center re-architecture efforts. It also removes reliance on tools for external communication.

Until now, iLO operated in a one-to-one approach, meaning that you could only look at one iLO at a time. HP iLO Federation is a fully distributed³ method for performing discovery of multiple systems, self-organizing those systems into groups, establishing trust, and securely communicating between systems. It uses the industry standard multicast approach and provides multicast methods, allowing other systems to discover iLOs. iLO Federation also standardizes several fields within the protocol so that a ping sweep approach is still possible, and adds extra information to support direct interrogation of responders. These core technologies provide reliability and interoperability, and include the following capabilities:

- On System intelligence – Robust scalability, self-healing⁴, and no single point of failure
- Real-time self-discovery – With multicast discovery of any bare metal server, iLOs can be discovered once the server receives auxiliary power
- Group membership – iLOs can be configured with federation settings and configured to be a member of a group. iLOs that are members of the same group will discover each other on the network, and begin reporting data/distributing commands
- Security - HP iLO Federation uses shared key encryption to implement trust requirements and ensure high levels of security.

To get a better idea how to use some of these capabilities, see the "[HP iLO Federation features](#)" section later in this document.

¹ A manual alternative that is less attractive than the automated user-friendly iLO Federation

² A protocol for detecting Multi-Protocol Label Switched (MPLS) data plane failures

³ A peer-to-peer management system, in which the iLOs communicate with each other and share the workload of managing all the systems. The closest iLO neighbors is identified as a peer. The local iLO identifies its peers through multicast discovery.

⁴ The ability of the group to tolerate network and device failures. Failed peer-to-peer relationships will be dropped and re-formed when devices recover.

HP iLO Federation structure

HP iLO Federation collects data by sending a query over the network to other server iLOs, and ultimately receives data returns for all of them. It does not poll for or store data. Each federated query performs a data collection. These queries are typically triggered by user actions on an iLO Federation page in the iLO web interface. When a user loads the page, it submits a federated query to collect the page data to iLO. iLO Federation then collects the data by sending the query over the network to other iLOs, and ultimately returns the data for all of them.

Groups

With HP iLO Federation, you can assign trust using arbitrary and automatic groupings. This enables you to see your datacenter logically, by rack, by row, by hardware type, or even by application when only a few servers need to be found quickly within hundreds of servers. Each group may contain any given number of iLOs and the same iLO may be included within up to ten groups. Groups may also overlap automatically, divide, and rejoin. Groups and keys also have these attributes:

- Each iLO list of groups and keys can be discovered automatically
- A group name and key allows an iLO to discover, and encrypt, and sign messages to other iLOs in the same group
- Groups can span racks, datacenters, and server-type
- Configure groups using the iLO web interface or RIBCL scripting

When iLO systems are in the same HP iLO Federation group, you can use the iLO web interface and other management tools from one system to manage all of the systems in the group. You can group systems together to create manageable sets of systems saving time and company resources. The settings on the Group Configuration page within the iLO UI apply to the local iLO system only. You must configure these settings separately on every iLO system using HP iLO Federation. For more information on how to configure and setup iLO Federation groupings please refer the iLO Federation User Guide at: hp.com/support/ilo4_federation Ug_en

If you use HP iLO Federation groups in two separate datacenters, the iLOs will collaborate if your network is set up to forward the multicast traffic. HP iLO Federation has the capability to set up and support groups that span geographies.

Network impact and security

Network traffic calculations for Multicast include the following elements:

- The time between each multicast announcements is configurable within iLO UI.
- Network traffic for a query is the SSL handshake and payload is about 2.5KB of data per iLO.
- Doubling the size of the network only adds one peer to each iLO
- Each multicast announcement is around 300 bytes. For 100,000 devices, announcing every 10 minutes, we calculated 1142 Kbps of network traffic. For a network with 100,000 servers on it should be capable of a LOT more. This is less than 0.1% of their network load capability.⁵

Addressing security concerns

The following measures ensure network security:

- No data is placed within the multicast packet only the iLO name and group membership information. This is purely used for iLOs to locate one another and nothing is publically available.
- The protocol used is Universal Plug and Play (UPnP) based on Simple Server Discovery Protocol (SSDP).
- Other vendors typically tend to provide other devices to perform a service like a media player for example which are not authenticated. iLO doesn't provide any services so nothing needs to be protected.
- The information passed from iLO to iLO is accomplished through Unicast and has 128 bit or higher encryption (depending on the AES/3DES switch setting)
- HP recommends that users employ good password practices when configuring a federation group key and in maintaining those passwords.

Multicast

Efficient and intelligent use of bandwidth is particularly important with respect to large scale server management. Bandwidth usage is also critical in relation to the surge of one-to-many or many-to-many communication-based applications. Multicast helps to fulfill the requirement of such bandwidth-intensive applications with its inherent ability to

⁵ Per HP Internal testing

replicate a single stream when and where necessary. Applications across industries such as finance, enterprise, content-provider, entertainment, education, Internet service providers, and surveillance companies use multicasting to optimize resources.

HP iLO Federation multicast incorporates many improvements, including IPv6 Multicast Listener Discovery (MLD) protocol. An industry-standard Simple Service Discovery Protocol (SSDP) provides the basis for multicasting in this environment. The same protocol is used for Universal Plug and Play (UPnP) and Web Services Dynamic Discovery (WS-Discovery). Network administrators are in control of tuning and configuration options. iLO Federation uses multicast to:

- Send network packets with a special destination address.
- Use switches on the network to forward copies of the packet to every device that is listening for it.
- Perform neighbor discovery so that one iLO can locate its neighbors automatically.

Multicast network requirements

Network switches have to allow for the discovery of bare-metal servers. When you use iLO Federation, note the following network requirements:

- If the switches in your network include the option to enable or disable multicast traffic, ensure that multicast traffic is enabled. This is required for iLO Federation and other HP products to discover the iLOs on the network.
- For iLOs that are separated by Layer 3 switches, you must configure the switches to forward SSDP multicast traffic between networks.

Configuring the multicast options

You must configure the multicast options for each iLO system that will be added to an iLO Federation group. Consult the iLO Federation procedure to configure multicast options for one iLO system at a time. For more information on how to configure multicast for iLO Federation please refer the iLO Federation User Guide at: hp.com/support/ilo4_federation_uq_en

Customer feedback

HP understands that the implementation of multicast may be disruptive to your customers, however as we spoke to multiple customers, we found that larger financial industries are supportive of the technology and some have even incorporated this methodology into their business today.

You can provide encouragement for customers who are reluctant to enable these capabilities on their production network. Reassure these customers that, when they have segregated their iLO connections onto a separate management network, enabling these network features on the management network will not affect the production network.

Note

You can use RIBCL XML scripts to complete this procedure for a batch of iLO systems. For more information, see the HP iLO 4 Scripting and Command Line Guide at: hp.com/go/ilo/docs

HP iLO Federation features

The “iLO Federation” selection has been added to the top-level of the iLO web-based UI navigation. Once you select iLO Federation, you’ll see the options displayed in Figure 1.

Figure 1.

The screenshot shows the HP iLO 4 ProLiant DL380p Gen8 web interface. On the left is a navigation menu with categories: Information, iLO Federation (highlighted with a blue box), Remote Console, Virtual Media, Power Management, Network, Remote Support, and Administration. The iLO Federation sub-menu includes: Multi-System View, Multi-System Map, Group Virtual Media, Group Power, Group Power Settings, Group Firmware Update, and Group Configuration. The main content area is titled 'iLO Overview' and contains an 'Information' table and an 'Active Sessions' section.

Information	
Server Name	WIN-EO3P9ADFD1J
Product Name	ProLiant DL380p Gen8
UUID	31323436-3730-3936-3131-333034393631
Server Serial Number	691130496101
Product ID	642107-001
System ROM	P70 08/26/2013
Backup System ROM	08/26/2013
Integrated Remote Console	.NET Java
License Type	iLO 4 Advanced
iLO Firmware Version	1.40 Jan 14 2014
IP Address	16.110.181.232
Link-Local IPv6 Address	FE80::6631:50FF:FE49:CB2
iLO Hostname	jy-ilo4380.americas.hpqcorp.net

Active Sessions

User:
Local User: doug

Support for SSH CLI for iLO Federation operations will follow the first release of iLO with iLO Federation (iLO 4 1.40). Until then, you can use the fully-featured iLO UI. However, RIBCL scripting is available for iLO Federation group configuration and viewing (see iLO Sample scripts v4.30). More integration of advanced scripting tools will be supported in future iLO releases.

iLO Federation first release features include the following:

- Multi-System View – The Multi-System View page displays Health status summary and product summary of all servers within an iLO Federation group.
- Multi-System Map – The Multi-System Map page displays information about the iLO systems in a selected group. It is useful for troubleshooting errors generated in the federation group and debugging purposes.
- Group Virtual Media – The Group Virtual Media feature enables you to connect a virtual CD/DVD or USB Key/Floppy image to all of the servers in an iLO Federation group.
- Group Power – The Group Power feature displays power status summary and enables you to manage the power of multiple servers within an iLO Federation Group.
- Group Power Setting – Display power usage summary and configure HP Automatic Group Power Capping for multiple servers within an iLO Federation group.
- Group Firmware Update – The Group Firmware Update feature displays a system firmware summary and allows you to update the firmware of multiple servers within an iLO Federation group.
- Group Configuration – Allows you to update the firmware of multiple servers from a system running the iLO web interface. You can Add, Delete, and Modify Federation group memberships for this iLO, configure multicast settings, enable or disable the iLO Federation feature.

Multi-System View

Using the Multi-System View you can browse one system for a health update of the entire datacenter, as well as review individual server health and model information. Administrators who need to view the health status of numerous systems at once can now browse one iLO via the Multi-System view and from one server pull the health of all servers within the datacenter, regardless of the number of servers and receive a live update. The Multi-System map page shows the other iLOs with which this iLO will directly communicate, and indicate the error status and availability of these devices, which can help in determining the cause of errors. For example, to view summary information for a configured group of servers, select a group from the “Selected Group” menu and view information.

The Multi-System screen provides the following information for the servers in the selected group:

- Health – The number of servers in each listed health status; the percentage of the total number of servers that is in the listed health status is also displayed. The health status value can be clicked to select a subset of systems matching that health status.
- Model – The list of servers, grouped by HP ProLiant Gen8 model number; the percentage of the total number of servers for each model number is also displayed. The model number can be clicked to select a subset of systems matching that model.
- Critical and Degraded Systems – The list of servers with a “Critical” or “Degraded” status; the list can be paged by clicking “Next” and “Prev” to display all of the servers. The name of a server can be clicked to select the named server.

In case of server failures which affect the System Health status, iLO Federation allows you to retrieve the list of servers which are failed/degraded in the iLO Federation group. This avoids the overhead of examining individual servers to determine the health status.

Group Virtual Media

The Group Virtual Media feature lets you deploy a single Operating System image to numerous servers at once by connecting a virtual CD/DVD or USB Key/Floppy image that can be accessed by the servers in an iLO Federation Management group. Where there is a requirement for mass deployment of an operating system, the traditional one to one media installation consumes a tremendous amount of time and manual efforts. Using Group Virtual Media, a single Operating System image can be deployed over 1000s of servers which saves time and effort to maximum extent.

Before you use the iLO Virtual Media feature, review the operating system considerations in the HP iLO User Guide.

Group Virtual Power

The Group Power feature lets you manage the power of a large number of servers from a system running the iLO web interface. Group Power management using iLO Federation saves time when managing power on a large number of servers. In certain cases where a server reset is required after a software update, it becomes possible to perform the reset from a single Web UI.

This feature allows you to do the following:

- Power off, reset, or power cycle a group of servers that are in the ON or Reset state.
- Power on a group of servers that are OFF.
- View the list of servers that will be affected by a Virtual Power Button push.

If you want to use the Group Power feature, ensure that each member of the group has granted the Virtual Power and Reset privilege to the group.

Group Power Settings

HP iLO Federation allows you to automatically adjust power on numerous systems at once by configuring HP Automatic Group Power Capping for your server groups. There are environments where power is limited, and you need to ensure limited power consumption. Automatic Group Power capping can be used in datacenters where less computing power may be required at a certain period of time over a day to ensure less power consumption by setting a desired power cap. The capping capabilities will dynamically adjust based on power usage and settings.

When using HP Automatic Group Power Capping, you can perform the following actions:

- The power caps that you set for a group operate concurrently with the power caps that you can set on the Power Settings page for an individual server.
- When a power cap is set, the average power reading of the grouped servers must be at or below the power cap value.

- If you want to configure HP Automatic Group Power Capping settings for an HP iLO Federation group, ensure that each member of the group has granted the “Configure iLO Settings” privilege to the group.
- When a Group Power Cap is set, the grouped systems share power in order to stay below the power cap. More power is allocated to busy servers and less power is allocated to servers that are idle.
- When the server is configured for both a local power cap and the Group Power Cap, server will be capped with the lower value among these two.

You cannot use the iLO web interface to configure group power capping settings for SL servers. Use one of the following tools to configure the power capping settings for SL servers:

- Power Interface Control Utility — This utility is available at the following website: hp.com/bizsupport/TechSupport/SoftwareDescription.jsp?prodTypeId=15351&prodSeriesId=4324034&swItem=MTXb0c48d305d24a4dbe80e5eccc&prodNameId=5037746.
- HP ProLiant SL Advanced Power Manager — For more information, see the HP ProLiant SL Advanced Power Manager User Guide at: hp.com/bc/docs/support/SupportManual/c02018322/c02018322.pdf

Group Firmware Update

The Group Firmware Update feature lets you update iLO firmware on numerous servers from a system running the iLO web interface. Updating firmware on individual servers becomes tedious and time consuming when there are 100s or 1000s of servers on the network. While HP Smart Update is the HP recommended utility to update all firmware and drivers, in certain cases, new iLO firmware or server ROM firmware updates are required to address issues or to implement enhancements. Group Firmware Management allows the Administrator to update the firmware on this large number of servers with less effort.

This currently available feature allows you to do the following:

- View the number of servers with each firmware version.
- View the flash status for the grouped servers.
- View the Trusted Platform Module (TPM) Option ROM Measuring status for the grouped servers.
- View the list of servers that will be affected by a firmware update.
- If you want to use the Group Firmware Update feature with an HP iLO Federation Management group, ensure that each member of the group has granted the “Configure iLO Settings” privilege to the group.

The following firmware types are supported:

- HP iLO
- HP ProLiant System ROM
- HP SL Chassis Firmware
- System Programmable Logic Device

HP Smart Update Manager and HP Service Pack for ProLiant

HP Smart Update Manager (HP SUM) is an innovative tool for firmware and driver maintenance on HP ProLiant and Integrity Servers.

HP SUM 6.3.0 and later takes advantage of the iLO Federation discovery feature to view information about servers in an iLO Federation Group. Over time, further integration with iLO Federation will allow discovery and updating of supported devices.

For more information about using the iLO Federation Management features with HP SUM, see the HP SUM User Guide at: hp.com/go/hpsum

All drivers, including iLO drivers, are available in the SPP as well as from the HP Support Center (HP SC). Supported OSes in the SPP are Microsoft® Windows®, Red Hat®, SLES, and VMware vSphere 5.x.

To install, download the SPP from hp.com/go/spp/download or used the standard HP repository, the HP Support Center.

For information about using the SPP, see the SPP documentation at hp.com/go/spp.

Licensing

HP iLO Federation real-time Discovery, Group Configuration, and Health Status standard features allow for data queries without a license. HP iLO Federation Management (Group Power, Group Power Capping, Group Virtual Media, and Group Firmware Updates) requires an HP iLO Advanced license or HP iLO Scale-Out license in order to manage servers in defined groups. For more information on licensing details please refer to the HP internal document [HP Integrated Light-Out Licensing Guide](#).

Summary

HP iLO Federation is an innovation for HP server infrastructures requiring scalable and efficient server management in enterprise environments. It allows you to unify the system management of thousands of servers, regardless of location, from only one system saving time, driving efficiencies, and enhancing the true value of the HP ProLiant servers.

HP iLO Federation is compatible with ProLiant Gen8 BL and DL, ML, SL, and MicroServers.

HP Restricted

Resources

HP iLO Management
hp.com/go/ilo

HP iLO documentation
hp.com/go/ilo/docs

HP SUM
hp.com/go/SmartUpdate

HP SPP
hp.com/go/spp

HP Intelligent Provisioning
hp.com/go/intelligentprovisioning


Intelligent Provisioning and STK Downloads
hp.com/us/en/enterprise/servers/management/ilo/index.aspx#tab=TAB5

HP ProLiant Gen8 Server Management
hp.com/go/proliantgen8/docs

Industry Standard Server Technology Papers
hp.com/servers/technology

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