



Technical Research Report

# Measuring the Ease of Deployment and Operation of Lenovo<sup>®</sup> ThinkAgile<sup>™</sup> VX HCI Solutions

**What does it take to deploy and manage a hyperconverged infrastructure (HCI) VMware vSAN<sup>™</sup> cluster using Lenovo ThinkAgile VX?**

## Executive Summary

Lenovo<sup>®</sup> ThinkAgile<sup>™</sup> VX Integrated Systems and appliances are hyperconverged infrastructure (HCI) based on VMware vSAN<sup>™</sup>. Lenovo partnered with VMware to create the Lenovo ThinkAgile VX Deployer tool to ease the difficulties of creating, extending, and managing such clusters.

Prowess Labs tested the ThinkAgile VX Deployer tool to evaluate how well it works, how easy it is to use, and how long it takes to perform the key operations of creating a new cluster and extending that cluster with an additional node. We tested these operations both for a first-time deployment and expansion, and for repeating the operations using a configuration file to

fill many of the fields automatically. We also tested to validate that VMware vSphere<sup>®</sup> Lifecycle Manager<sup>™</sup> (vLCM) was able to perform a successful remediation of the cluster that the ThinkAgile VX Deployer tool had created.

The results of Prowess testing validated that the ThinkAgile VX Deployer tool performed as expected. In this paper, companies considering using the ThinkAgile VX Deployer tool can learn what to expect in terms of time needed to accomplish tasks, and they can see what to expect through screenshots of the interface in action.

## Key Findings

1. The Lenovo<sup>®</sup> ThinkAgile<sup>™</sup> VX Deployer tool was easy to use, with an intuitive process flow.
2. Time to deployment was fast, and for most of that time, no user action was needed.
3. The configuration file feature reduced repetitive input and made for a repeatable deployment.
4. Integration into VMware vCenter<sup>®</sup> was seamless for viewing topology and remediating the cluster in a single interface.

## Introduction

Companies are attracted to HCI offerings such as VMware HCI, but the difficulty of setting up and maintaining such systems can be off-putting. Creating clusters and adding nodes to them can be complex and time consuming. Keeping infrastructure up to date while maintaining compliance has historically been a highly manual task, often requiring separate specialized tools to update each tier of the infrastructure.

Lenovo partners with VMware to address these challenges and make it easier to deploy and maintain VMware HCI clusters on Lenovo ThinkAgile VX Integrated Systems. The ThinkAgile VX Deployer tool aims to let users deploy, integrate, and expand clusters quickly and easily using a single tool. It also aims to enhance hardware lifecycle management within the VMware vCenter® management console via Lenovo® XClarity® Integrator.

Prowess Labs has put the young (version 1.2) ThinkAgile VX Deployer tool to the test to evaluate its effectiveness and ease of use. This paper presents the results of our testing of key features of the ThinkAgile VX Deployer tool, including setup of a new cluster from scratch using the wizard-based user interface (UI), automated setup using a configuration file, adding a node to an existing cluster, and exercising lifecycle-management features.

## Overview of the ThinkAgile VX Deployer Tool

The ThinkAgile VX Deployer tool is a web-based UI used to simplify and automate the deployment of Lenovo ThinkAgile VX systems within VMware vSAN clusters. The ThinkAgile VX Deployer tool can install and configure the following software:

### **VMware ESXi™**

VMware ESXi™ is a bare-metal hypervisor that the ThinkAgile VX Deployer tool installs on the hardware of each host in the cluster. ESXi translates requests between the physical and virtual resources, making virtualization possible.

### **VMware vCenter Server®**

VMware vCenter Server® is a management console that provides a centralized platform for controlling VMware vSphere environments. One service that runs in VMware vCenter Server is VMware vLCM, which provides centralized and simplified management to install software, maintain that software through updates and upgrades, and decommission it.

### **Lenovo® XClarity® Integrator**

Lenovo XClarity Integrator is the hardware support manager (HSM) used by vCenter for firmware upgrades. Lenovo XClarity Integrator fully integrates with VMware vLCM to give the VMware vCenter Server software visibility into Lenovo hardware.

The interface for the ThinkAgile VX Deployer tool is a straightforward web-based installation wizard with three top-level options:

- Install a new cluster (using the wizard).
- Add nodes to an existing cluster (using the wizard).
- Use a configuration file to install a new cluster or add nodes to an existing cluster.

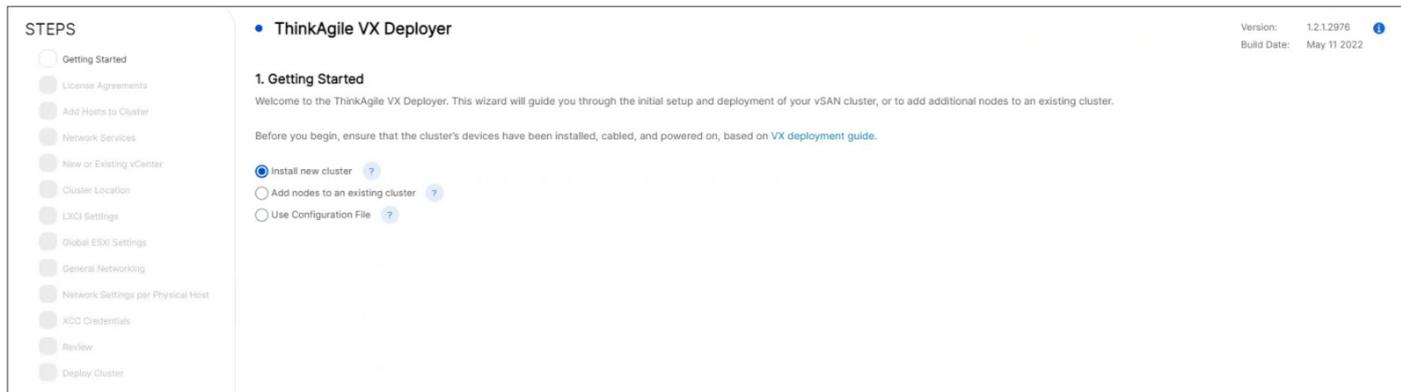
Prowess testing included all three of these options, plus some key lifecycle-management features in VMware vCenter Server. The following sections describe the results of our testing. For each test area, we walk through the steps to accomplish these operations, using screenshots to illustrate what to expect from the tool and providing details about how long the steps took to complete.

## Test Area 1: Install a New Cluster

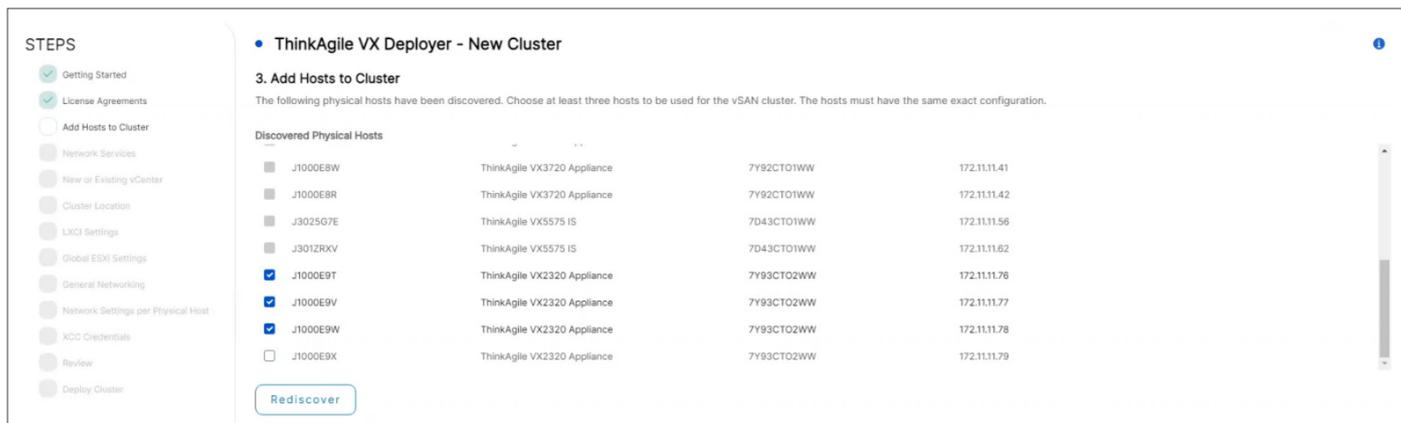
In this test area, we created a new cluster from three available ThinkAgile VX hosts using the ThinkAgile VX Deployer wizard interface. These steps begin after logging in to the ThinkAgile VX Deployer tool.

### Steps

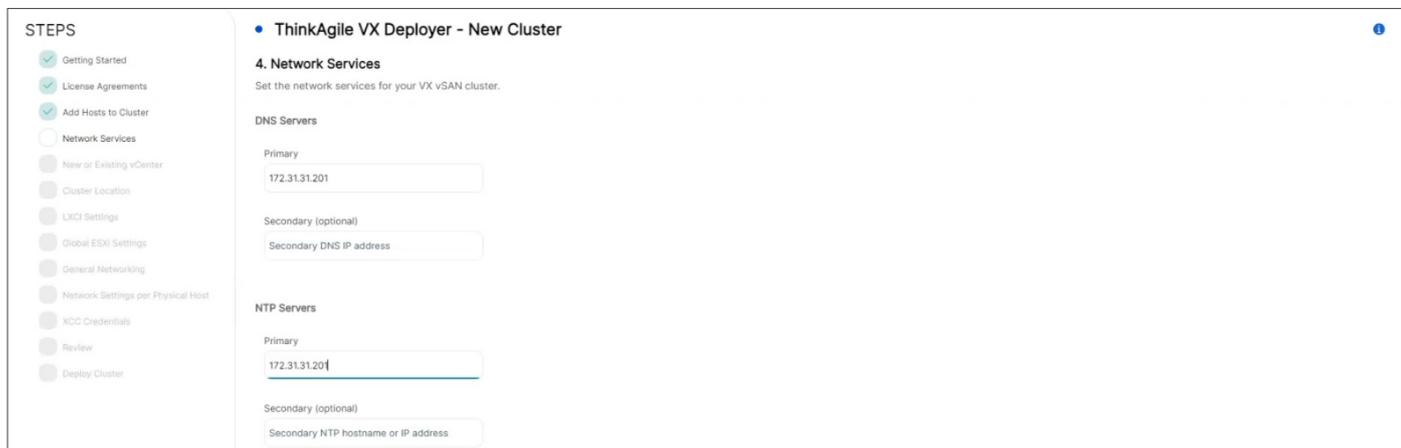
1. From the **Getting Started** menu, select **Install New Cluster**.



2. Accept the license agreements.
3. Add the three initial hosts to the cluster.



4. Provide DNS and NTP server information.



5. Provide domain information for the new vCenter server and passwords for user accounts.

**STEPS**

- Getting Started
- License Agreements
- Add Hosts to Cluster
- Network Services
- New or Existing vCenter
- Cluster Location
- LXCI Settings
- Global ESXi Settings
- General Networking
- Network Settings per Physical Host
- XCC Credentials
- Review
- Deploy Cluster

**ThinkAgile VX Deployer - New Cluster**

### 5. New or Existing vCenter

You can install a new vCenter server or you can use an existing one. Choose one of the following options, and then complete the settings required for that option.

Install a new vCenter server

Fully Qualified Domain Name

SSO (Single Sign-On) Domain

User ID

Password

Confirm Password

User ID

Password

Confirm Password

Use an existing vCenter server

6. Provide cluster and physical location information.

**STEPS**

- Getting Started
- License Agreements
- Add Hosts to Cluster
- Network Services
- New or Existing vCenter
- Cluster Location
- LXCI Settings
- Global ESXi Settings
- General Networking
- Network Settings per Physical Host
- XCC Credentials
- Review
- Deploy Cluster

**ThinkAgile VX Deployer - New Cluster**

### 6. Cluster Location

Specify the details for the vSAN cluster.

**Cluster Location in vCenter**

vCenter Datacenter

vSAN Cluster

**Physical Location of Cluster**

Organization Name

Region Name

Site Name

7. Set the ThinkAgile VX Deployer tool to install Lenovo XClarity Integrator, and then provide host/network configuration information and an admin password.

**STEPS**

- Getting Started
- License Agreements
- Add Hosts to Cluster
- Network Services
- New or Existing vCenter
- Cluster Location
- LXCI Settings
- Global ESXi Settings
- General Networking
- Network Settings per Physical Host
- XCC Credentials
- Review
- Deploy Cluster

**ThinkAgile VX Deployer - New Cluster**

### 7. LXCI Settings

Specify whether to install a new instance of Lenovo XClarity Integrator (LXCI) for vCenter, which enables you to manage the ThinkAgile VX cluster hardware through vCenter. If you choose to install LXCI, you must specify the network and user account settings for LXCI.

Install LXCI

**Networking**

LXCI Host Name:     LXCI Domain:     Management IP Address:

XCC Network IP Address:     XCC Network VLAN ID:

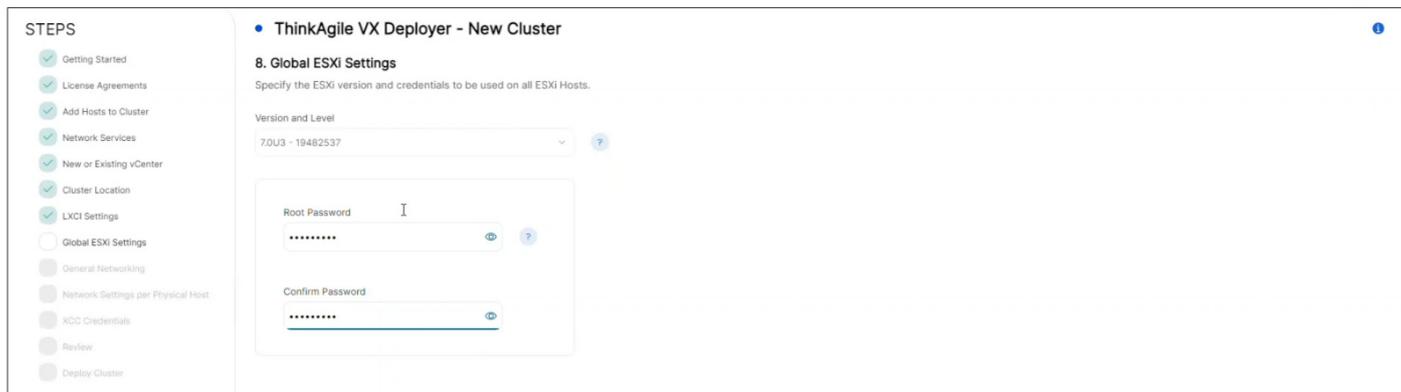
**Credentials**

User ID:

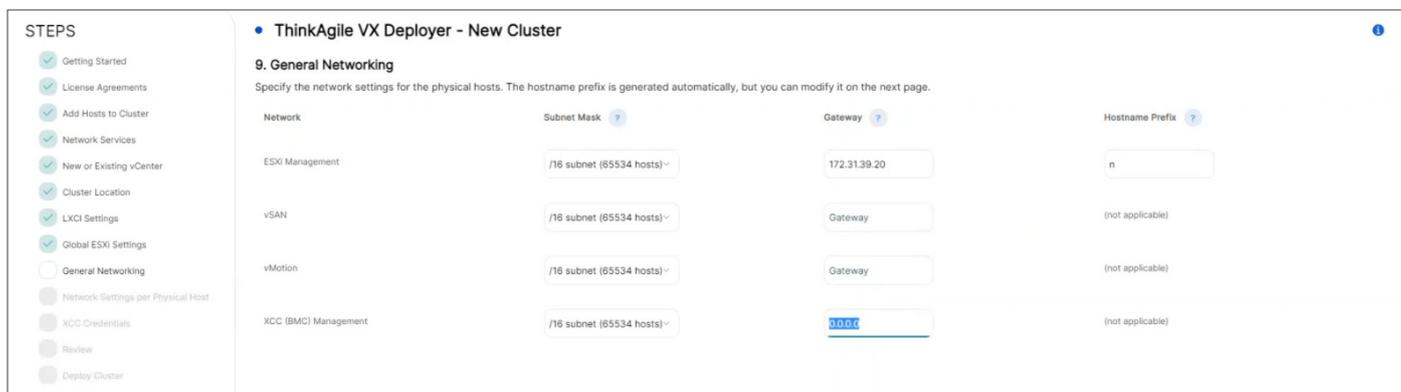
Password:

Confirm Password:

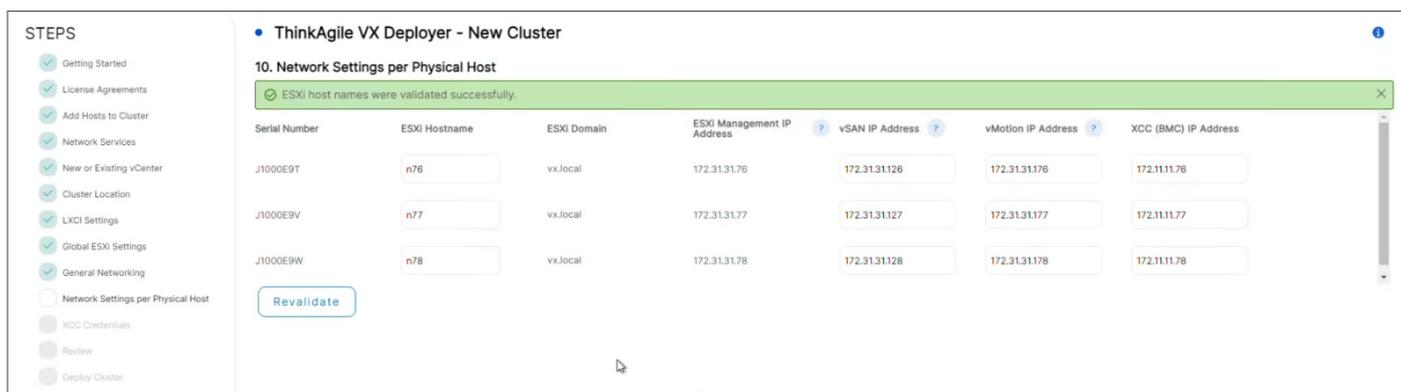
8. Set the new password for ESXi management for all hosts.



9. Provide netmask information for the vSAN, VMware vSphere® vMotion®, and Lenovo XClarity Controller management networks, in addition to netmask, default gateway, and hostname prefix information for the ESXi network.



10. Edit the hostnames and provide vSAN and vSphere vMotion IP information for each host. Lenovo XClarity Controller IPs should be auto-filled, but they can be edited here.



11. Provide the new Lenovo XClarity Controller password for all hosts (which can be configured as a common password or as a unique password for each host).

**STEPS**

- Getting Started
- License Agreements
- Add Hosts to Cluster
- Network Services
- New or Existing vCenter
- Cluster Location
- LXCI Settings
- Global ESXi Settings
- General Networking
- Network Settings per Physical Host
- XCC Credentials
- Review
- Deploy Cluster

**ThinkAgile VX Deployer - New Cluster**

**11. XCC Credentials**

Each physical host has an XCC (BMC), which is used for hardware management. To simplify management, specify a common XCC password to be assigned to all hosts. In addition, you must specify the current XCC passwords. The factory default password is listed for the current XCC password, but note that logging into an XCC for the first time forces a password change.

Specify New Common XCC Password - This new password will be configured for all the XCCs, for User ID: USERID

Password: [password field]

Re-enter Password: [password field]

Specify Current XCC Password for the 3 Physical Hosts Selected for Cluster

Use the same XCC password for all physical hosts

Serial #	VX Model	Machine Type	IPv4 of XCC	XCC User ID	Current XCC Password
J1000E9T	ThinkAgile VX2320 Appliance	7Y93CTO2WW	172.11.11.76	USERID	[password field]
J1000E9V	ThinkAgile VX2320 Appliance	7Y93CTO2WW	172.11.11.77	USERID	[password field]
J1000E9W	ThinkAgile VX2320 Appliance	7Y93CTO2WW	172.11.11.78	USERID	[password field]

12. Review the configuration information and export a configuration file for future use.

**STEPS**

- Getting Started
- License Agreements
- Add Hosts to Cluster
- Network Services
- New or Existing vCenter
- Cluster Location
- LXCI Settings
- Global ESXi Settings
- General Networking
- Network Settings per Physical Host
- XCC Credentials
- Review
- Deploy Cluster

**ThinkAgile VX Deployer - New Cluster**

**12. Review**

**Warning:** All data on the servers listed in the Physical Hosts section will be deleted as a result of this deployment.

Click **Deploy Cluster** to begin the deployment. It can take some time to complete, depending upon the number of nodes that are being used to create the vSAN Cluster.

**Note:** You can monitor the deployment, but you cannot stop the deployment after it has started.

**General Cluster Settings**

Organization Name	ACME
Region	Space
Site	MoonBase
vCenter Datacenter	TestDataCenter
vSAN Cluster	TestCluster
Host Version and Level	7.0U3 - 19482537

**Physical Hosts**

Serial #	ESXi Fully Qualified Domain Name	ESXi Management IP	vSAN IP	vMotion IP	XCC (BMC) IP Address
J1000E9T	n76.vx.local	172.31.31.76	172.31.31.126	172.31.31.176	172.11.11.76
J1000E9V	n77.vx.local	172.31.31.77	172.31.31.127	172.31.31.177	172.11.11.77
J1000E9W	n78.vx.local	172.31.31.78	172.31.31.128	172.31.31.178	172.11.11.78

**vCenter Management**

New or Existing vCenter	New
vCenter Server Version	7.0.3.00500
Fully Qualified Domain Name	uslemvcsa01.vx.local
SSO	vsphere.local

**LXCI Management**

Fully Qualified Domain	uslemxci01.vx.local
Name	
User ID	admin
Resolved IP	172.31.31.219
XCC Network IP Address	172.11.11.219
XCC Network VLAN ID	11

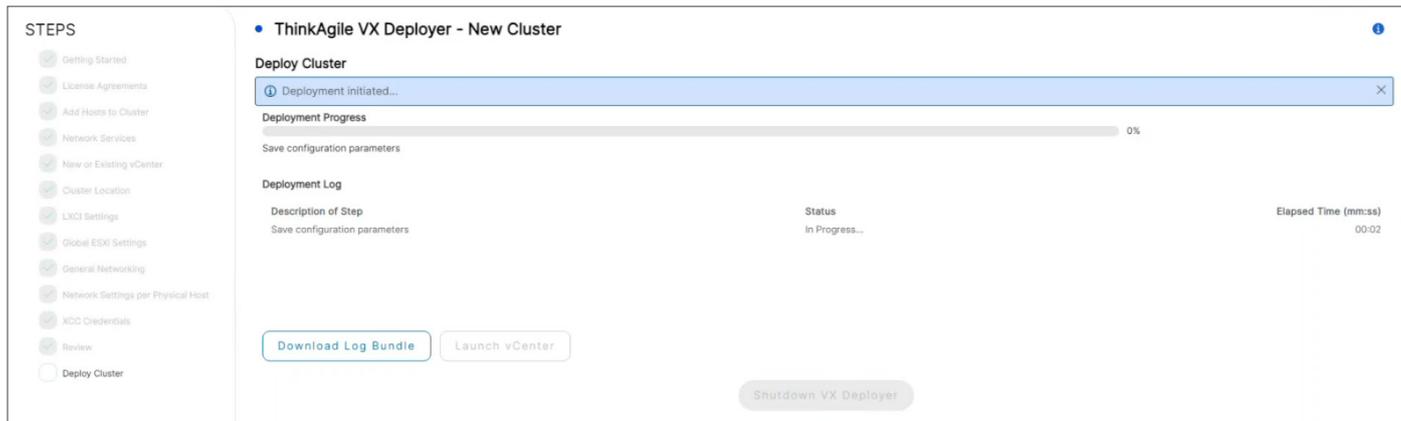
**Networking Services**

Primary DNS Server	172.31.31.201
Primary NTP Server	172.31.31.201

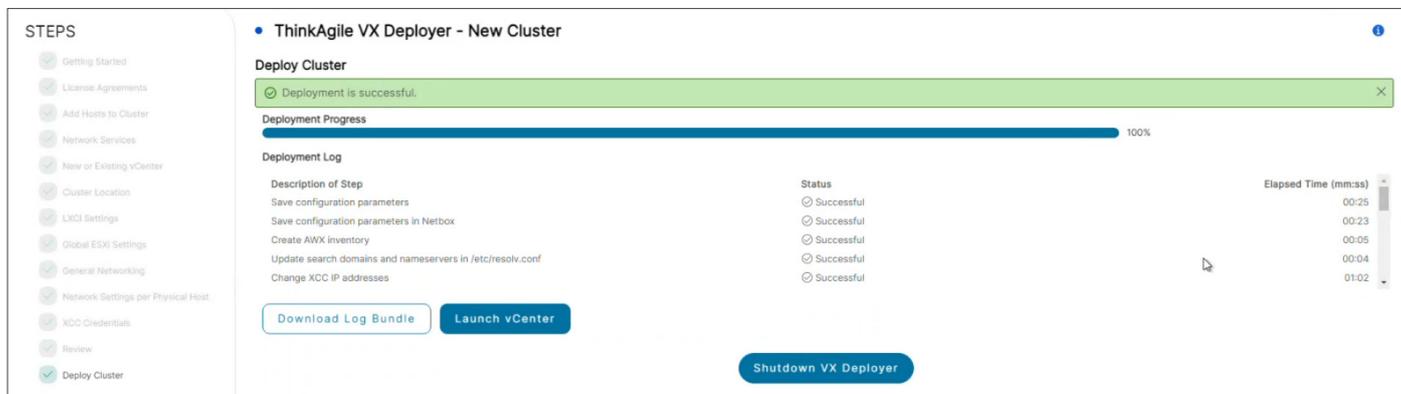
**ESXi Management Network** **XCC (BMC) Management Network**

Buttons: Print, Back, Deploy Cluster, Export Configuration

13. Click **Deploy Cluster**, and then monitor the deployment's progress.



14. The ThinkAgile VX Deployer tool will notify you when deployment is complete.



### Timings

The time it took to complete each of the steps above is shown below:

Step	Time
Getting Started	0:08
License Agreements	0:04
Add Hosts to a Cluster	0:31
Network Services	0:14
VMware vCenter® Configuration	0:47
Cluster Location	0:44
Lenovo® XClarity® Integrator Settings	1:16
Global VMware ESXi™ Settings	0:37
General Networking	0:17
Network Settings/Host	1:31
Lenovo XClarity Controller Credentials	0:13
Review	1:34
Deployment	57:15
Total	1:05:11

## Test Area 2: Install a New Cluster Using a Configuration File

When we installed a new cluster in test area 1, we exported a configuration file during the final review and before deployment. In this test area, we used that configuration file to further automate the process of creating another new cluster. The process here is essentially the same as in test area 1, stepping through the same wizard, except that most of the information on the screens, with the exception of password credentials, is now automatically filled in. Screenshots are not included in this test area because the screens look the same as in the previous test area. These steps begin after logging in to the ThinkAgile VX Deployer tool.

### Steps

1. Select **Use Configuration File**.
2. Click **Import the VX Configuration File**.
3. Accept the license agreements.
4. Confirm the included hosts in the cluster.
5. Confirm the DNS and NTP server information.
6. Provide vCenter credentials.
7. Confirm location details.
8. Provide Lenovo XClarity Integrator details.
9. Provide a new ESXi password.
10. Confirm general networking settings.
11. Confirm per-host networking settings.
12. Provide the new common Lenovo XClarity Controller password.
13. Review the configuration and deploy the cluster.

### Timings

The time it took to complete each of the steps above is shown below:

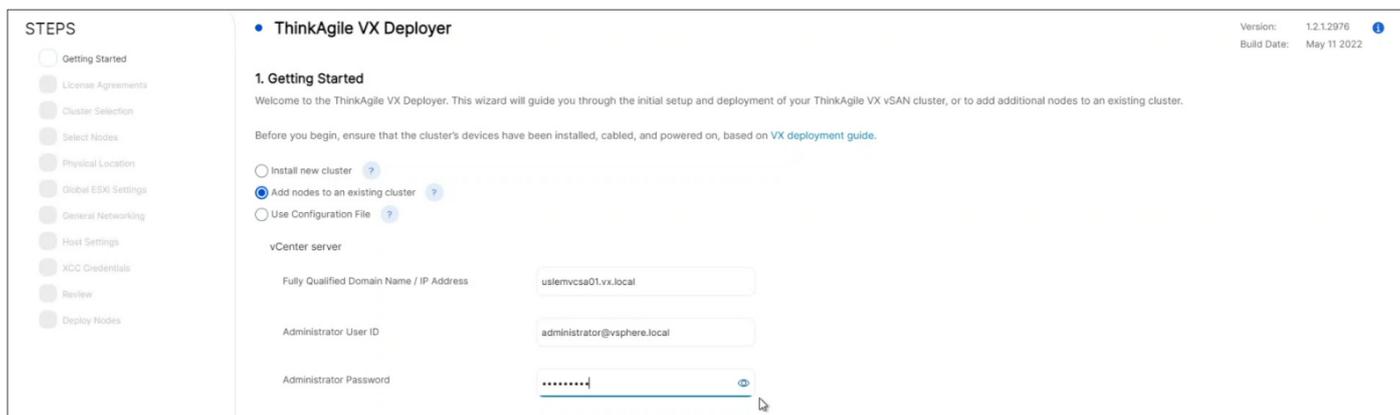
Step	Time
Getting Started	0:26
License Agreements	0:04
Add Hosts to a Cluster	0:24
Network Services	0:08
VMware vCenter® Configuration	0:50
Cluster Location	0:40
Lenovo® XClarity® Integrator Settings	0:38
Global VMware ESXi™ Settings	0:30
General Networking	0:05
Network Settings/Host	0:23
Lenovo XClarity Controller Credentials	0:11
Review	1:05
Deployment	57:17
Total	1:02:41

## Test Area 3: Add Nodes to an Existing Cluster

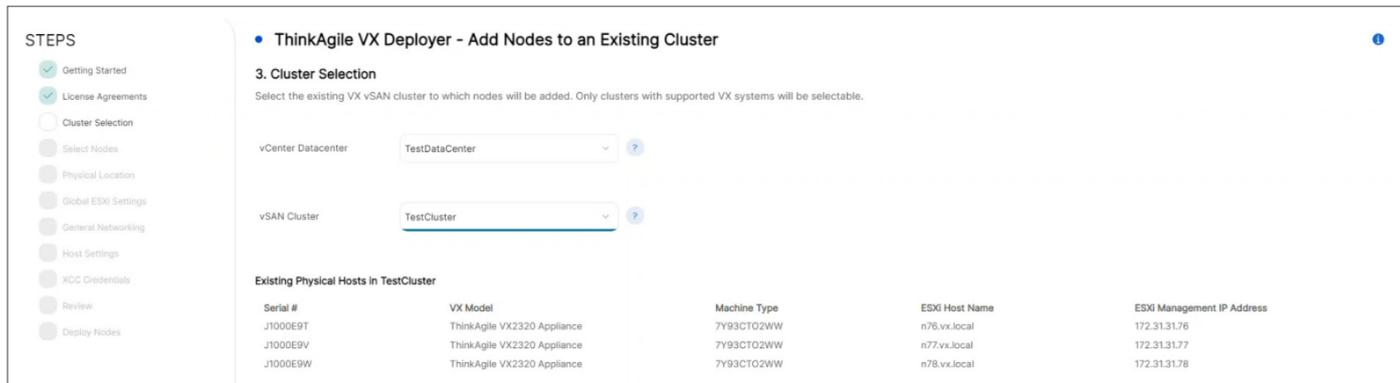
In this test area, we extended the cluster to add a fourth ThinkAgile VX host using the ThinkAgile VX Deployer wizard interface. These steps begin after logging in to the ThinkAgile VX Deployer tool.

### Steps

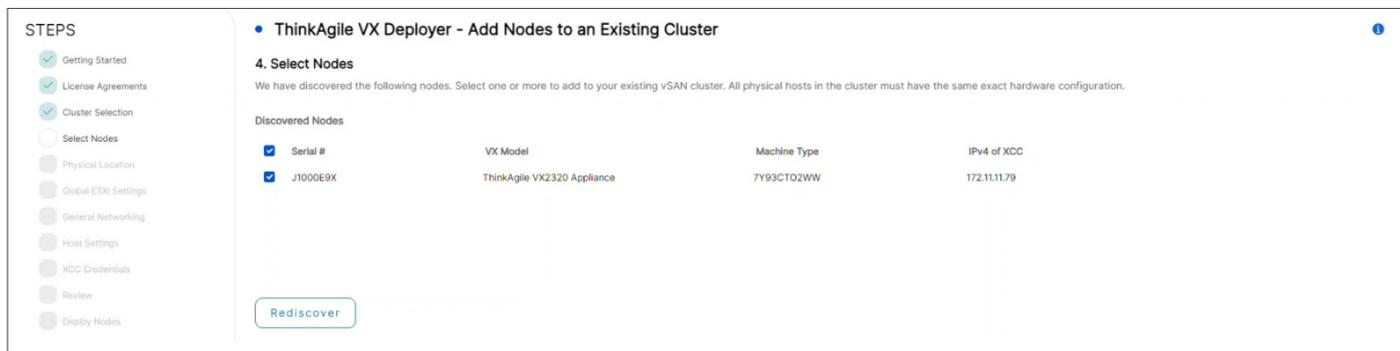
1. Select **Add Nodes to an Existing Cluster**, and then provide the vCenter hostname and login information.



2. Accept the license agreements.
3. Select the data center/vSAN cluster to which to add the host.



4. Select the desired node to add to the cluster.



5. Select the physical location for the new host.

**STEPS**

- Getting Started
- License Agreements
- Cluster Selection
- Select Nodes
- Physical Location**
- Global ESXi Settings
- General Networking
- Host Settings
- XCC Credentials
- Review
- Deploy Nodes

**ThinkAgile VX Deployer - Add Nodes to an Existing Cluster**

### 5. Physical Location

Specify the physical location for your VX vSAN cluster.

Organization Name: ACME

Region Name: Space

Site Name: MoonBase

6. Set the new ESXi management password.

**STEPS**

- Getting Started
- License Agreements
- Cluster Selection
- Select Nodes
- Physical Location
- Global ESXi Settings**
- General Networking
- Host Settings
- XCC Credentials
- Review
- Deploy Nodes

**ThinkAgile VX Deployer - Add Nodes to an Existing Cluster**

### 6. Global ESXi Settings

Specify the ESXi version and credentials to be used on all ESXi Hosts.

Version and Level: 7.0U3 - 19482537

Root Password: [masked]

Confirm Password: [masked]

7. Set the netmask information for the Lenovo XClarity Controller (XCC) network and the netmask, gateway, and hostname prefix for the ESXi management network.

**STEPS**

- Getting Started
- License Agreements
- Cluster Selection
- Select Nodes
- Physical Location
- Global ESXi Settings
- General Networking**
- Host Settings
- XCC Credentials
- Review
- Deploy Nodes

**ThinkAgile VX Deployer - Add Nodes to an Existing Cluster**

### 7. General Networking

Specify the network settings for each host. At a minimum, you must specify the ESXi Management gateway and the XCC (BMC) Management gateway.

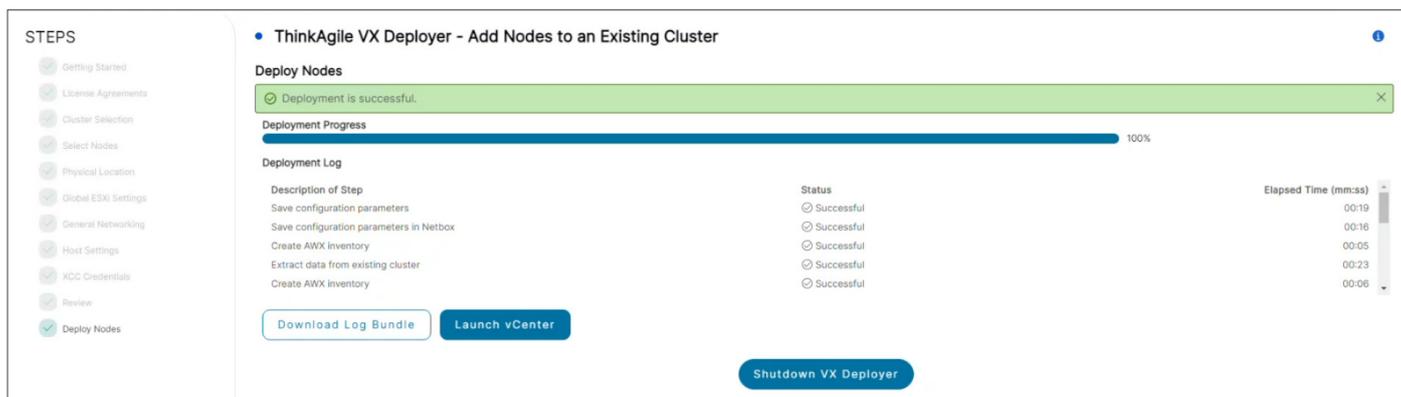
Network	Subnet Mask	Gateway	Hostname Prefix
ESXi Management	/16 subnet (65534 hosts)	172.31.39.20	n
vSAN	/16 subnet (65534 hosts)	Gateway	(not applicable)
vMotion	/16 subnet (65534 hosts)	Gateway	(not applicable)
XCC (BMC) Management	/16 subnet (65534 hosts)	0.0.0.0	(not applicable)

8. Edit the hostname, vSAN, and vSphere vMotion IP addresses for the new host.

9. Provide the new Lenovo XClarity Controller password for the new host.

10. Review the configuration and export a configuration file for future use.

11. Click **Deploy Cluster**, and then monitor the deployment’s progress.
12. The ThinkAgile VX Deployer tool will notify you when deployment is complete.



### Timings

The time it took to complete each of the steps above is shown below:

Step	Time
Getting Started	0:20
License Agreements	0:27
Cluster Selection	0:09
Select Nodes	0:33
Physical Location	0:19
VMware ESXi™ Settings	0:37
General Networking	0:22
Host Networking	0:43
Lenovo® XClarity® Controller Credentials	0:26
Review	0:43
Deployment	23:30
Total	28:09

## Test Area 4: Add Nodes to a Cluster Using a Configuration File

When we added a new node in test area 3, we exported a configuration file during the final review and before deployment. In this test area, we used that configuration file to further automate the process of adding the new host again. The process here is essentially the same as in test area 3, stepping through the same wizard, except that most of the information on the screens, with the exception of password credentials, is now automatically filled in. Screenshots are not included in this test area because they look nearly the same as in the previous test area. These steps begin after logging in to the ThinkAgile VX Deployer tool.

### Steps

1. Select **Add Notes to an Existing Cluster**.
2. Provide vCenter Server details.
3. Accept the license agreements.
4. Select the vCenter cluster to extend.
5. Select the node to add to the cluster.
6. Provide cluster location information.
7. Provide an ESXi password.
8. Confirm the general networking configuration.
9. Confirm the host networking configuration.
10. Provide a new Lenovo XClarity Controller password.
11. Review the configuration before adding a node.
12. Add a node to the cluster.

### Timings

The time it took to complete each of the steps above is shown below:

Step	Time
Getting Started	0:36
License Agreements	0:25
Cluster Selection	0:08
Select Nodes	0:24
Physical Location	0:10
VMware ESXi™ Settings	0:35
General Networking	0:20
Host Networking	0:30
Lenovo® XClarity® Controller Credentials	0:24
Review	0:40
Deployment	23:43
Total	27:55

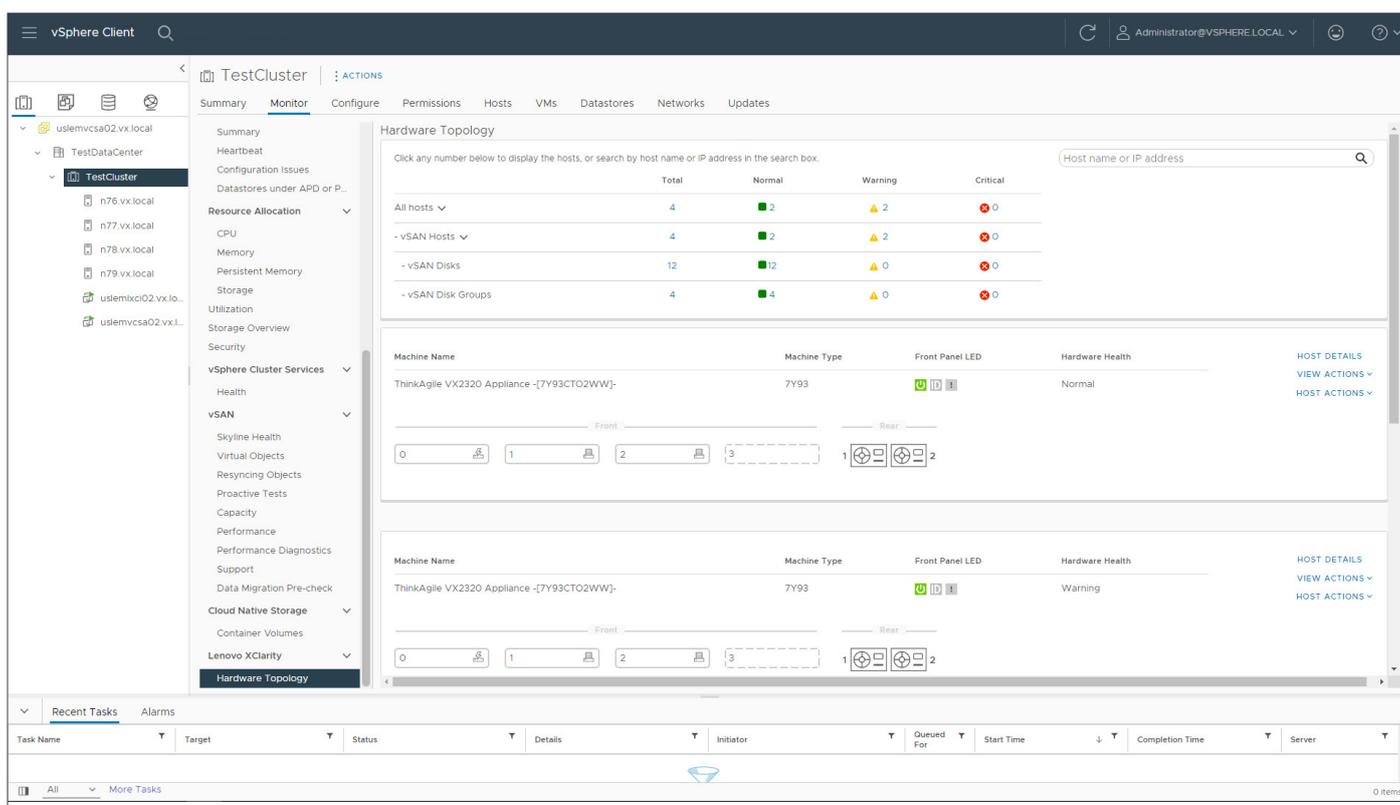
## Test Area 5: Remediating a Cluster in the Lifecycle Manager

One of the last tasks the ThinkAgile VX Deployer tool completes when deploying a cluster is deploying Lenovo XClarity Integrator and using it to manage the servers. This serves as the HSM for VMware vLCM and allows cluster-aware rolling updates. It also enables hardware-topology and server-event management.

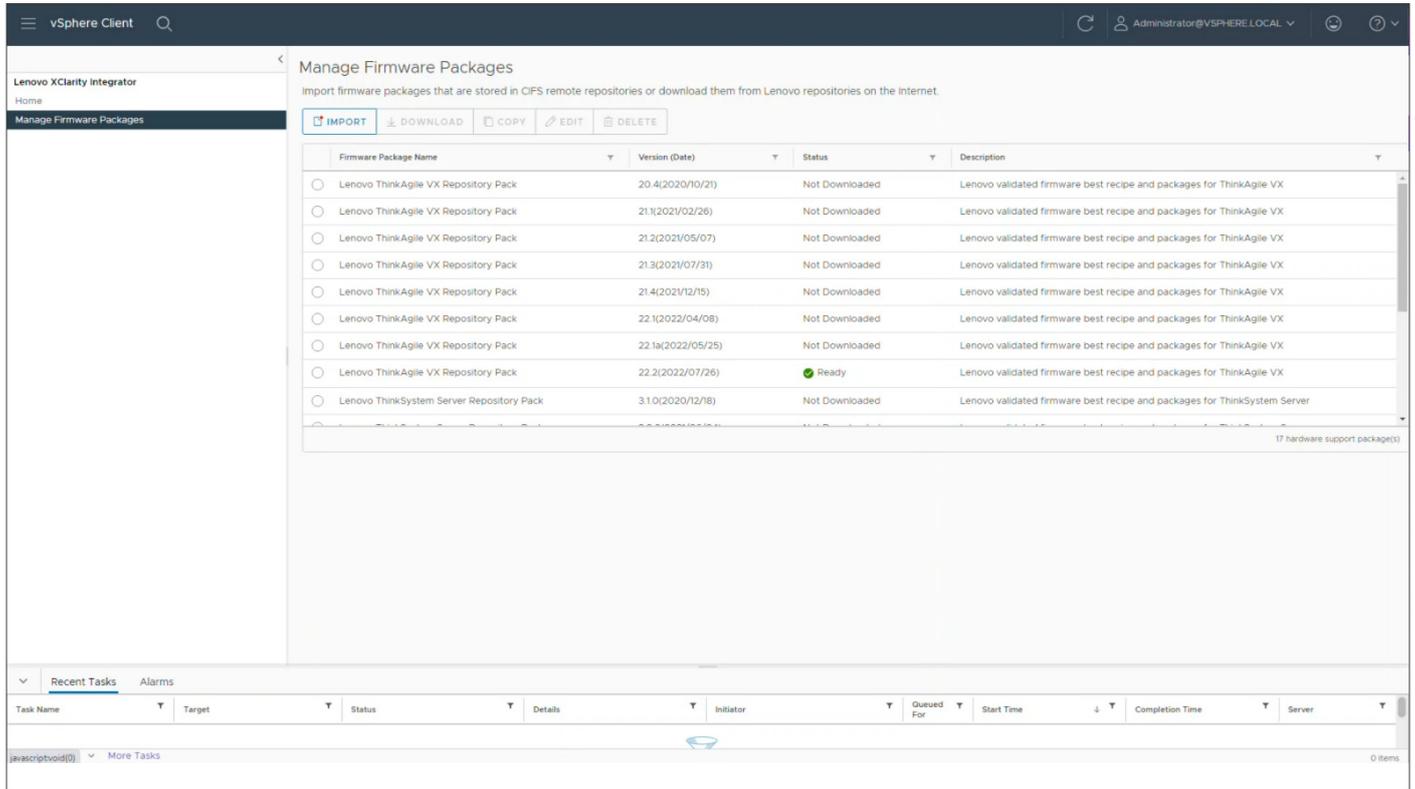
In this test area, we tested the process within vCenter to remediate the cluster.

### Steps

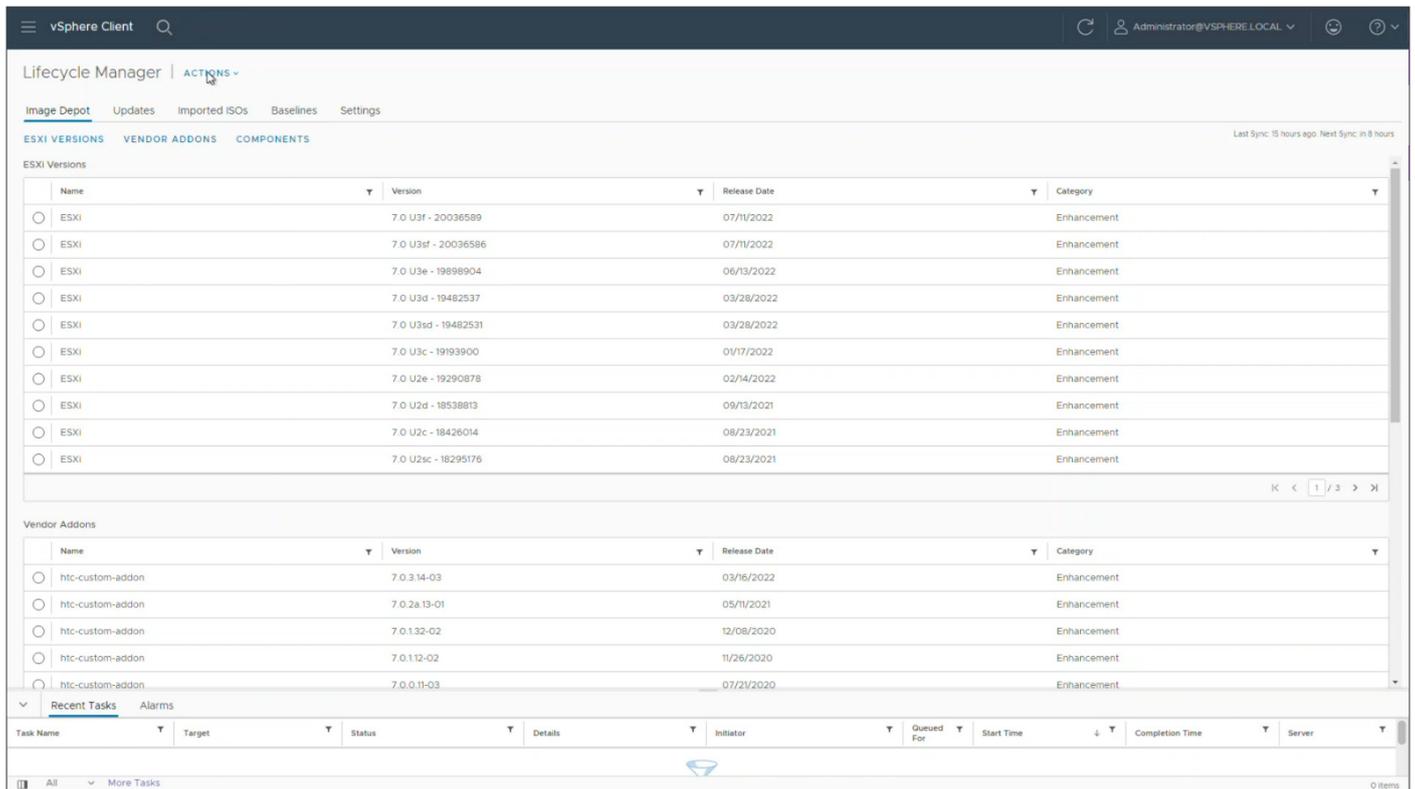
1. Launch VMware vCenter. (Note that there is a convenient launch button on the last screen of the ThinkAgile VX Deployer wizard.)
2. Before starting remediation, it's a good idea to look at the **Hardware Topology** screen to confirm no warnings need to be resolved first. Conveniently, there is no need to leave vCenter to map the virtual and physical attributes for the topology feature.



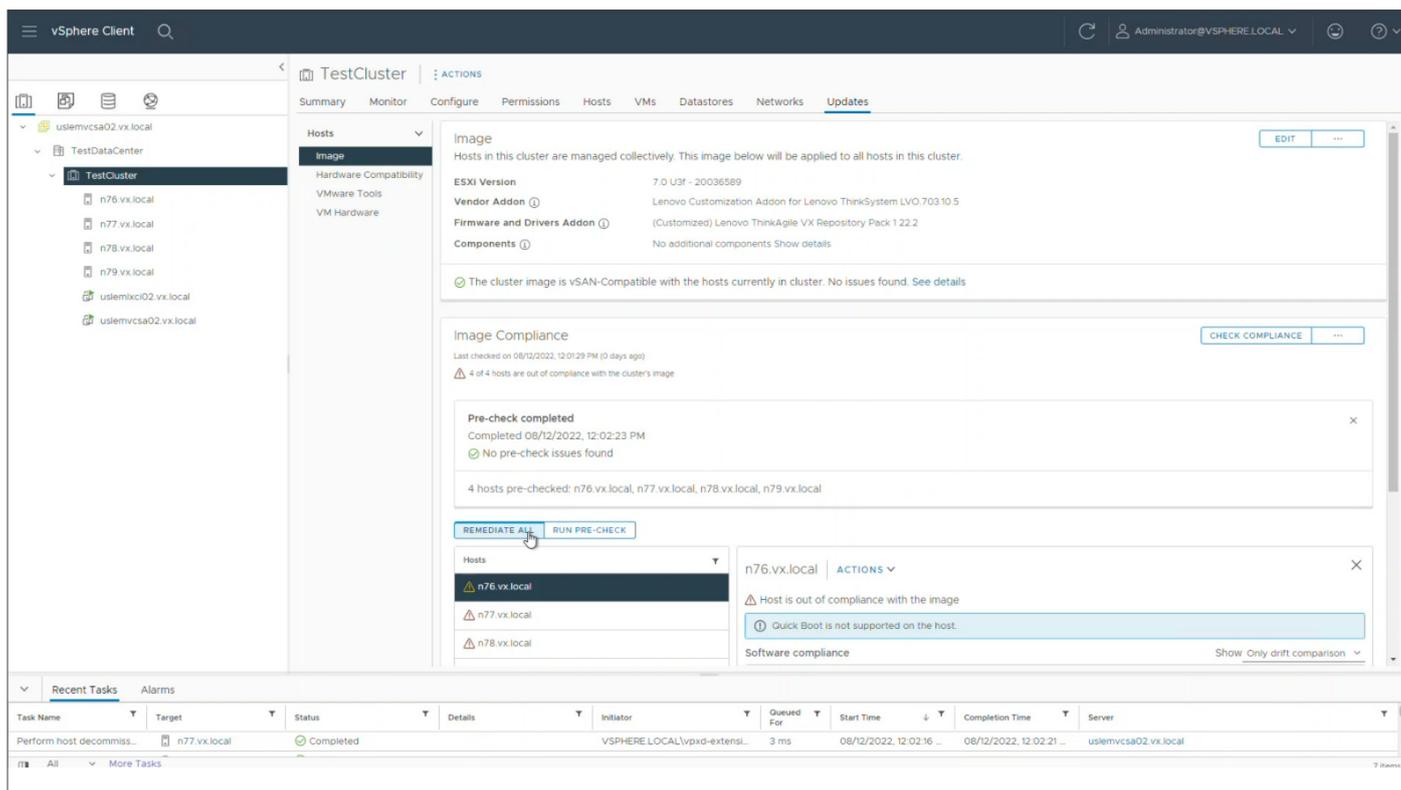
- To update firmware on the hosts in the cluster, first make sure that the requisite firmware package was uploaded in the XClarity Integrator repository.



- Verify **ESXi**, **Vendor Add-on**, and **Component** images were uploaded to vLCM. The ESXi version, repository package (firmware bundle), and add-on (driver bundle) are required to ensure certification compatibility with the vSphere hardware compatibility list (HCL).



5. With those Lenovo-specific uploads confirmed, continue with the normal vCenter remediation process by marking the cluster as needing an update:
  - a. Sync the updates and sync the HCL.
  - b. Set up a new update for the cluster in the cluster's **Updates** tab, and pick which ESXi version, vendor add-on, and firmware package you need for the update.
  - c. Check cluster-image compliance, and the software will verify nodes as compliant.
  - d. Run a pre-check before remediation to make sure there aren't issues on the cluster that would prevent successful updates.
6. Remediate the cluster by clicking **Remediate All**.



vLCM will show you the remediation in progress and will notify you when remediation is complete.

## Findings and Analysis

Prowess test engineers found the Lenovo ThinkAgile VX Deployer tool to be straightforward to use. The wizard-style interface proceeds intuitively from one screen to the next, with the tasks showing completed down the task list on the left. Each step is validated before the user can move on to the next step, which the test engineers appreciated because they knew that finished tasks were complete and correct and would not need to be revisited later. Contextual help is available to clarify instructions for select fields, and a [deployment guide](#) provides more details if they are needed.

It took about an hour to create a three-node cluster using the ThinkAgile VX Deployer wizard. Importantly, that included less than 10 minutes spent completing the wizard's dozen task screens and clicking **Deploy Cluster**, after which the deployment proceeded without interaction. Adding a fourth node to the cluster took just under half an hour—less than 5 minutes to complete the wizard and approximately 23 minutes to deploy without interaction. In a large environment, where there might be a large number of clusters to create or extend, the ability to start on the next cluster while monitoring the progress of the last one can significantly reduce the amount of time to complete multiple cluster deployments.

Using a configuration file to auto-fill fields in the wizard made the process easier to create and expand a cluster. When compared to deploying by manually stepping through the wizard, the process took about the same amount of time. In both cases, the two test runs were completed within seconds of each other. Two factors account for this. First, because the bulk of the time is taken after the wizard is completed, there is not much opportunity to save time completing the wizard. And second, multiple sets of credentials still need to be entered for security purposes, auto-filled data needs to be confirmed, and every **Next** button needs to be clicked. While the time savings was not significant, reducing the need to enter the same information repeatedly was a feature the test engineers appreciated, and one that can make deployment more easily repeatable, even by a less experienced engineer.

As part of deploying a new cluster, the ThinkAgile VX Deployer tool installs Lenovo XClarity Integrator as the HSM used by vCenter for firmware upgrades. We tested vCenter to verify the integration was complete, and vCenter was able to perform a remediation of the cluster—that is, upgrading the firmware in each of the nodes in the cluster. We found that all the pieces were in place for the remediation to be completed as expected, and the seamless integration was evident in the ability to map the virtual and physical attributes of the network topology.

## Learn More

- Learn more about Lenovo ThinkAgile Integrated Systems and VMware HCI at [www.lenovo.com/us/en/servers-storage/vmware-hci](http://www.lenovo.com/us/en/servers-storage/vmware-hci).
- View the ThinkAgile VX Deployment Guide (with ThinkAgile VX Deployer) at [https://thinkagile.lenovofiles.com/help/topic/com.lenovo.thinkagile.vx/vx\\_deployment\\_guide\\_with\\_vx\\_deployer.pdf](https://thinkagile.lenovofiles.com/help/topic/com.lenovo.thinkagile.vx/vx_deployment_guide_with_vx_deployer.pdf).
- Find this report and more at <https://www.prowesscorp.com/project/lenovo-thinkagile-vx-hci-easy-deployment-operation-vmware/>.