

云计算技术与应用



第09章：Backup and Convert

<https://aitcm.hactcm.edu.cn>

河南中医药大学信息技术学院（智能医疗行业学院）智能医疗教研室
河南中医药大学医疗健康信息工程技术研究所

2025年3月

讨论提纲

- ✓ **虚拟机的备份与恢复**
 - 虚拟机的备份模式
 - 第三方 VMware vSphere 的备份解决方案
 - VMware vSphere Replication
- ✓ **虚拟机的导入与导出**
 - 虚拟机导出为 OVF
 - 通过 OVF 部署虚拟机
- ✓ **转换（迁移到虚拟化，上云）**
 - VMware vCenter Converter
 - StarWind V2V Converter / P2V Migrator
- ✓ **扩展的管理工具**
 - RVTTools、HCI Bench
 - vSphere Mobile Client



1. 虚拟机的备份与恢复

1.1 虚拟机的备份模式

□ 选择备份解决方案，取决于要保护的数据是什么？

- 数据中心的配置
- 数据中心的数据
- 虚拟机
- 应用程序
- 虚拟机的运行状态
-

基于需求制定解决方案，不是通过技术方案完成工作。



1. 虚拟机的备份与恢复

1.1 虚拟机的备份模式

□ 对虚拟机进行备份有三种方式：

■ 通过代理备份：

- 在备份对象上安装客户端软件，执行备份任务。
- 用于 VM 或 VM 群集的备份，可保护物理环境或者业务数据。
- 例如：Veritas Backup Exec

■ 通过 vSphere 备份：

- 基于 vSphere 功能和 API，进行虚拟机的备份。
- 例如：Veeam Backup & Replication、Nakivo Backup & Replication

■ 通过专用设备实现备份：

- 备份一体机，从数据中心基础设施的底层进行备份。



1. 虚拟机的备份与恢复

1.1 虚拟机的备份模式

❑ 软件备份方案需使用特定协议从存储中读取数据，vSphere 支持四种：

■ Network Block Device, NBD:

- ❑ ESXi Host 使用 NBD 协议从存储中读取数据，并通过网络将其发送到备份程序。
- ❑ 此模式可用于任何基础结构配置，是最简单的实现方法。

■ Network Block Device Secure Sockets Layer, NBDSSL:

- ❑ 与 NBD 相同，但使用 SSL 对通过 TCP/IP 连接传递的数据进行加密。

■ SCSI HotAdd:

- ❑ 允许 VM 运行时动态添加或移除 SCSI 设备，实现存储资源的动态扩展或收缩。
- ❑ 数据不会通过网络，而是直接从数据存储读取和写入数据存储，首选模式。

■ Direct SAN:

- ❑ 数据直接从 SAN 或 iSCSI LUN 读取，数据传输速度最快。
- ❑ 如果 VM 的虚拟磁盘存储在通过 FC、FCoE 和 iSCSI 连接到 ESXi Host 的共享 SAN LUN 上，则可使用 Direct SAN 传输模式。

1. 虚拟机的备份与恢复

1.2 第三方 vSphere 数据备份方案

Veeam Backup and Replication

NAKIVO Backup and Replication

Altaro VM Backup

VMware Backup Solution | NAKIVO

https://www.nakivo.com/vmware-backup/

Company Contact us Sales +886 2 7735 4056 Support +852 8124 5762

NAKIVO

WHY NAKIVO SOLUTIONS INTEGRATIONS PRICING PARTNERS SUPPORT

START FREE TRIAL EN

Leading VMware Backup Solution

- ✓ Native support for VMware v5.5 – 8.0.2^{NEW}
- ✓ Instant granular and VM recovery
- ✓ Anti-ransomware features
- ✓ Cloud backup integration
- ✓ Subscription and perpetual licenses

DOWNLOAD FREE TRIAL SCHEDULE DEMO



BENEFITS FOR MSPS PRICING RESOURCES FAQ

EIFFAGE SIEMENS JOHN'S HOPKINS UNIVERSITY HONDA RADISSON HOTELS CISCO

Everything You Need for VMware Backup and Recovery

Advanced Virtual Machine Backup

Agentless backups using VMware's native snapshot

Online - Chat with us

VMware vSphere Replication Solution | NAKIVO

https://www.nakivo.com/vmware-replication/

Company Contact us Sales +886 2 7735 4056 Support +852 8124 5762

NAKIVO

WHY NAKIVO SOLUTIONS INTEGRATIONS PRICING PARTNERS SUPPORT

START FREE TRIAL EN

VMware Replication from NAKIVO

NAKIVO Backup & Replication provides multiple disaster recovery features for VMware vSphere to help keep RTOs and RPOs to a minimum for mission critical VMs. Use these features to ensure high availability during disruptions, increase IT infrastructure resilience and maintain business continuity.

- ✓ Real-Time Replication^{RTA}
- ✓ Replication from Backup
- ✓ Automated Failover
- ✓ Site Recovery Orchestration

TRY FOR FREE REQUEST A DEMO



OVERVIEW KEY BENEFITS PRICING FAQ

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Leading Brands Trust NAKIVO

VMware vSphere Replication at a Glance

Online - Chat with us

Altaro VM Backup Software for VM: X

https://www.altaro.com/vmware-backup/

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Virtual Machine Backup for VMware

Full control over your VMware backup jobs across all hosts

Watch Demo Download your Free Trial

30-day trial + free for micro businesses
Get started in < 15 minutes

spiceworks 5 stars 548 Peer-Reviewed
Users Love Us
Leader 2023
PCE TOP 5
WE ARE BUSINESS
2023 award partner
2023 WINNER
STORAGE AWARDS
Cloud Product of the Year
IIPRO

vmware

Protect your VMware environment easily and cost-effectively, using VM Backup. Enjoy full control over your VMware virtual machine (VM) backup tasks across all hosts through an intuitive interface, and set your mind at rest thanks to award-winning 24/7 support, making VM Backup your logical choice for VMware backup.

POWERFUL FUNCTIONALITY

RANSOMWARE PROTECTION
LEVERAGING IMMUTABLE CLOUD STORAGE

FAST, RELIABLE BACKUPS AND RESTORES

EASE OF USE AND UNBEATABLE VALUE

Uncomplicated, powerful functionality

A backup and replication solution for VMware must provide flexibility and power to give you confidence in your backup strategy. You need to be able to replicate data to an offsite location or a removable drive, to be able to restore individual files or emails, to restore from different points in time, to verify backup integrity, and minimize downtime.



Most importantly, you need a solution you can rely on. VM Backup meets this need as it:

- Removes complexities from VMware to enable you to **easily manage backups and fast restores**
- Takes care of the complex configurations and enables you to manage and monitor backups across all your **VMware hosts in a single view**
- Allows you to drag and drop VMs into a **schedule and retention policy**



Altaro VM Backup Software for VM: X

https://www.altaro.com/vmware-backup/

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- Takes care of the complex configurations and enables you to manage and monitor backups across all your **VMware hosts in a single view**
- Allows you to drag and drop VMs into a **schedule and retention policy**
- Instantly restore** an email with just a few clicks
- Configure **automated backup verification** for peace of mind
- Supports multiple cloud storage providers** - Through full native integration with **MS Azure**, **Amazon S3** and **Wasabi**, VM Backup enables you to easily store backups using the cloud provider of your choice.

Check out all features View full pricing and editions Watch a 10 min Demo. No registration required

1. 虚拟机的备份与恢复

1.3 vSphere Replication

- vSphere Replication 是 vCenter Server 的扩展。
 - 实现 VM 的复制和恢复。
 - 是基于存储复制的解决方案，可与 Site Recovery Manager 结合使用。
 - vSphere Replication 基于文件的异步复制，在 VM 级别提供高效、低成本、简单且功能强大的复制。
 - vSphere Replication 的备份恢复的最小周期为 5 分钟，不支持实时备份。
 - vSphere Replication 不支持 VM 快照的复制。
 - vSphere Replication 依赖于 vCenter Server 进行配置和管理。



1. 虚拟机的备份与恢复

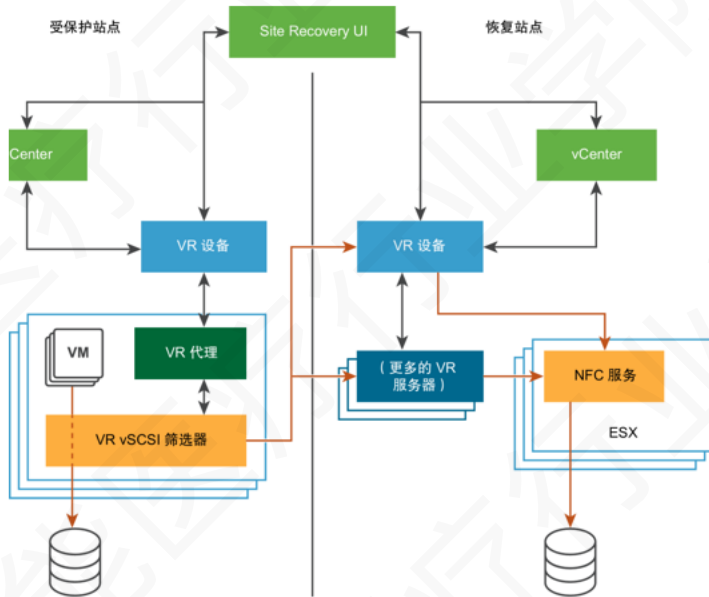
1.3 vSphere Replication

□ vSphere Replication 的工作方式

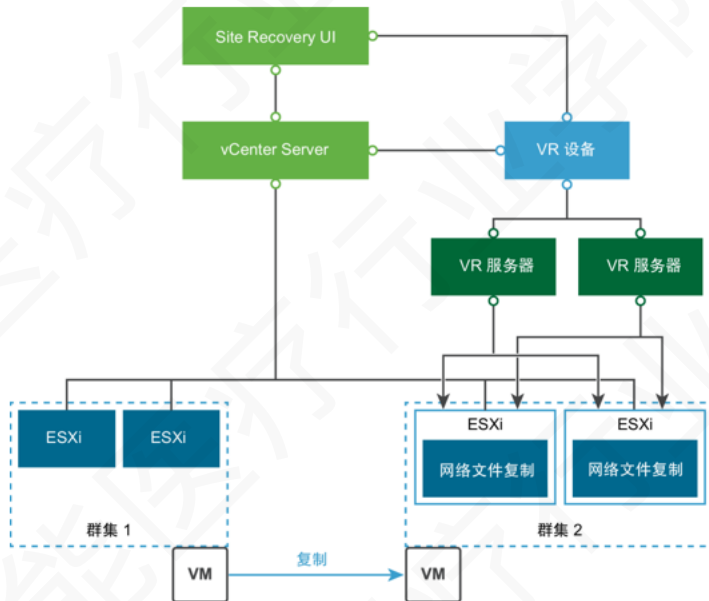
- 在两个 vCenter Server 间进行复制
 - vSphere Replication 会同时安装在源站点和目标站点上。
 - 每个 vCenter Server 上部署一个 vSphere Replication 设备。
 - 可以部署附加 vSphere Replication 服务器。
- 在一个 vCenter Server 中进行复制
 - vCenter Server 中添加多个 vSphere Replication 服务器，将虚拟机复制到其他集群。
- 复制到共享目标站点



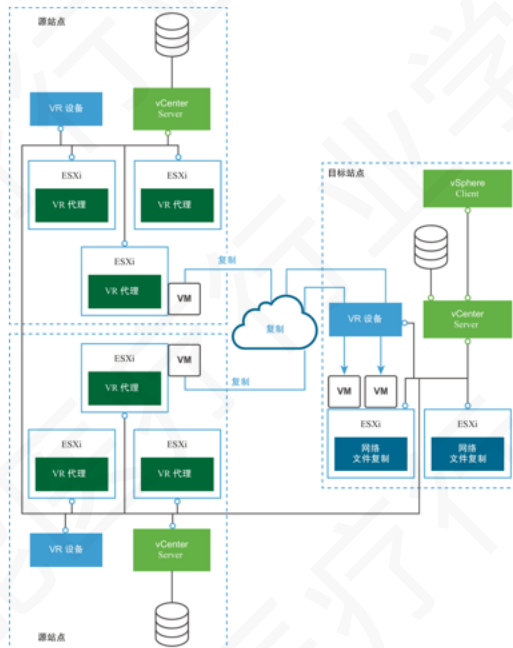
在两个 vCenter Server 间进行复制



在一个 vCenter Server 中进行复制



复制到共享目标站点



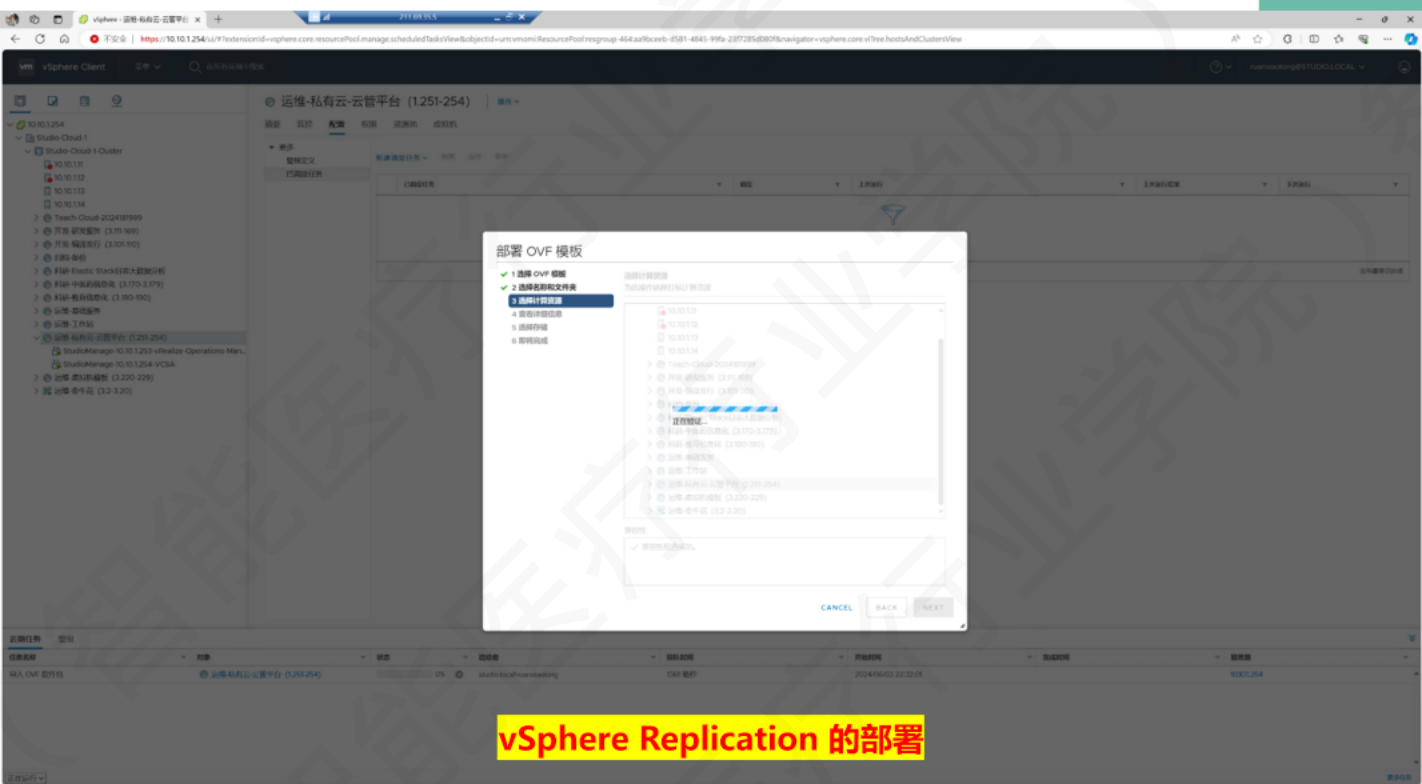
1. 虚拟机的备份与恢复

1.3 vSphere Replication

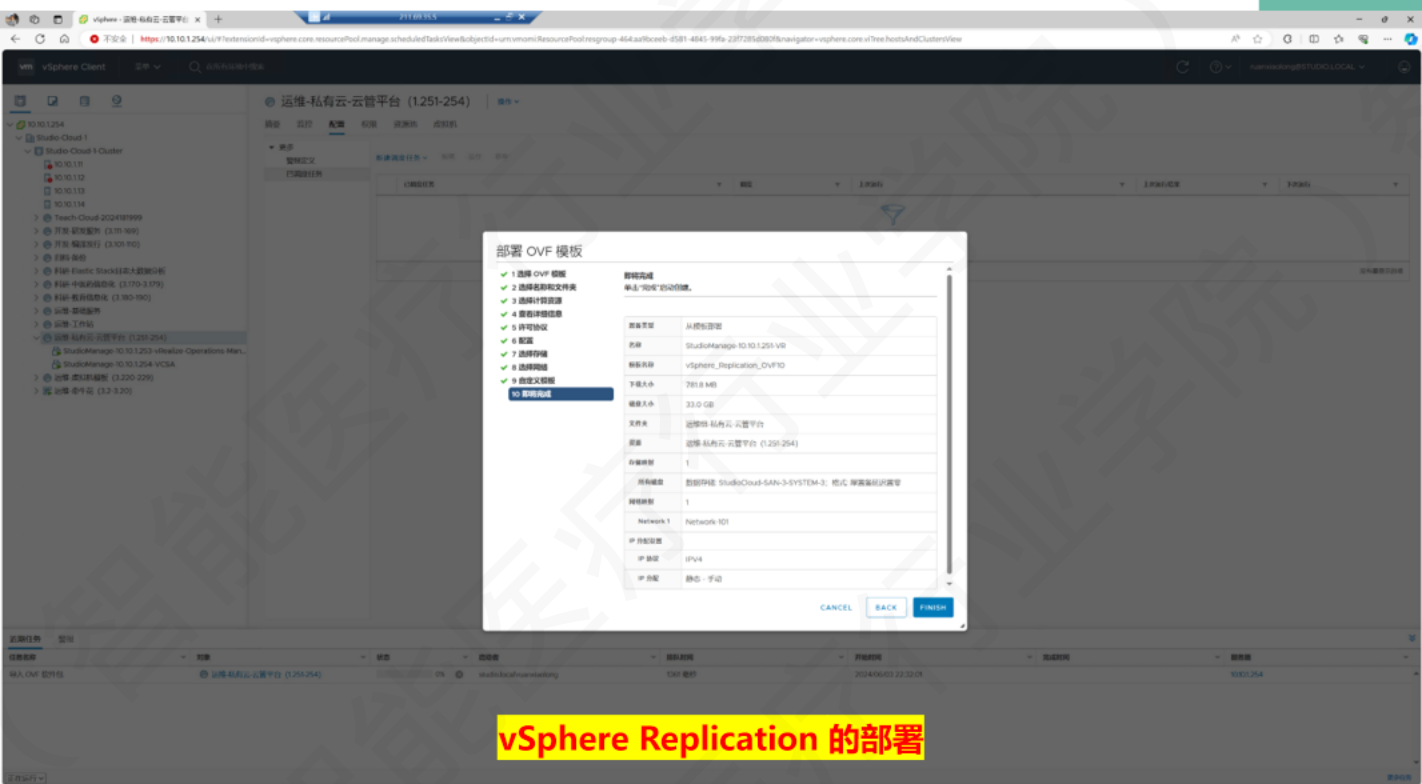


部署 vSphere Replication
使用 vSphere Replication

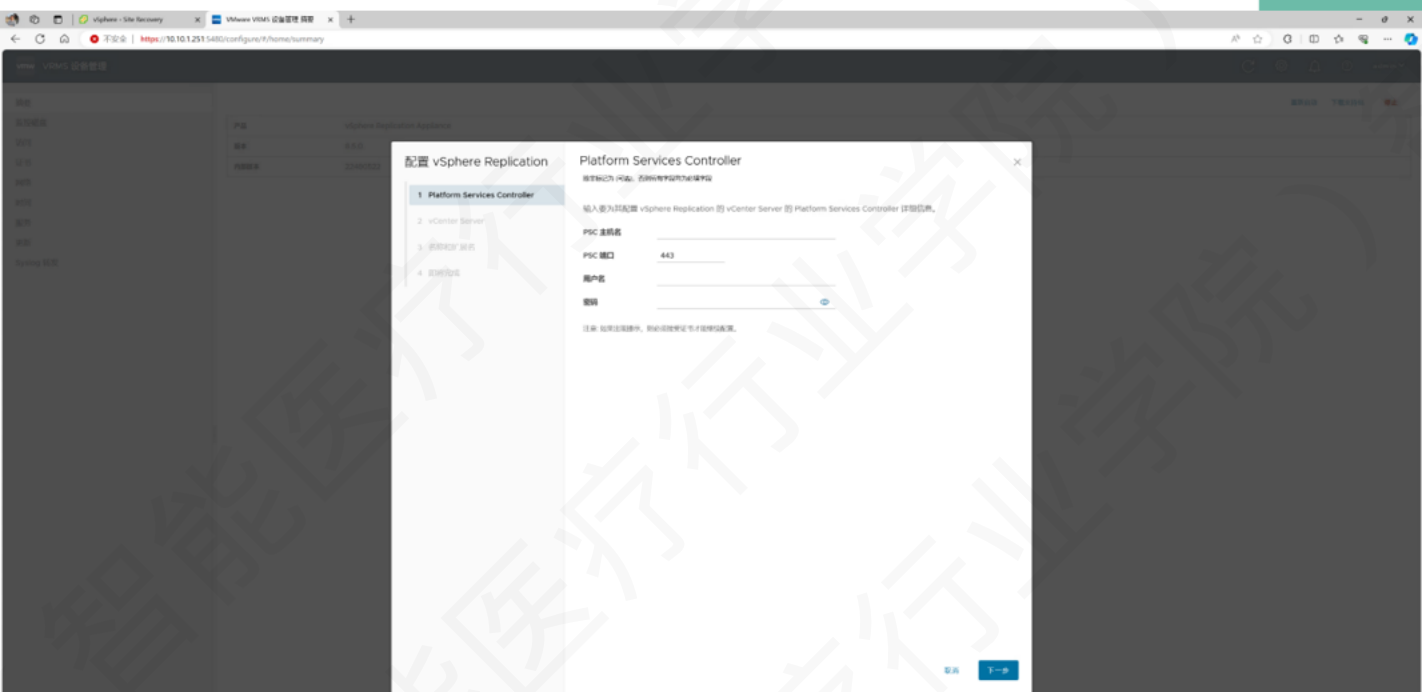




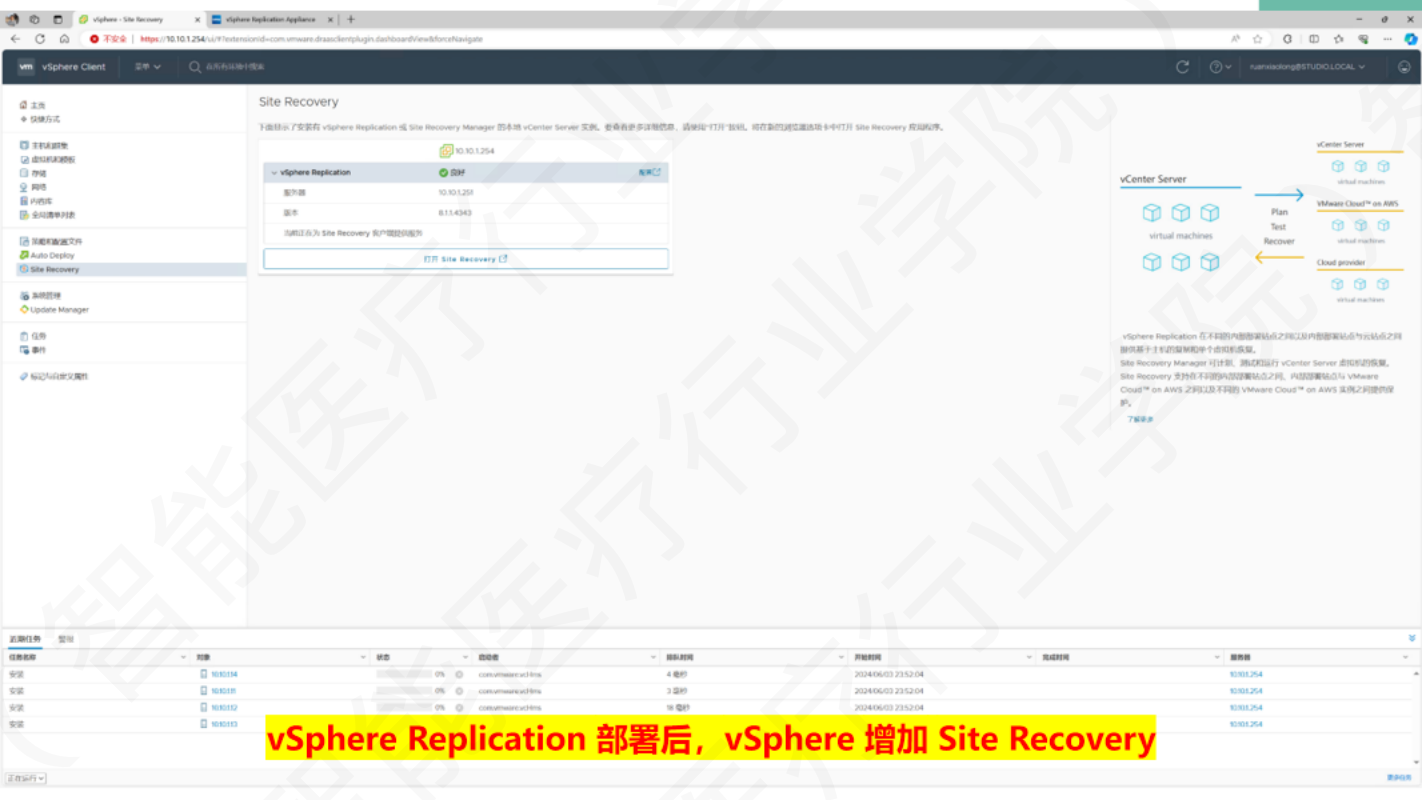
vSphere Replication 的部署



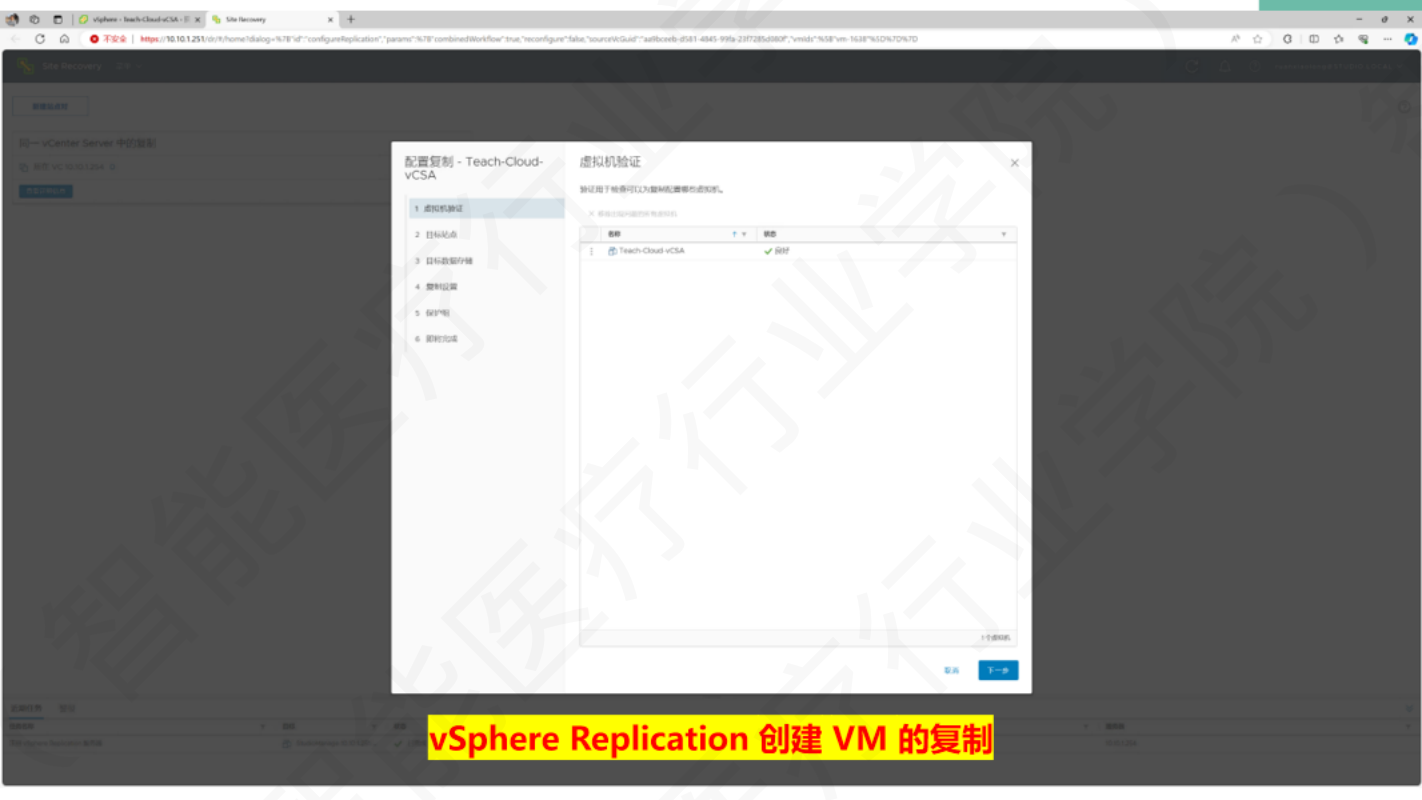
vSphere Replication 的部署



vSphere Replication 的部署



vSphere Replication 部署后, vSphere 增加 Site Recovery



配置复制 - Teach-Cloud-VCSA

1 虚拟机验证

2 目标站点

3 目标数据存储

4 复制设置

5 保护策略

6 复制方式

虚拟机验证

验证用于检查可以复制配置哪些虚拟机。

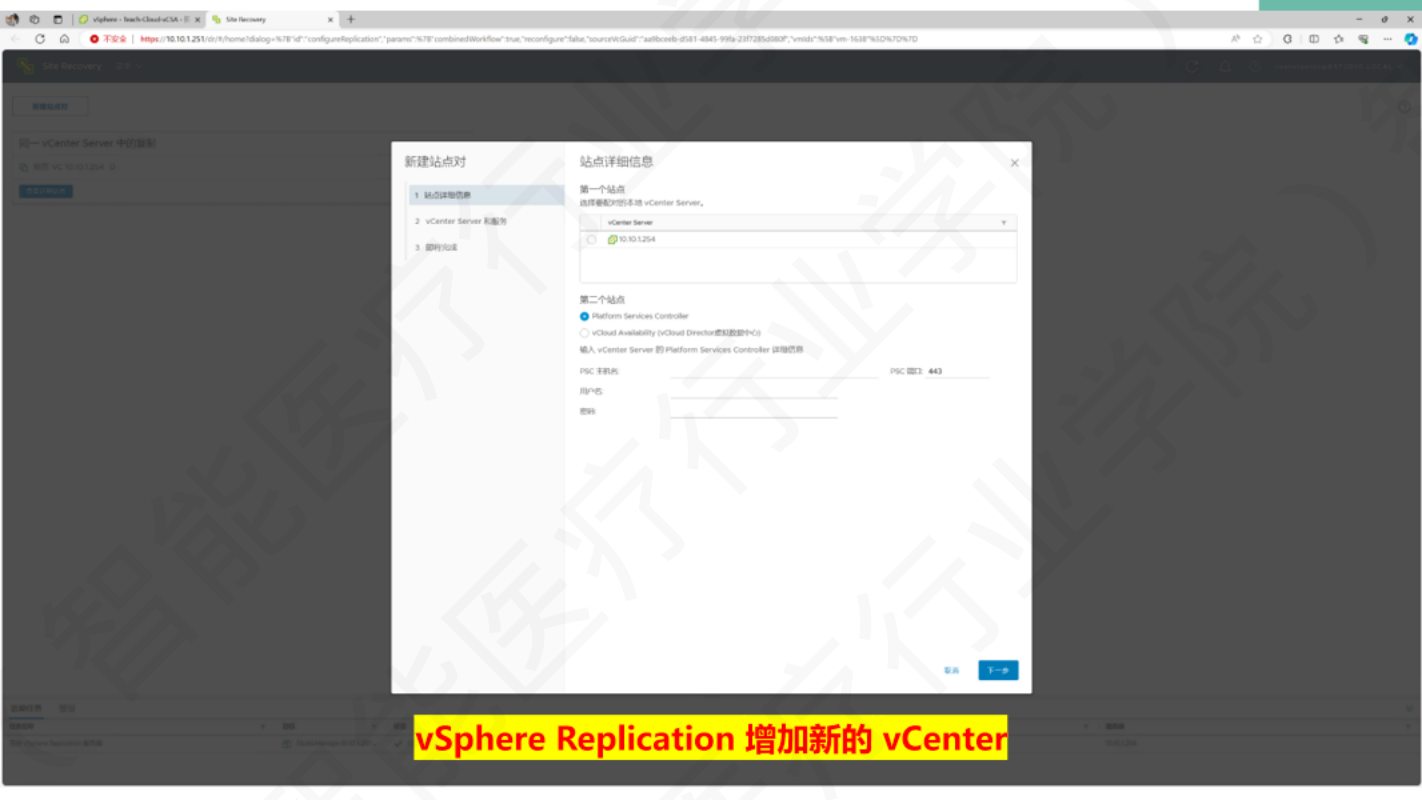
× 单击以展开/折叠所有虚拟机

名称	状态
Teach-Cloud-VCSA	良好

1个虚拟机

取消 下一步

vSphere Replication 创建 VM 的复制



vSphere Replication 增加新的 vCenter

2. 虚拟机的导入与导出

- 开放式虚拟化格式，Open Virtualization Format (OVF)
 - 一种开源的文件规范，描述了一个开源、安全、有效、可拓展的便携式虚拟打包格式。
 - OVF 包通常由以下几个部分组成：
 - OVF 文件：是 OVF 包的核心部分，包含了虚拟机的配置信息，如虚拟机的硬件配置、操作系统类型、磁盘映像等。
 - MF 文件：可选文件，OVF 文件的哈希值，用于验证完整性。
 - Cert 文件：可选文件，OVF 文件的数字证书，用于验证来源和完整性。
 - 磁盘映像文件：是虚拟机的磁盘映像文件。
 - 附加资源文件：可选文件，例如 ISO 映像文件、驱动程序文件等。
 - OVA (Open Virtualization Appliance) 是开放虚拟化设备。
 - OVA 是 OVF 文件的一种单文件发行版，将 OVF 文件和相关的虚拟磁盘文件打包成一个单一文件，方便在不同环境间传输和部署。

2. 虚拟机的导入与导出

- VMware vSphere 通过三种方式提供 OVF 支持：
 - 从 OVF 模板部署新虚拟机（实质上是导入 OVF 格式的虚拟机）
 - 将虚拟机导出为 OVF 模板
 - 将 OVF 模板存储在内容库中



2. 虚拟机的导入与导出

❑ 虚拟机导出为 OVF 模板的应用场景：

- 在多个 vCenter Server 间共用虚拟机模板。
- 将虚拟机从一个 vSphere 上迁移到另一个 vSphere 中。
- 将虚拟机迁移到支持 OVF 标准的其他云数据中心，或从其他云数据中心迁移。
- 软件产品发行。



2. 虚拟机的导入与导出

2.2 通过 OVF 部署虚拟机



通过 OVF 部署虚拟机



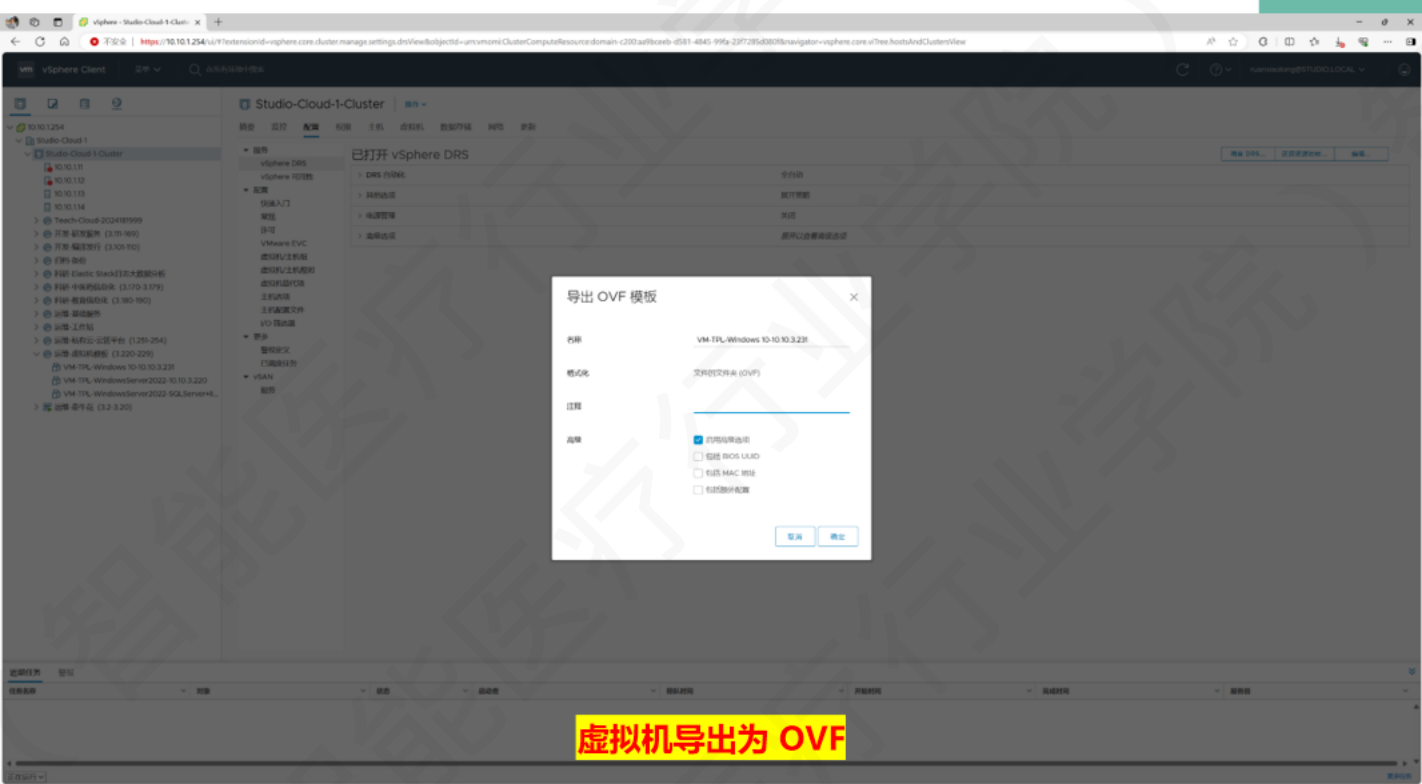
2. 虚拟机的导入与导出

2.3 虚拟机导出为 OVF



虚拟机导出为 OVF





虚拟机导出为 OVF

3. 转换

3.1 Converting VM

- 现有部署在物理服务器或者其他虚拟化平台上的业务，迁移到 vSphere，是实现虚拟化数据中心的重要工作。
 - 业务系统重新部署和进行数据迁移，非常麻烦，且风险很高。
 - 业务系统也不可能允许长时间的服务停机，来等待迁移。
- 迁移有两种方式：
 - VMware 提供的工具进行迁移：VMware vCenter Convert
 - 借助vSphere API 实现的第三方的迁移工具。



3. 转换

3.2 VMware vCenter Converter

■ VMware vCenter Converter 支持两种模式的转换：

■ Physical to virtual (P2V)

- 用于将物理计算机转换为虚拟机。
- VMware vCenter Converter 允许从运行 Windows 和 Linux 的物理机器进行转换，并支持桌面和服务器的版本。

■ Virtual to virtual (V2V)

- 将一个操作系统、应用程序和数据从一个虚拟机或磁盘分区迁移到另一个虚拟机或磁盘分区。
- VMware vCenter Converter 支持从第三方虚拟机转换，如 Hyper-V 和 KVM 到 vSphere。



3. 转换

3.3 StarWind V2V Converter / P2V Migrator

□ StarWind V2V Converter 和 P2V Migrator 是免费软件。

- StarWind V2V Converter 将不同格式的虚拟机进行转换
 - Converting VM from Hyper-V to VMware ESXi (.vhdx to .vmdk)
 - Converting VM from VMware ESXi to Hyper-V (.vmdk to .vhdx)
 - Converting Image File from Hyper-V to VMware ESXi Format
 - Converting Image File from VMware ESXi to Hyper-V Format
 - Converting Local File to Local File
- StarWind P2V Migrator 将物理机转换为虚拟机
 - Convert Physical Machine to Hyper-V VM
 - Convert Physical Machine to VMware ESXi VM
 - Convert Physical Machine to Microsoft Azure VM
 - Convert Physical Machine to AWS VM



3. 转换

3.3 StarWind V2V Converter / P2V Migrator



StarWind V2V Converter / P2V Migrator (Free Software)
<https://www.starwindsoftware.com/starwind-v2v-converter>



4. 扩展的管理工具

- RVTools 可查看 vCenter 信息，并将信息导出到类似 Excel 的电子表格当中。
 - 关键功能：
 - 信息显示：可以直观地显示每台虚拟机的信息，如 CPU、内存、网络、HBA 卡等。
 - 信息导出：可以将虚拟化平台的信息导出为 Excel 文档，方便后期编写文档或作为其它项目实施时的参考信息。
 - 平台支持：支持 vCenter 和单台 ESXi Host。
 - 分类与报告：支持视图分类并创建报告。
 - 健康检查：通过 vHealth 标签页展示关于 VMware Tools、快照和僵尸文件的预警。
 - 地址：<https://www.robware.net>



4. 扩展的管理工具

4.1 RVTools



RVTools:
<https://www.robware.net>



Login

RVTools 4.6.1

To directly manage a single host, enter the IP address or host name. To manage multiple hosts, enter the IP address or name of

IP address / Name

User name:

JIANGZEPENG-MI\ruan

Password:

☒ Use Windows session credentials

Cancel

Login

RVTools 界面

RVTools 的 vHealth

4. 扩展的管理工具

❑ HCIBench (Hyper-Converged Infrastructure Benchmark)

- VMware 开发的开源工具，是评估超融合基础架构性能的基准测试工具。
- 主要功能：
 - ❑ 自动化测试
 - 自动化整个基准测试过程，包括环境准备、负载生成和结果收集。
 - 自动部署测试虚拟机，配置存储和网络，并运行指定的负载模式。
 - ❑ 负载生成
 - 使用FIO (Flexible I/O Tester) 作为负载生成工具，能够模拟不同类型的工作负载（如读/写比例、随机/顺序I/O等）。
 - 用户可以自定义I/O模式以反映其特定应用的性能需求。
 - ❑ 可扩展性
 - 可以扩展到大规模测试，支持多个vSAN集群的性能测试。
 - 支持配置和测试不同规模的集群，以评估其扩展性能。
 - ❑ 详细报告



Introducing HCIbench: A Free Storage Performance Testing Tool For Hyperconverged

vmware

Virtual Blocks Blog

by Broadcom

HomeProductsCustomer SuccessPartnersPodcast

Introducing HCIbench: A Free Storage Performance Testing Tool For Hyperconverged

Chuck Hollis

August 10, 2015

There's been a lot in the press recently around the subject of testing storage performance on newer hyperconverged architectures. Our own experience is that there are big differences in how a given hardware configuration will perform, depending on whose hyperconverged software stack you're using. If performance is important to you, you should know what you're getting before you buy. With regards to vSAN, we've been continually publishing the results of our own internal testing, and done so with enough detail so that someone could reproduce the results if desired (scroll to the bottom of this page for a sampling). We've also supported independent reviewers such as StorageReview.com to share their own unbiased results. That being said, we'd like to do more — much more. Wouldn't it be great if anyone could easily do their own head-to-head testing? To help customers make better informed choices, we're introducing a free new tool that makes storage performance testing on hyperconverged clusters much, much easier. We call it HCIbench, as in "hyperconverged infrastructure benchmark". It's essentially an automation wrapper around the popular and proven Vdbench open source benchmark tool that makes it far easier to automate testing across a hyperconverged cluster. The people who've tried it tell us that it's a huge step forward in simplicity and repeatability. Easier testing = more testing = better testing.

Why Testing Hyperconverged Is Harder Than It Looks

Doing performance testing on familiar external storage arrays can be relatively straightforward. Set

Updated on August 22, 2015

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vmware-labs/hci-benchmark-appliance

Notifications Fork 2 Star 38

CodeIssuesPull requestsDiscussionsActionsProjectsWikiSecurityInsights

mainBranchesTags

47 Commits

API-CALL-SAMPLES

HCIbench

CODE_OF_CONDUCT.md

CONTRIBUTING_DOC.md

HCIbench_User_Guide_2.8.1.pdf

README.md

README

Code of conduct

Security

HCIbench

Overview

HCIbench stands for "Hyper-converged Infrastructure Benchmark". It's essentially an automation wrapper around the popular and proven open source benchmark tools: Vdbench and Fio that make it easier to automate testing across a HCI cluster. HCIbench aims to simplify and accelerate customer POC performance testing in a consistent and controlled way. The tool fully automates the end-to-end process of deploying test VMs, coordinating workload runs, aggregating test results, performance analysis and collecting necessary data for troubleshooting purposes.

HCIbench is not only a benchmark tool designed for vSAN, but also could be used to evaluate the performance of all kinds of Hyper-Converged Infrastructure Storage in vSphere environment.

Try it out

Version	OVA	Release Date
2.8.3	HCIbench 2.8.3	5/23/2024
2.8.2	HCIbench 2.8.2	6/6/2023
	HCIbench 2.8.1	2/10/2023

Web Browser: IE8+, Firefox or Chrome

HCIbench stands for "Hyper-converged Infrastructure Benchmark". It's an automation wrapper around the popular and proven open source benchmark tools: Vdbench and Fio that make it easier to automate testing across a HCI cluster. It's the recommended tool for VMware vSAN customer to run performance testing.

Readme

Code of conduct

Security policy

Activity

Custom properties

30 stars

4 watching

2 forks

Report repository

Releases 3

HCIbench 2.8.3

2 weeks ago

Latest

+ 2 releases

Packages

No packages published

Contributors 2

cweid4

vmware

vmware VMware GitHub Bot

Languages

Python 33.3%

JavaScript 0.0%

Shell 0.0%

Ruby 3.0%

HTML 0.4%

Perl 0.1%

4. 扩展的管理工具

4.2 HCI Bench



Introducing HCIbench: A Free Storage Performance Testing Tool For Hyperconverged
<https://blogs.vmware.com/virtualblocks/2015/08/12/introducing-hcibench-a-free-storage-performance-testing-tool-for-hyperconverged/>



4. 扩展的管理工具

4.2 HCI Bench



HCI Bench On GitHub

<https://github.com/vmware-labs/hci-benchmark-appliance>



4. 扩展的管理工具

4.3 vSphere Mobile Client

□ vSphere Mobile Client是

- VMware 发布的移动应用程序，旨在通过移动设备（如智能手机和平板电脑）管理和监控 vSphere。
- 主要功能：
 - 实时监控：
 - 提供实时的虚拟机（VM）和主机状态监控。
 - 显示关键性能指标，如CPU、内存使用率、网络和存储性能等。
 - 基本管理操作：
 - 允许执行虚拟机的基本管理操作，如启动、停止、重启和挂起虚拟机。
 - 支持对虚拟机进行快照管理，包括创建、删除和恢复快照。
 - 告警和通知：
 - 提供vSphere环境的告警和事件通知功能。
 - 用户可以查看和管理告警，及时响应和解决潜在问题。



4. 扩展的管理工具

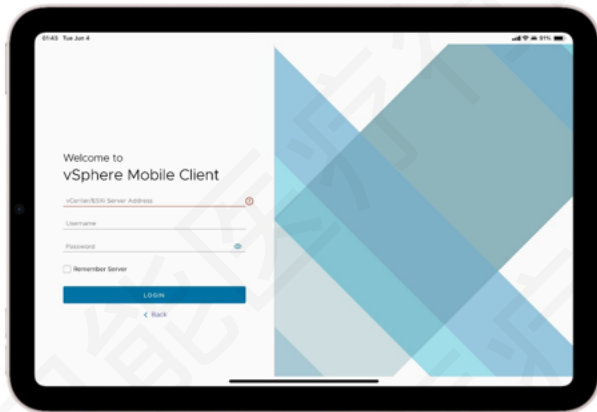
4.3 vSphere Mobile Client



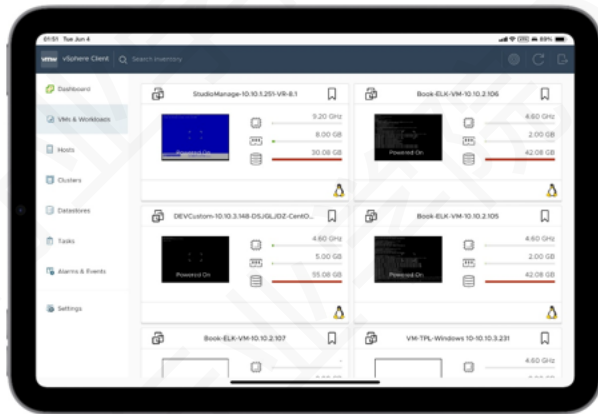
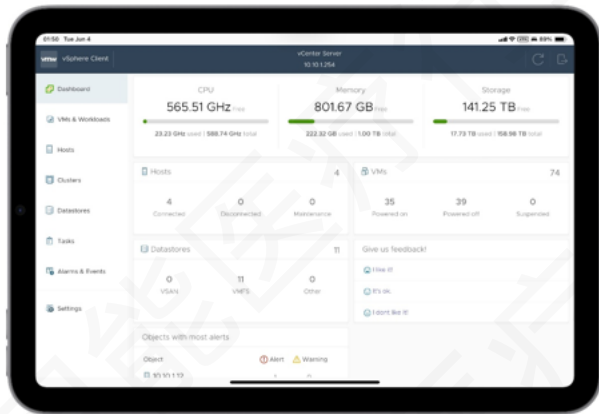
vSphere Mobile Client -Access vSphere Anytime, Anywhere, Any Device

<https://blogs.vmware.com/code/2021/05/28/vsphere-mobile-client-access-vsphere-anytime-anywhere-any-device/>

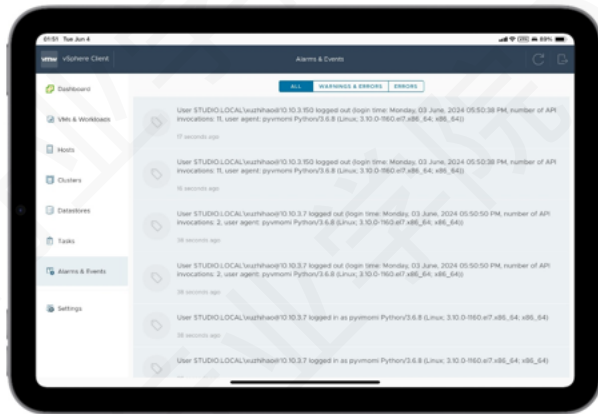
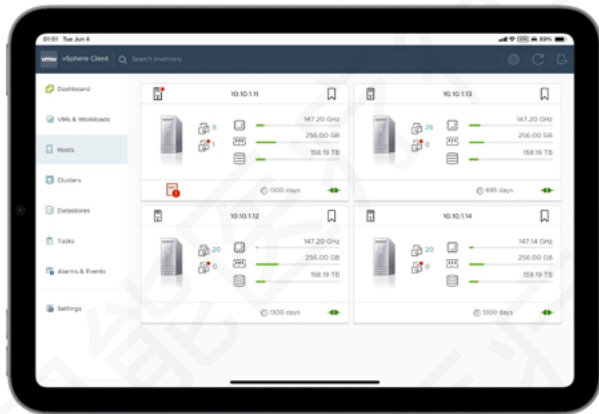




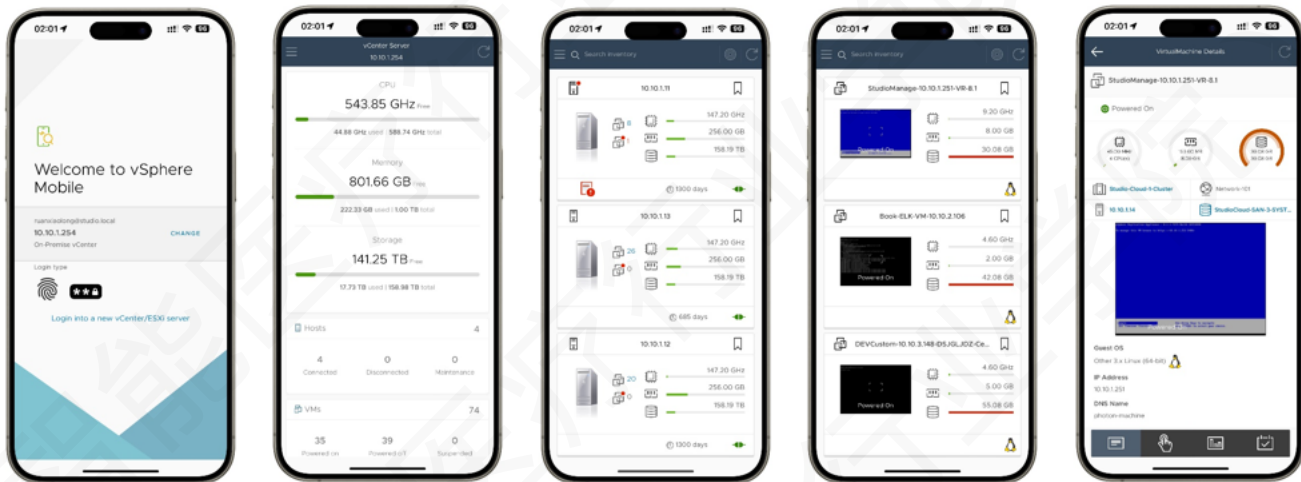
vSphere Mobile Client for iPad



vSphere Mobile Client for iPad



vSphere Mobile Client for iPad



vSphere Mobile Client for iPhone

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