SIMPLIFYING IT MANAGEMENT WITH CISCO UCS DIRECTOR
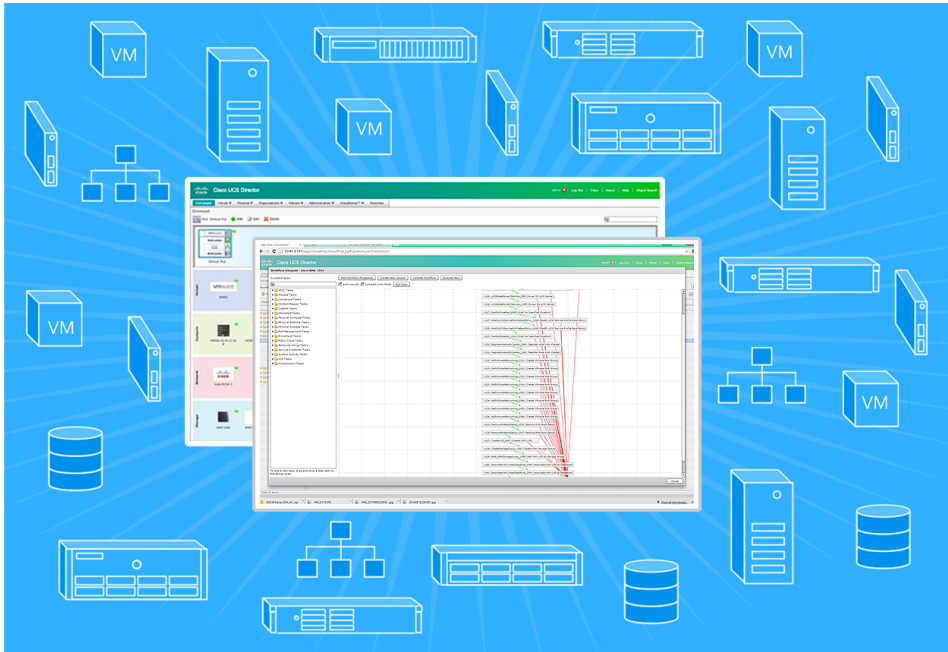
Faster, simpler management of a mixed data center with Cisco® UCSD®

UCSD reduced:

the risk of user error by automating common data center tasks

the complexity of operations by consolidating resources to a single interface

the deployment of an entire virtual infrastructure including 100 VMs to four easy steps

in our hands-on testing

Today's enterprise data center often comprises a disparate assemblage of multi-vendor compute, network, and storage equipment that has accrued over the years. Deploying resources and applications in this kind of heterogeneous environment can be challenging. IT must maintain a variety of vendor-specific management tools and the in-house SMEs (subject matter experts) who know how to use them. This manual approach to operations is an inefficient prospect that can lead to losses in productivity and unwanted expenses.

Cisco UCS Director (UCSD) is an integrated management tool that solves these challenges by providing a single interface to manage multi-vendor resources and automates many tasks common to IT administrators. By automating OS and switch deployment and configuration, clustered infrastructure creation, storage resource zoning, VM deployment, and more, Cisco UCSD can reduce both the risk of human error and free up your SMEs for strategic tasks.

To put the value of automation in a heterogeneous environment into perspective, consider that using Cisco UCSD, we were able to deploy an entire VMware environment including 100 VMs with only four easy steps. Performing a deployment of this size and complexity without Cisco UCSD would likely require multiple mid-level engineers using a suite of tools, operating in a designated maintenance window.

THE CHALLENGES FACING IT ADMINISTRATORS

With Cisco UCS Director, your IT management can become more consistent and efficient by replacing the time-consuming process of manually provisioning and de-provisioning data center resources with automated workflows.

If you were to set out today to build an enterprise-class data center from the ground up, it would likely be a uniform environment that was efficient, thoroughly documented, and fully compliant with all licensing, security, and regulatory requirements.

Most data centers in the real world don't resemble this description. Equipment has accrued over time, and includes a wide range of compute, storage, and networking devices. Each device has its own management interface or proprietary tool requiring some sort of authentication and software dependencies unique to the platform. Keeping track of these disparate devices can be confusing and can monopolize a great deal of an IT administrator's time. Some management tools require dedicated hardware that increases server sprawl and require outdated software that can introduce security vulnerabilities.

In many organizations, groups outside the official IT bailiwick work around these challenges by setting up their own IT operations. Unfortunately, this shadow or stealth IT can be a source of inefficiency and vulnerability in the areas of security and regulatory compliance.

In this kind of environment, IT admins complete daily tasks with no standardization in a manual, time-consuming manner where human error and process inefficiencies abound.

UCS DIRECTOR STREAMLINES OPERATIONS

Cisco UCS Director works with Cisco hardware as well as a variety of other vendor platforms, including HP ProLiant servers.

Amid the reality of disparate enterprise IT environments and the risks that come with shadow IT, a comprehensive management tool can bring enormous value. With Cisco UCS Director, your IT management can become more consistent and efficient by replacing the time-consuming process of manually provisioning and de-provisioning data center resources with automated workflows. Best of all, Cisco UCS Director works with Cisco hardware as well as a variety of other vendor platforms, including HP ProLiant servers.

Cisco UCS Director lets IT streamline provisioning and management of servers, storage, and networking devices with these features:

- Central management from a single pane
- Policy-based provisioning
- Adaptive provisioning
- Dynamic capacity management
- End-to-end process automation

Specific features of Cisco UCS Director's heterogeneous infrastructure management include:

- Support for Hewlett Packard Onboard Administrator to install bare-metal blades and manage them using Cisco UCS Director's task library
- Extensive enhancements for VMware and EMC solution components
- Integration of third-party solutions into the Cisco UCS Director management platform with a publicly available software development kit

To learn more about Cisco UCS Director, visit www.cisco.com/go/ucsdirector.

IN OUR LABS

To learn about how Cisco UCS Director streamlines management of disparate devices, we set up our test environment with multiple devices, including Cisco and HP servers, Cisco and EMC storage, and Cisco Nexus and MDS switches, and incorporated each into UCSD (See Appendix B). We then used the Workflow Designer in UCS Director to create automated workflows for setting up severs (see Appendix C for the steps we used to create the Cisco workflow and Appendix D for the steps we used to create the HP workflow).

Cisco UCS Director – the value of automation

UCSD automated the deployment of all our resources, including 100 VMs, in four easy steps, using a single user interface (see Appendix E).

Using custom workflows makes complex, error-prone tasks, such as manually provisioning resources, into a simple, easy, and repeatable process that we were able to execute quickly and consistently in our lab (see Figure 1). With UCSD workflows, we automated our entire testing environment by installing and configuring server OS, virtual infrastructure, network, and storage resources. UCSD automated the deployment of all our resources, including 100 VMs, in four easy steps, using a single user interface (see Appendix E). By contrast, in a typical infrastructure deployment of this size, this effort would require multiple mid-level engineers using a suite of tools, operating in a designated maintenance window, to complete the same tasks.
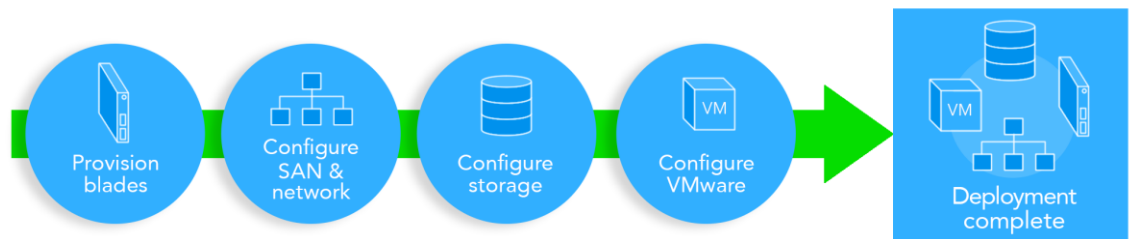

Figure 1: We used Cisco UCS Director to provision blade and to configure networking, storage, and virtualization.

Integrating virtual infrastructure into Cisco UCS Director

We found UCS Director to be a powerful platform that would let us easily automate and manage day-to-day operations and reduce the need for various management tools.

Cisco UCS Director integrates with VMware vCenter Server to provide automation and lifecycle management of virtual infrastructure. Beginning with the physical infrastructure, Cisco UCS Director provides automated deployment of the ESXi hypervisor onto bare-metal hardware such as Cisco UCS and HP BladeSystem c7000, and then presents the hypervisor hosts to vCenter for hosting virtual machines.

During this process, Cisco UCS Director also provides the capability to provision physical storage and present the storage as datastores that host the data for virtual machines using automated workflows. For our testing, we automated the PXE boot of multi-vendor blades and their dependent infrastructure, such as virtual switches, port groups, and datastores, as per the environmental needs.

We found UCS Director to be a powerful platform that would let us easily automate and manage day-to-day operations and reduce the need for various management tools.

Integrating physical compute managers into Cisco UCS Director

We found that UCS Director could easily integrate another vendor's chassis and blade infrastructure and provide a single-pane management platform to perform automation, bare metal provisioning tasks, and management tasks.

Cisco UCS Director has the native ability to manage a UCS chassis by incorporating UCS Manager to extend all the features of UCS Manager. This allows UCS Director to natively mange and report automated monitoring for health, status, and resources. In addition to managing UCS hardware, IT administrators can also use UCSD to manage blade chassis from other vendors. In our labs, we demonstrated this ability by using and integrating an HP BladeSystem c7000 with two HP ProLiant BL460 blades. Integrating the HP BladeSystem c7000 extended our ability to automate a workflow to provision a bare-metal blade server with ESXi and automate building an entire infrastructure. We also demonstrated UCS Director's ability to manage HP blade servers utilizing HP's Onboard Administrator.

We found that UCS Director could easily integrate another vendor's chassis and blade infrastructure and provide a single-pane management platform to perform automation, bare-metal provisioning tasks, and management tasks.

Integrating enterprise storage devices into Cisco UCS Director

We found that by integrating Cisco UCS Director with multiple vendors' enterprise-class storage, we could use automation workflow tools to perform all storage related tasks simply and quickly.

In most IT organizations today, storage administrators must manage multiple types of storage from Fibre Channel to iSCSI, NFS, and SSDs. This can create many day-to-day management challenges, from the need to provision storage quickly, to simply managing multiple management interfaces. Cisco UCS Director's ability to easily integrate multiple vendors' storage devices into a single management pane solves many of these issues. By integrating storage into UCS Director, this allows the storage administration team to quickly understand and manage all aspects of complex multi-vendor enterprise storage. In our testing, we demonstrated UCS Director's flexibility by integrating EMC VNX and Cisco Invicta storage to highlight UCSD flexibility in managing a typical multi-vendor storage environment. Cisco UCS Director includes orchestration features that allow you to automate configuration and management of enterprise storage tasks in one or more workflows.

We found that by integrating Cisco UCS Director with multiple vendors' enterprise-class storage, we could use UCSD automation workflow tools to perform all enterprise-level storage related tasks simply and quickly.

Cisco UCS Director replaces many vendor-specific tools

In the PT labs, we set up a multi-vendor environment consisting of a Cisco UCS chassis managing two Cisco UCS B200 blades, Cisco Invicta storage, Cisco MDS9134 Multi Fabric switch, EMC VNX 5500, and an HP BladeSystem c7000 containing two ProLiant BL460 blades. Each device using its own traditional management interface presented multiple problems. For example, the EMC Unisphere management client requires a Microsoft Windows OS and a specific version of Oracle's Java client, which could pose a problem for a Macintosh user. Traversing these dependency issues can be a hassle and even a security risk as users may be required to maintain a separate management VM or workstation to access the UI. This workaround requires additional resources, and can introduce security vulnerabilities if the other resources are not properly maintained.

We found that by integrating Cisco compute, network, and storage devices into UCSD, we could extend management of these devices across a consistent single pane for ease of management. Because UCSD can perform common day-to-day tasks across a suite of multi-vendor platforms, UCSD can reduce reliance upon the native tools and therefore reduce the need to maintain separate management client interfaces that may not meet an organization's security standards.

During our testing, we also integrated an HP BladeSystem c7000 chassis managing two HP ProLiant BL460c blades. Once we integrated the c7000 into UCSD, we could demonstrate UCSD's ability to incorporate the management features of HP Onboard Administrator to extend to the blade servers. We also integrated a VMware vCenter 5.5 appliance into UCSD to demonstrate its ability to manage virtual infrastructure.

CONCLUSION

Managing a heterogeneous enterprise data center can be overwhelming, inefficient, and expensive without the correct tools. Cisco UCS Director provides a unified, simplified interface with a centralized login to save time and hassles for your IT staff and SMEs. Bringing all your disparate compute, network, and storage devices into a single pane of glass with Cisco UCSD can reveal and remedy inefficiencies, enable greater collaboration between teams, let you deploy resources more quickly, reduce human error, and streamline reporting—all of which brings value to your organization.

APPENDIX A – SYSTEM CONFIGURATION INFORMATION

Figure 2 provides detailed configuration information about the test servers. Note that we used the Cisco UCS B200 M3 Blade Server for the systems under test and used the Cisco UCS B200 M3 Blade Server for our test bed infrastructure. Figures 3 and 4 detail the storage we used in our tests.

System	Cisco UCS B200 M3 server	HP ProLiant BL460c Gen8
General		
Number of processor packages	2	2
Number of cores per processor	8	6
Number of hardware threads per core	16	12
System power management policy	OS Control	OS Control
CPUs		
Vendor	Intel®	Intel
Name	Xeon®	Xeon
Model number	E5-2690	E5-2640
Socket type	FCLGA2011	FCLGA2011
Core frequency (GHz)	2.90	2.50
Bus frequency	8.0 GT/s	7.2 GT/s
L1 cache	32 KB + 32 KB (per core)	32 KB + 32 KB (per core)
L2 cache	256 KB (per core)	256 KB (per core)
L3 cache	20 MB	15 MB
Platform		
Vendor and model number	Cisco UCS B200 M3	HP ProLiant Gen8 BL460c
Motherboard model number	73-13217-07	654609-001
BIOS name and version	Cisco B200M3.2.2.1a.0.111220131105	HP I31 12/24/2012
BIOS settings	Default	Default
Memory module(s)		
Total RAM in system (GB)	256	64
Vendor and model number	Samsung® M393B2G70BH0-YK0	Samsung M393B1K70DH0-YH9
Type	PC3L-12800R	PC3L-10600R
Speed (MHz)	1,600	1,333
Speed running in the system (MHz)	1,600	1,333
Size (GB)	16	8
Number of RAM module(s)	16	8
Chip organization	Double-sided	Double-sided
Rank	Dual	Dual
Local storage		
Vendor and model number	Seagate® ST9146803SS	HP EH0146FBQDC
Number of drives	1	1
Size (GB)	146	146
Speed (RPM)	10,000	15,000
Type	SAS	SAS

System	Cisco UCS B200 M3 server	HP ProLiant BL460c Gen8
RAID controller		
Vendor and model	LSI® MegaRAID® SAS	HP SmartArray
Controller firmware	20.12.1-0160	v3.54
Operating system		
Name	ESXi 5.5 U2	ESXi 5.5 U2
Build number	1746974-custom	2403361-custom
Language	English	English
Operating system power profile	Maximum Performance	Maximum Performance
I/O adapters		
Vendor and model number	Cisco UCS VIC 1240	HP FlexFabric 10Gb 2-port 554M
Type	mLOM	mLOM

Figure 2: System configuration information.

	Cisco UCS Invicta C3124SA Appliance
Storage	
Number of 24-disk processor enclosures	1
Power supplies	
Total number	2
Disk array enclosures	
Number of 24-disk array enclosures	1
Disks	
Number of 240GB SSDs	24
Operating system	
Name	Invicta

Figure 3 Detailed configuration information for the Cisco UCS Invicta C3124SA Appliance.

	EMC VNX5500
Number of storage arrays	1
Number of storage controllers per array	1
RAID level	5
Firmware version (Block)	05.32.000.5.215
Firmware version (File)	7.1.76-4
Number of drives	50
Model number	HUC10606
Drive size (GB)	600
Drive buffer size (MB)	16
Drive RPM	10,000
Drive type	6Gb/s SAS 2.5"

Figure 4: Detailed configuration information for the EMC VNX5500 array.

APPENDIX B – HOW WE TESTED: SETTING UP AND DEPLOYING OUR TEST BED AND CISCO UCS DIRECTOR
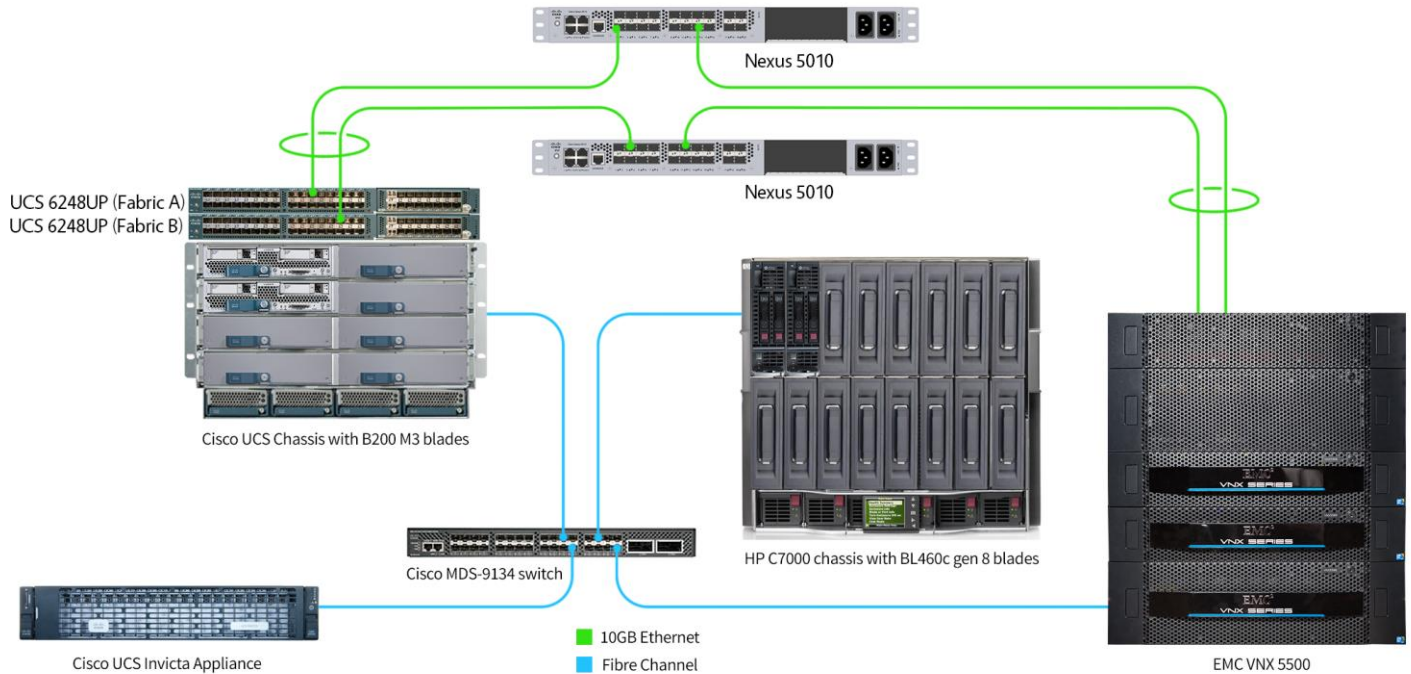

Figure 5: Our test bed diagram.

Installing UCS Director

1. Log into vSphere Client.
2. In vSphere Client, click File, Deploy OVF Template. The Deploy OVF Template wizard will open.
3. On the Source page, click Browse, and then select the OVF package from a stored location.
4. Click Next.
5. Click Next again.
6. Accept the License Agreement, and click Next.
7. Enter a name (Cisco UCSD), and select the Inventory Location.
8. Select Cluster where appliance will reside, and click Next.
9. Select Host where appliance will reside, and click Next.
10. On the Disk Format page, select Thin Provision.
11. Click Next.
12. Verify the Destination Network for Network 1.
13. Click Next.
14. Leave Application properties as defaults, and click Next.
15. Check Power on after deployment checkbox.
16. Click Finish to complete deployment of UCSD Appliance.

Installing Baremetal Agent (BMA)

1. In vSphere Client, click File, Deploy OVF Template. The Deploy OVF Template wizard will open.
2. On the Source page, click Browse, and then select the OVF package.
3. Click Next.
4. Click Next again.
5. Accept the License Agreement, and click Next.
6. Enter a name of BMA appliance, and select the Inventory Location.
7. Click Next.
8. Click Next.
9. On the Disk Format page, select Thin Provision.
10. Click Next.
11. Verify the Destination Network for Network 1.
12. Click Next.
13. Enter and confirm the BMA root user password (Passw0rd1).
14. Enter the Management IP Address for eth0 (10.128.4.2).
15. Enter the Management IP Subnet Mask for eth0 (255.255.0.0).
16. Enter the Gateway IP for eth0 (10.128.0.1).
17. Enter the IP Address for eth1 (192.168.78.1).
18. Enter the Subnet Mask for eth1 (255.255.255.0).
19. Click Next.
20. Check Power on after deployment, and click Finish.

Patching BMA to version 5.3

1. Obtain Cisco UCSD BMA patch cusd_bma_patch_5_3_0_.zip.
2. Copy BMA patch into the /tmp directory.
3. Log into the BMA console via PuTTY using default credentials from installation.
4. Use the `cd /tmp` command to change to patch directory.
5. Unzip the patch unzip cusd_bma_patch_5_3_0_.zip.
6. Change directory to the patch directory
   `cd ucsd_bma_patch_5_3_0_0`
7. Run `./applyPatch.sh` to apply the patch to Baremetal Agent.
8. To verify patch installation, run the following command
   `/opt/infra/showBMAVersion.sh`
   (Note: Version number is now 5.3.)
9. Restart BMA services, and log in to UCSD select Administration → Physical Accounts → Bare Metal Agents.
10. Click Stop Services → Stop Service → Ok. Select Start Services → Start.

Integrating Cisco UCS Manager into Cisco UCS Director

1. Select Administration → Physical Accounts → Physical Accounts.
2. Select +Add icon.
3. In Add Account dialog use defaults, and click Submit.
    a. Select Locally Authenticated for Authentication Type.
    b. Select All Servers for Server Management.
    c. Enter unique Account Name.
    d. Enter Server Address for UCSM.

e. Enter User ID.
        f. Enter Password.
    4. Click Add.
    5. Verify that connection status is listed as Success.

Integrating VMware vCenter into Cisco UCS Director

1. Select Administration → Virtual Accounts.
2. Select +Add icon.
3. Select VMware as cloud type.
        a. Enter desired Cloud Name.
        b. Enter vCenter IP address.
        c. Enter Server User ID.
        d. Enter Server Password.
4. Click Add.
5. Verify that connection status is listed as Success.
6. Click Add.
7. Verify that connection status is listed as Success.

Integrating HP Onboard Administrator into Cisco UCS Director

1. Select Administration → Physical accounts → Physical Accounts.
2. Select +Add icon.
3. From Add Account dialog, select HP OA as Account Type.
4. Click Submit.
5. Enter the following to Add Account dialog box:
        a. Unique Account Name
        b. Server IP Address
        c. User Name
        d. Password
6. Click Submit.
7. Verify that connection is listed as Success.

Integrating Cisco Invicta storage into Cisco UCS Director

1. Select Administration → Physical accounts → Physical Accounts.
2. Select +Add icon.
3. From the Add Account dialog box, select Storage.
4. From the Category pull-down menu, select Storage.
5. From Account Type pull-down menu, select UCS Invicta Appliance.
6. Click Submit.
7. Enter the following to Add Account dialog box:
        a. Unique Account Name
        b. Server IP Address
        c. User ID
        d. Password
8. Click Submit.
9. Verify that connection status is listed as Success.

Integrating EMC-VNX 5500 into Cisco UCS Director

1. Select Administration → Physical accounts → Physical Accounts.
2. Select +Add icon.
3. From the Add Account dialog box, select Storage.
4. From the Category pull-down menu, select Storage.
5. From Account Type pull-down menu, select EMC VNX Block.
6. Click Submit.
7. Enter the following to Add Account dialog box:
   a. Unique Account Name
   b. Storage Processor A IP Address
   c. Storage Processor B IP Address
   d. Block Access User Name
   e. Block Access Password
   f. NaviSecCLI Host IP Address
   g. NaviSecCLI Host User Name
   h. NaviSecCLI Host User Password
8. Click Submit.
9. Verify Connection status is listed as Success.

Integrating Cisco MDS 9134 Multilayer Fabric Switch into Cisco UCS Director

1. Select Administration → Physical accounts → Managed Network Elements.
2. Select + Add Network Element icon.
3. From the Add Network Element dialog box, select Network.
4. From the Device Category pull-down menu, select Cisco Nexus OS.
5. Enter Login.
6. Enter Password.
7. Click Submit.
8. Verify that connection status is listed as OK.

Logging into UCS Director

1. Select Policies → Orchestration.
2. Select Add Workflow.
   a. Name Workflow.
   b. Add Description.
   c. Accept Workflow Context default.
   d. Select Folder.
3. Select Next.

Creating Virtual Datacenter

1. Select Policies → Virtual/Hypervisor Policies →Virtual Data Centers.
2. Select Add icon.
3. Select catalog Type Standard.
4. Select Submit.
5. Enter vDC name.
6. Select Submit.

Publishing a catalog
1. Select Policies → Catalog.
2. Select Add Workflow.
3. Select Account Type VMware.
4. Select Submit.
5. Enter catalog name.
6. Select Submit.

Creating the Service Delivery Policy
1. Select Policies → Virtual/Hypervisor Policies → Service Delivery.
2. Select Mark Datastore for ISO.
    a. Select Cloud.
    b. Select Data Store.
3. Select Submit.
4. Select Guest OS ISO Image Mapping Policy.
    a. Select Add icon.
    b. Enter Policy Name.
    c. Select Cloud Name.
    d. Select ISO Image.
5. Select Submit.

APPENDIX C – HOW WE TESTED: USING CISCO UCS DIRECTOR WORKFLOW DESIGNER TO CREATE WORKFLOW FOR DEPLOYING CISCO UCS BLADES

1. Select Policies → Orchestration.
2. Select Add Workflow.
   a. Name Workflow.
   b. Add Description.
   c. Accept Workflow Context default.
   d. Select Folder.
3. Select Next.
4. Select Submit.
5. Select and double-click newly created Policy to open Workflow Designer.
6. Select and expand Physical Compute Tasks → Cisco UCS Tasks.
7. Drag and drop the following task into the workspace: Create UCS Service Profile from Template.
   a. Select Next.
   b. Select Next.
   c. Enter environment-specific parameters.
   d. Select Next.
   e. Select Submit.
8. Drag and drop the following task into the workspace: Create UCS Service Profile from Template.
   a. Select Next.
   b. Select Next.
   c. Enter environment-specific parameters.
   d. Select Next.
   e. Select Submit.
9. Drag and drop the following task into the workspace: Associate UCS Service Profile.
   a. Select Next.
   b. Select Next.
10. Enter environment-specific parameters.
    a. Select Next.
    b. Select Submit.
11. Drag and drop the following task into the workspace: Associate UCS Service Profile.
    a. Select Next.
    b. Select Next.
    c. Enter environment-specific parameters.
    d. Select Next.
    e. Select Submit.
12. Drag and drop the following task into the workspace: Setup PXE Boot With BMA.
    a. Select Next.
    b. Check boxes for mandatory fields (user input will auto-populate).
    c. Select Next.
    d. Enter environment-specific PXE network information.
    e. Select Next.

f. Select Submit.
13. Drag and drop the following task into the workspace: Setup PXE Boot With BMA.
    a. Select Next.
    b. Check boxes for mandatory fields (user input will auto-populate).
    c. Select Next.
    d. Enter environment-specific PXE network information.
    e. Select Next.
    f. Select Submit.
14. Drag and drop the following task into the workspace: Power On UCS Server.
    a. Select Next.
    b. Check boxes for mandatory fields (user input will auto-populate).
    c. Select Next.
    d. Enter environment-specific PXE network information.
    e. Select Next.
    f. Select Submit.
15. Drag and drop the following task into the workspace: Power On UCS Server.
    a. Select Next.
    b. Check boxes for mandatory fields (user input will auto-populate).
    c. Select Next.
    d. Enter environment-specific PXE network information.
    e. Select Next.
    f. Select Submit.
16. Select and expand Cloupia Tasks → General Tasks.
17. Drag and drop the following task into the workspace: Wait for Specific Duration.
    a. Select Next.
    b. Select Next.
    c. Set Duration to 15 min.
    d. Select Next.
    e. Select Submit.
18. Select and expand Virtualization Tasks → VMware Tasks → VMware Host Tasks.
19. Drag and drop the following task into the workspace: Register Host with vCenter.
    a. Select Next.
    b. Select Next.
    c. Enter environment-specific parameters.
    d. Select Next.
    e. Select Submit.
20. Drag and drop the following task into the workspace: Register Host with vCenter.
    a. Select Next.
    b. Select Next.
    c. Enter environment-specific parameters.
    d. Select Next.
    e. Select Submit.
21. Select and expand Virtualization Tasks → VMware Tasks → VMware Network Tasks.
22. Drag and drop the following task into the workspace: Create VMware Port Group.

a. Select Next.
b. Check Map to Use Input for vSwitch Name.
c. Select Next.
d. Enter environment-specific parameters.
e. Select Next.
f. Select Submit.

23. Drag and drop the following task into the workspace: Create VMware Port Group.
    a. Select Next.
    b. Check Map to Use Input for vSwitch Name.
    c. Select Next.
    d. Enter environment-specific parameters.
    e. Select Next.
    f. Select Submit.

24. Drag and drop the following task into the workspace: Create VMware Port Group.
    a. Select Next.
    b. Check Map to Use Input for vSwitch Name.
    c. Select Next.
    d. Enter environment-specific parameters.
    e. Select Next.
    f. Select Submit.

25. Drag and drop the following task into the workspace: Create VMware Port Group.
    a. Select Next.
    b. Check Map to Use Input for vSwitch Name.
    c. Select Next.
    d. Enter environment-specific parameters.
    e. Select Next.
    f. Select Submit.

26. Drag and drop the following task into the workspace: Create VMware Port Group.
    a. Select Next.
    b. Check Map to Use Input for vSwitch Name.
    c. Select Next.
    d. Enter environment-specific parameters.
        i. Select Vm Kernel Portgroup as connection type.
        ii. Check Enable DHCP.
    e. Select Next.
    f. Select Submit.

27. Drag and drop the following task into the workspace: Create VMware Port Group.
    a. Select Next.
    b. Check Map to Use Input for vSwitch Name.
    c. Select Next.
    d. Enter environment-specific parameters.
        i. Select Vm Kernel Portgroup as connection type.
        ii. Check Enable DHCP.
    e. Select Next.

f. Select Submit.
28. Drag and drop the following task into the workspace: Create VMware Port Group.
    a. Select Next.
    b. Check Map to Use Input for vSwitch Name.
    c. Select Next.
    d. Enter environment-specific parameters.
        i. Select Vm Kernel Portgroup as connection type.
        ii. Check Enable DHCP.
    e. Select Next.
    f. Select Submit.
29. Drag and drop the following task into the workspace: Create VMware Port Group.
    a. Select Next.
    b. Check Map to Use Input for vSwitch Name.
    c. Select Next.
    d. Enter environment-specific parameters.
        i. Select Vm Kernel Portgroup as connection type.
        ii. Check Enable DHCP.
    e. Select Next.
    f. Select Submit.
30. Select and expand Cloupia Task Folder → Network Services Tasks.
31. Drag and drop the following task into the workspace: Remove PXE Boot Setup.
    a. Select Next.
    b. Check boxes for mandatory fields (user input will auto-populate).
    c. Select Next.
    d. Select Next.
    e. Select Submit.
32. Drag and drop the following task into the workspace: Remove PXE Boot Setup.
    a. Select Next.
    b. Check boxes for mandatory fields (user input will auto-populate).
    c. Select Next.
    d. Select Next.
    e. Select Submit.
33. Select and expand Physical Storage Tasks → EMC Tasks → EMC VNX Tasks.
34. Drag and drop the following task into the workspace: Create VNX Storage group.
    a. Select Next.
    b. Select Next.
    c. Enter environment-specific parameters.
    d. Select Next.
    e. Select Submit.
35. Drag and drop the following task into the workspace: Create VNX LUN.
    a. Select Next.
    b. Select Next.
    c. Enter environment-specific parameters.
    d. Select Next.

e. Select Submit.
36. Drag and drop the following task into the workspace: Add VNX LUN to Storage Group.
    a. Select Next.
    b. Select Next.
        i.   Select Map to User Input for Storage Group.
    c. Enter environment-specific parameters.
    d. Select Next.
    e. Select Submit.
37. Drag and drop the following task into the workspace: Associate VNX LUN as Datastore.
    a. Select Next.
        i.   Select Map to User Input for Select Host Node.
        ii. Select Map to User Input for LUN Name.
    b. Select Next.
    c. Enter environment-specific parameters.
    d. Select Next.
    e. Select Submit.
38. Drag and drop the following task into the workspace: Rescan Storage Adapter.
    a. Select Next.
    b. Select Next.
    c. Select Next.
    d. Enter environment-specific parameters.
    e. Select Next.
39. Drag and drop the following task into the workspace: Start Loop.
    a. Select Next.
    b. Select Number of times to loop.
    c. Select Next.
    d. Select count based iteration.
    e. Select Next.
    f. Select Submit.
40. Drag and drop the following task into the workspace: New VM Provision.
    a. Select Next.
    b. Select Next.
    c. Enter environment-specific parameters.
    d. Select Next.
    e. Select Submit.
41. Drag and drop the following task into the workspace: End Loop.
    a. Select Next.
    b. Select Next.
    c. Select Next.
    d. Select Submit.

APPENDIX D –HOW WE TESTED: USING CISCO UCS DIRECTOR WORKFLOW DESIGNER TO CREATE WORKFLOW FOR DEPLOYING HP BL 460 BLADES

1. Select and double-click newly created Policy to open Workflow Designer.
2. Select and expand Cloupia Task Folder → Network Services Tasks.
3. Drag and drop the following task into the workspace: Setup PXE Boot With BMA.
   a. Select Next.
   b. Check boxes for mandatory fields (user input will auto-populate).
   c. Select Next.
   d. Enter environment-specific PXE network information.
   e. Select Next.
   f. Select Submit.
4. Drag and drop the following task into the workspace: Setup PXE Boot With BMA.
   a. Drag and drop the following task into the workspace: Setup PXE Boot With BMA.
   b. Select Next.
   c. Check boxes for mandatory fields (user input will auto-populate).
   d. Select Next.
   e. Enter environment-specific PXE network information.
   f. Select Next.
   g. Select Submit.
5. Select and expand Physical Compute Tasks → HP Tasks → HP OA Tasks.
6. Drag and drop the following task into the workspace: Power On HP OA Blades.
   a. Select Next.
   b. Check boxes Select Bay (user input will auto-populate).
   c. Select Next.
   d. Select One Time Boot Order PXE.
   e. Select Next.
   f. Select Submit.
7. Drag and drop the following task into the workspace: Power On HP OA Blades.
   a. Select Next.
   b. Check boxes Select Bay (user input will auto-populate).
   c. Select Next.
   d. Select One Time Boot Order PXE.
   e. Select Next.
   f. Select Submit.
8. Select and expand Cloupia Tasks → General Tasks.
9. Drag and drop the following task into the workspace: Wait for Specific Duration.
   a. Select Next.
   b. Select Next.
   c. Set Duration to 15 min.
   d. Select Next.
   e. Select Submit.
10. Select and expand Physical Compute Tasks → HP Tasks → HP OA Tasks.

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11. Drag and drop the following task into the workspace: Power On HP OA Blades.
    a. Select Next.
    b. Check boxes Select Bay (user input will auto-populate).
    c. Select Next.
    d. Select One Time Boot Order PXE.
    e. Select Next.
    f. Select Submit.
12. Drag and drop the following task into the workspace: Power On HP OA Blades.
    a. Select Next.
    b. Check boxes Select Bay (user input will auto-populate).
    c. Select Next.
    d. Select One Time Boot Order PXE.
    e. Select Next.
13. Select and expand Cloupia Tasks → General Tasks.
14. Drag and drop the following task into the workspace: Wait for Specific Duration.
    a. Select Next.
    b. Select Next.
    c. Set Duration to 5 min.
    d. Select Next.
    e. Select Submit.
15. Select and expand Virtualization Tasks → VMware Tasks → VMware Host Tasks.
16. Drag and drop the following task into the workspace: Register Host with vCenter.
    a. Select Next.
    b. Select Next.
    c. Enter environment-specific parameters.
    d. Select Next.
    e. Select Submit.
17. Drag and drop the following task into the workspace: Register Host with vCenter.
    a. Select Next.
    b. Select Next.
    c. Enter environment-specific parameters.
    d. Select Next.
    e. Select Submit.
18. Select and expand Virtualization Tasks → VMware Tasks → VMware Network Tasks.
19. Drag and drop the following task into the workspace: Create VMware Port Group.
    a. Select Next.
    b. Check Map to Use Input for vSwitch Name.
    c. Select Next.
    d. Enter environment-specific parameters.
    e. Select Next.
    f. Select Submit.
20. Drag and drop the following task into the workspace: Create VMware Port Group.
    a. Select Next.
    b. Check Map to Use Input for vSwitch Name.

    c. Select Next.
    d. Enter environment-specific parameters.
    e. Select Next.
    f. Select Submit.

21. Drag and drop the following task into the workspace: Create VMware Port Group.
    a. Select Next.
    b. Check Map to Use Input for vSwitch Name.
    c. Select Next.
    d. Enter environment-specific parameters.
    e. Select Next.
    f. Select Submit.

22. Drag and drop the following task into the workspace: Create VMware Port Group.
    a. Select Next.
    b. Check Map to Use Input for vSwitch Name.
    c. Select Next.
    d. Enter environment-specific parameters.
    e. Select Next.
    f. Select Submit.

23. Drag and drop the following task into the workspace: Create VMware Port Group.
    a. Select Next.
    b. Check Map to Use Input for vSwitch Name.
    c. Select Next.
    d. Enter environment-specific parameters.
       i. Select Vm Kernel Portgroup as connection type.
       ii. Check Enable DHCP.
    e. Select Next.
    f. Select Submit.

24. Drag and drop the following task into the workspace: Create VMware Port Group.
    a. Select Next.
    b. Check Map to Use Input for vSwitch Name.
    c. Select Next.
    d. Enter environment-specific parameters.
       i. Select Vm Kernel Portgroup as connection type.
       ii. Check Enable DHCP.
    e. Select Next.
    f. Select Submit.

25. Drag and drop the following task into the workspace: Create VMware Port Group.
    a. Select Next.
    b. Check Map to Use Input for vSwitch Name.
    c. Select Next.
    d. Enter environment-specific parameters.
       i. Select Vm Kernel Portgroup as connection type.
       ii. Check Enable DHCP.
    e. Select Next.

f. Select Submit.
26. Drag and drop the following task into the workspace: Create VMware Port Group.
    a. Select Next.
    b. Check Map to Use Input for vSwitch Name.
    c. Select Next.
    d. Enter environment-specific parameters.
        iii. Select Vm Kernel Portgroup as connection type.
        iv. Check Enable DHCP.
    e. Select Next.
    f. Select Submit.
27. Select and expand Cloupia Task Folder → Network Services Tasks.
28. Drag and drop the following task into the workspace: Remove PXE Boot Setup.
    a. Select Next.
    b. Check boxes for mandatory fields (user input will auto-populate).
    c. Select Next.
    d. Select Next.
    e. Select Submit.
29. Drag and drop the following task into the workspace: Remove PXE Boot Setup.
    a. Select Next.
    b. Check boxes for mandatory fields (user input will auto-populate).
    c. Select Next.
    d. Select Next.
    e. Select Submit.
30. Select and expand Physical Storage Tasks → EMC Tasks → EMC VNX Tasks.
31. Drag and drop the following task into the workspace: Create VNX Storage group.
    a. Select Next.
    b. Select Next.
    c. Enter environment-specific parameters.
    d. Select Next.
    e. Select Submit.
32. Drag and drop the following task into the workspace: Create VNX LUN.
    a. Select Next.
    b. Select Next.
    c. Enter environment-specific parameters.
    d. Select Next.
    e. Select Submit.
33. Drag and drop the following task into the workspace: Add VNX LUN to Storage Group.
    a. Select Next.
    b. Select Next.
        i. Select Map to User Input for Storage Group.
    c. Enter environment-specific parameters.
    d. Select Next.
    e. Select Submit.
34. Drag and drop the following task into the workspace: Associate VNX LUN as Datastore.

a. Select Next.
    i. Select Map to User Input for Select Host Node.
    ii. Select Map to User Input for LUN Name.
b. Select Next.
c. Enter environment-specific parameters.
d. Select Next.
e. Select Submit.
35. Drag and drop the following task into the workspace: Rescan Storage Adapter.
    a. Select Next.
    b. Select Next.
    c. Select Next.
    d. Enter environment-specific parameters.
    e. Select Next.
36. Drag and drop the following task into the workspace: Start Loop.
    a. Select Next.
    b. Select Number of times to loop.
    c. Select Next.
    d. Select count based iteration.
    e. Select Next.
    f. Select Submit.
37. Drag and drop the following task into the workspace: New VM Provision.
    a. Select Next.
    b. Select Next.
    c. Enter environment-specific parameters.
    d. Select Next.
    e. Select Submit.
38. Drag and drop the following task into the workspace: End Loop.
    a. Select Next.
    b. Select Next.
    c. Select Next.
    d. Select Submit.

APPENDIX E – HOW WE TESTED: USING THE CISCO AND HP WORKFLOWS TO PROVISION ESXI FROM BARE METAL AND PROVISION 100 VMS

1. Select Policies → Orchestration.
2. Select Workflow.
3. Select appropriate folder contain desired workflow.
4. Highlight and right-click workflow select execute now.
   a. Select Blades.
   b. Select HDD for boot order.
   c. Enter number of VMs to deploy.
   d. Select Submit.

ABOUT PRINCIPLED TECHNOLOGIES

Principled Technologies®

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