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EXAM BLUEPRINT

# Nutanix Certified Master—Multicloud Infrastructure (NCM-MCI) 5.20

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**Disclaimer:**

The Nutanix Certified Master - Multicloud Infrastructure (NCM-MCI) 5.20 Exam Blueprint Guide provides an overview of the objectives that must be mastered to achieve the NCM-MCI credential. Nutanix does not offer any guarantees that this guide will ensure a candidate's success in achieving the NCM-MCI 5 Certification. All information in this guide is subject to change at any time at the sole discretion of Nutanix.

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# 1. The Exam

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## 1.1 PURPOSE OF EXAM

The Nutanix Certified Master - Multicloud Infrastructure (NCM-MCI) 5.20 exam tests candidates on their skills and abilities performing advanced administrative tasks and optimizing both virtualized workloads and infrastructure components on an AOS 5.20 implementation. Successful candidates demonstrate mastery of these skills and abilities.

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## 1.2 NUMBER OF QUESTIONS

The NCM-MCI 5.20 exam consists of 90 multiple choice, multiple response, and drag-and-drop questions.

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## 1.3 PRICING

The cost for the NCM-MCI 5.20 exam is \$199 USD.

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## 1.4 PASSING SCORE

The passing score for this exam is 3000, using a scaled scoring method. The scale is from 1000-6000. Scaled scores are calculated using a mathematical formula that considers a variety of factors, including the number and type of exam questions included in a specific version of the exam. Because this combination may vary in different versions of the same examination, scaled scores provide a fair score for everyone based on the version of the exam taken.

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## 1.5 HOW OBJECTIVES RELATE TO QUESTIONS ON THE EXAM

Objectives summarize what the test is designed to measure. Objectives are developed by Exam Developers and Subject Matter Experts based on identified tasks that relate to the job of deploying and administering a Nutanix AOS 5.20 cluster.

Once the initial development process is complete, these objectives are verified using an external group of individuals in the actual job role.

Finally, a number of questions is determined for each objective, which relates directly to the criticality of the task in the job role.

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## 1.6 LANGUAGES

The exam is available in English, Japanese, and Simplified Chinese.

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## 1.7 TIME LIMIT

The time limit for the exam is 180 minutes.

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## 1.8 SCHEDULING AND TAKING THE EXAM

This exam is delivered via remote proctoring in your home or office, or at a designated testing center. Occasionally, testing at Nutanix events may also be offered. At the start of the registration process, you will be asked to choose remote or in person testing. After registering for the exam, you will receive further information specific to the testing method you chose. Regardless of whether you test remotely or in person, you must provide valid identification and will be provided with a monitored and secure exam experience.

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## 1.9 CERTIFICATION TRACKS

The NCM-MCI 5.20 exam is a component of the Nutanix Multicloud Infrastructure track. The certification requires that candidates have obtained the NCP-MCI 5 certification. While it is not required that you attend a course, Nutanix provides training that covers the objectives on the exam.

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## 1.10 RETAKE POLICY

If a candidate fails an exam on the first attempt, they are allowed two additional attempts. There is a seven-day waiting period between attempts. Like the first attempt, these are paid for individually and Nutanix recommends that you allow sufficient time between attempts to be properly prepared and to maximize your chances for success.

Please note: After three attempts, you will be unable to take the exam for 60 days, after which you can e-mail [university@nutanix.com](mailto:university@nutanix.com) and request that your attempts are reset. Nutanix recommends you utilize the time to thoroughly review this guide and the related references and/or take the recommended training for this exam.

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## 1.11 EXAM SECURITY

Nutanix reserves the right to refuse certifying a candidate who violates exam security policies. This includes copying and redistribution of exam material, using any type of study material during the exam itself, attempting to photograph exam items and taking an exam using a false identity. Your identity is captured as part of the exam registration process and must be validated before you will be allowed to take the exam.

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## 1.12 RECERTIFICATION

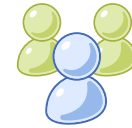
Once you have achieved the NCM-MCI 5 certification, it will remain valid until Nutanix releases the next major version of the certification (i.e. NCM-MCI 6). At that time, you have one year to upgrade your certification to the new release before it expires.

Nutanix provides a delta training covering features that are part of the AOS release that coincides with the new version of the certification.

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## 1.13 BENEFITS OF CERTIFICATION

- Digital badge from Credly that you can share on social media
- Points on Nutanix Xtribe that you can redeem for prizes (not available for Nutanix employees)
- Access to the Certification store at <http://store.nutanix.com> for shirts, mugs, and more
- Opportunity to participate as a SME to develop future exams
- Discount on attending Nutanix .NEXT



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## 2. Intended Audience

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### 2.1 INTENDED AUDIENCE

A candidate for the NCM-MCI certification has approximately 3-5 years of general IT experience, 1-2 years of experience working with AOS, and at least 6 months of experience working with AHV, as well as additional generalized systems administration experience. They are typically IT professionals and IT architects who are capable of optimizing and troubleshooting both virtualized workloads and infrastructure components on an AOS 5.20 implementation and can use Prism Central to centrally monitor, manage and troubleshoot multi-cluster deployments.

The following Nutanix products are covered in this exam:

- AOS version 5.20.x (all license tiers)
- Prism Central version pc.2022.1 (all license tiers)



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# 3. Objectives covered in the NCM-MCI 5.20 Exam

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## 3.1 INTRODUCTION

It is recommended that candidates have the knowledge and skills necessary to deploy, administer and troubleshoot a Nutanix AOS environment before attempting the NCM-MCI 5.20 exam.

It is also recommended, though not required, that the candidate complete the course described section 4 in prior to taking the exam.

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## 3.2 OBJECTIVES

Prior to taking this exam, candidates should understand each of the following objectives. Each objective is listed below; along with related tools the candidate should have experience with, and related documentation that contains information relevant to the objective.

Please note that some documentation requires access via the Support Portal. Information on creating an account for use with the Support Portal can be found [here](#).

All objectives may also be referenced in other product documentation not specifically highlighted below. The candidate should be familiar with all relevant product documentation or have the equivalent skills.

### SECTION 1 - ADMINISTRATION AND PLANNING

#### *Objective 1.1 - Given a scenario, maintain Nutanix cluster health*

Knowledge:

- Utilize Prism Central dashboard to ensure cluster is operating at optimal status
- Calculate CPU, memory, and storage usage of the cluster
- Locate any over-provisioned, under-provisioned, or constrained VMs
- Modify VMs that need attention



## References

- [Controller VM Components](#)
- [Nutanix Configuration Maximums](#)
- [Shutting down an AHV cluster](#)
- [Shutting down an AHV node in a cluster](#)
- [Prism Central Projects Summary](#)
- [Prism Central VMs Summary](#)
- [Behavioral Learning Tools](#)
- [Enabling High Availability for a cluster](#)
- [Nutanix Guest Tools](#)
- [Requirements for enabling services](#)

### *Objective 1.2 - Given a scenario, upgrade firmware*

#### Knowledge:

- Distinguish when updating a Nutanix product would require updating firmware
- Demonstrate how to upgrade firmware
- Confirm hypervisor compatibility for all components

## References

- [Acropolis Upgrade Guide](#)
- [Manually updating firmware](#)
- [Manually updating data drive firmware](#)
- [Recommended upgrade order](#)
- [Preparing a cluster with direct upload](#)
- [Effects of updates on a cluster](#)
- [Expanding a cluster](#)
- [Upgrading SATADOM firmware](#)

### *Objective 1.3 - Given a scenario, analyze cluster performance*

#### Knowledge:

- Differentiate performance impacts of the cluster, VM, and physical infrastructure
- Determine availability configuration impacts on cluster performance
- Analyze root causes of a cluster performance problem, given a scenario
- Determine when cluster expansion is required, given a scenario
- Verify appropriate steps to improve cluster performance, given a scenario

## References

- [Prism Web Console Guide](#)
- [Prism Central Guide](#)
- [Rack Fault Tolerance](#)
- [AHV Turbo](#)
- [Alert Metrics](#)
- [Behavioral Learning Tools](#)
- [CVM Memory Configuration](#)
- [Infrastructure Resiliency](#)

### *Objective 1.4 – Evaluate Capacity Runways to predict growth*

#### Knowledge:

- Determine current resource Runway information
- Assess future resource requirements
- Configure and analyze workload scenarios
- Determine resource utilization to detect anomalies

## References

- [Prism Central Guide](#)
- [Creating a Scenario](#)
- [Prism Central Cluster Details](#)
- [Resource Planning](#)

### *Objective 1.5 – Given a scenario, troubleshoot performance issues*

#### Knowledge:

- Given a set of performance data, determine which component should be changed to resolve issues
- Investigate factors that impact performance
- Determine which tool or process should be used during analysis
- Validate environment to determine production readiness

## References

- [X-Ray Guide](#)
- [Using X-Ray versus diagnostic.py](#)
- [Prism Central Analysis Dashboard](#)
- [Configuring Data Protection with Asynchronous Replication](#)
- [Interpreting CPU Ready values](#)
- [AHV Best Practices](#)

*Objective 1.6 - Given a scenario, troubleshoot issues using alerts and/or logs*

Knowledge:

- Given an alert, analyze the problem domain and recommend solution
- Given multiple alerts, prioritize an action plan
- Correlate alerts to isolate to a specific issue

References

- [Life Cycle Manager Guide](#)
- [Foundation 4.5.x Release Notes](#)
- [Configuring NCC Frequency](#)
- [Nutanix Core Performance](#)
- [Re-enabling Metro Availability Configuration after Failover](#)
- [Cluster Health Checks](#)
- [Guest VM Health Checks](#)
- [NCC Availability Zone Health Check](#)
- [Interpreting CPU Ready values](#)
- [NCC Check Zookeeper Health](#)
- [NCC Check Hostname Resolution](#)

## SECTION 2 - STORAGE MANAGEMENT

*Objective 2.1 - Given a scenario, implement Files*

Knowledge:

- Determine Files configurations for single nodes, shares, multiprotocol environments
- Install and configure Files
- Modify file server instance
- Given a scenario, configure necessary file shares
- Troubleshoot Files issues

References

- [Nutanix Files](#)
- [Files Deployment](#)
- [Performance Optimization](#)
- [File Server Management](#)
- [Prerequisites for Deploying Files](#)
- [Files Quota Types, Notifications, and Policies](#)
- [NCC Checking Multiple FSVMs on a Single Node](#)
- [Files Architecture](#)

*Objective 2.2 – Given a scenario, implement Volumes*

Knowledge:

- Determine appropriate Volumes configuration
- Determine ways to create and present access to Volume Groups
- Determine ways that Volume Group disks are attached/presented to AHV VMs
- Determine the limitations when attaching Volume Group disks to the VMs
- Configure iSCSI initiator on supported operating systems

References

- [Nutanix Volumes](#)
- [Volumes Overview](#)
- [Service-Specific Settings and Configuration](#)
- [Volumes Best Practices](#)
- [Volumes Port Reference](#)

*Objective 2.3 – Given a scenario, troubleshoot storage*

Knowledge:

- Given a scenario, determine why a Volume Group is not accessible by a guest VM
- Given a sequence of events, determine the root cause of loss of storage access in a cluster
- Given a set of conditions, explain the impact on storage latency in a cluster
- Given a scenario, determine the root cause of poor storage performance in a guest VM
- Evaluate how a set of conditions affects the I/O path for a VM's storage I/O
- Analyze logs to determine root causes of high metadata usage

References

- [Infrastructure Resiliency](#)
- [The Nutanix Bible \(Book of Storage Services\)](#)
- [Disk I/O Latency on a Nutanix Cluster](#)
- [Fault Tolerance – Block Failure](#)
- [Redundancy Factor vs Replication Factor](#)
- [Discovering the Volumes Target from the Windows Client](#)
- [Block Fault Tolerance](#)
- [Node Failure](#)
- [Volumes Port Reference](#)

## SECTION 3 - DATA PROTECTION

### *Objective 3.1 - Validate Disaster Recovery configurations*

#### Knowledge

- Given a set of business requirements, determine a DR solution
- Determine if a solution can meet the defined SLAs
- Determine the amount of storage and networking necessary for a given scenario
- Determine cluster viability for a given scenario

#### References

- [Data Protection and Disaster Recovery](#)
- [NCC Check Unsupported Dense Node Configuration](#)
- [Application-Consistent Recovery Point Conditions and Limitations](#)
- [Data Protection with Async Replication](#)
- [Data Protection with NearSync Replication](#)
- [Data Protection and Recovery with Prism Element](#)
- [Conditions for Implementing Data Protection with Metro Availability](#)
- [Performing Failover](#)
- [Restoring an Entity from a Protection Domain](#)
- [Volume Group Data Protection](#)

### *Objective 3.2 - Configure Data Protection to meet corporate HA/DR requirements*

#### Knowledge

- Determine which Data Protection solutions should be used
- Configure Protection Domain settings for NearSync, Async, and Metro Availability
- Troubleshoot issues using DP/DR solutions
- Determine steps to recover from site failures

#### References

- [Configuring NearSync Disaster Recovery](#)
- [The Definitive Guide to Data Protection and Disaster Recovery](#)
- [Configuring a Protection Domain](#)
- [Creating a Recovery Plan](#)
- [Protection and DR between On-Prem Sites](#)
- [Protection with Synchronous Replication Schedule \(0 RPO\) and DR](#)
- [Synchronous Replication Requirements](#)
- [Metro Availability Witness Option](#)
- [Limitations of Data Protection with NearSync Replication](#)
- [Conditions for Application-Consistent Snapshots](#)
- [vSphere Metro Storage Cluster for Metro Availability](#)
- [Failover and Failback Operations for Async and NearSync Replication](#)
- [Troubleshooting Data Protection Replication to Remote Sites](#)
- [Metro Availability Operational Scenarios](#)

## SECTION 4 - SECURITY

### *Objective 4.1 - Configure security for Nutanix Enterprise Clouds*

#### Knowledge

- Determine requirements to disable password-based access to the cluster
- Describe the risk management features Nutanix uses to provide higher levels of cluster security
- Determine the appropriate security procedures when using AIDE
- Given a scenario, determine which security features should be enabled
- Demonstrate how to enable advanced security features
- Given security data, determine actions and possible consequences
- Evaluate the validity of a given configuration state
- Using security advisories, determine a course of action in a given situation

#### References

- [Security Guide](#)
- [Prism Central Guide \(Security and User Management\)](#)
- [Creating an Isolation Environment Policy](#)
- [Hardening AHV](#)
- [Hardening the Controller VM](#)
- [Emergency Local Account Usage](#)
- [SCMA Implementation](#)
- [Network Segmentation during Cluster Expansion](#)
- [Network Segmentation Prerequisites](#)
- [Controlling Cluster Access](#)
- [Switching Between Native and External Key Managers](#)

### *Objective 4.2 - Given a scenario, secure workloads*

#### Knowledge

- Configure VM categories for Flow
- Configure Flow policies
- Determine when to enable Flow
- Determine VM security requirements
- Troubleshoot Flow policies
- Determine which policies and categories to use with Flow in conjunction with Leap

## References

- [Security and User Management](#)
- [Security Policy Model](#)
- [Flow Microsegmentation Guide](#)
- [Quarantine Policy Configuration](#)
- [Creating an Application Security Policy](#)
- [Monitoring an Application Security Policy](#)
- [Data-at-Rest Encryption](#)
- [Service Chain Integration](#)

## *Objective 4.3 – Configure security to leverage external authentication/authorization resources*

### Knowledge

- Determine when and how to use STIGs
- Configure the Nutanix environment to utilize an ICAP server
- Configure multisite SYSLOG servers
- Configure AD/LDAP for authentication
- Enable CAC
- Revoke and replace public SSL certificates
- Configure connections to external key management servers

## References

- [Configuring Authentication](#)
- [Certificate Management](#)
- [Antivirus Scanning](#)
- [Restoring Identity and Access Management Configuration Settings](#)
- [Enabling and Configuring Client Authentication/CAC](#)
- [Adding a SAML-Based Identity Provider](#)
- [Installing an SSL Certificate](#)
- [Configuring Authentication](#)
- [Configuring Dual Encryption](#)
- [Assigning Role Permissions](#)
- [Enabling Microservices Infrastructure](#)

## SECTION 5 - WORKLOAD MANAGEMENT

### *Objective 5.1 - Configure infrastructure for workloads*

#### Knowledge

- Determine how to configure infrastructure to support various workloads
- Given a scenario, determine when to enable storage efficiency features
- Determine how to configure the networking infrastructure based on workloads

#### References

- Resource Planning
- Storage Management
- Zero-Touch Foundation Central
- Upgrade Foundation Central via LCM
- Image Management Scenarios and Configurations
- Image Placement Policies
- Microsoft SQL Server Best Practices on Nutanix
- Nutanix Storage Best Practices
- AHV Networking
- SAP HANA on AHV
- Virtualizing Splunk on Nutanix
- Data Efficiency

### *Objective 5.2 - Given a scenario, optimize performance for specific workloads*

#### Knowledge

- Recommend settings required to support SAP HANA optimal performance
- Determine when it is appropriate to use VM NUMA pinning
- Determine when to modify CVM resource configurations to support specific workload scenarios
- Recommend specific configurations for Microsoft SQL Server

#### References

- Prism Central Guide (Resource Planning)
- Prism Web Console Guide (Storage Management)
- Virtual Machine Memory Management (vNUMA)
- Storage Quality of Service (QoS)
- Cassandra on Nutanix
- Microsoft SQL Server on Nutanix
- Microsoft SQL Server - Best Practices on Nutanix
- Microsoft Exchange Server on Nutanix
- Volumes Best Practices
- SAP HANA Deployment Recommendations
- Splunk on Nutanix Design Decisions



*Objective 5.3 – Given a scenario, migrate workloads*

Knowledge

- Given a scenario, migrate Windows VMs to AHV
- Convert an existing ESXi cluster to an AHV cluster
- Migrate SMB shares
- Migrate NFS exports

References

- [Virtual Machine Management](#)
- [Move User Guide](#)
- [Nutanix Cross Hypervisor Disaster Recovery](#)
- [Migrating workloads using Account with UAC Error](#)
- [Image Uploads with Invalid Footer Error](#)
- [Move for VMs Troubleshooting and FAQs](#)
- [Files Migration Requirements and Recommendations](#)
- Specific Workloads:
  - › [Data Efficiency](#)
  - › [Virtual Infrastructure \(Cluster\) Administration](#)
  - › [AHV Networking Recommendations](#)
  - › [Core Performance](#)
  - › [Flash Mode](#)
  - › [Nutanix Files: Migration Guide](#)

## SECTION 6 – NETWORKING

*Objective 6.1 – Configure network segmentation*

Knowledge

- Determine if segmentation is supported within a given cluster environment
- Determine which tool should be used to configure network segmentation
- Configure firewall rules on CVM
- Configure the backplane network
- Configure RDMA

References

- [AHV Networking](#)
- [Securing Traffic thru Network Segmentation](#)
- [Reconfiguring the Backplane Network](#)
- [Isolating Service-Specific Traffic](#)

*Objective 6.2 – Configure networking for optimal performance*

Knowledge

- Given a scenario, analyze network performance
- Optimize performance based on network data

References

- [AHV Networking Recommendations](#)
- [Storage Quality of Service \(QoS\)](#)
- [Configuring Rack Fault Tolerance](#)
- [Network Management](#)
- [Network Visualization](#)

*Objective 6.3 – Given a scenario, troubleshoot connectivity issues*

Knowledge

- Analyze network diagrams in Prism to determine the root cause of an issue
- Assess network stability using log files
- Given a scenario, determine a procedural sequence to resolve issues
- Given a usage graph, determine which recommendations to make to resolve issues

References

- [Layer 2 Network Management](#)
- [AHV Networking Management](#)
- [AHV Networking Best Practices](#)
- [NCC Checking Host NIC Errors](#)
- [How to Enable, Disable, and Verify LACP on AHV Hosts](#)
- [Troubleshooting Native VLAN-Related Connectivity Issues](#)
- [Virtual Switch Requirements](#)

*Objective 6.4 – Given a scenario, troubleshoot network visualizations*

Knowledge

- Identify issues using the Network Analysis page
- Troubleshoot incomplete network visualization information

References

- [Network Visualization Prerequisites](#)
- [Network Visualizer](#)
- [Customizing the Topology View](#)
- [Configuring Network Switch Information](#)
- [Viewing VM Information](#)
- [Viewing Host Information](#)
- [Viewing Switch Information](#)

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# 4. Course Recommendations

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## 4.1 COURSE RECOMMENDATION

For the NCM-MCI 5.20 exam, Nutanix recommends studying the following courses. The material provided in these courses covers a majority of the objectives (approximately 80%) that appear on the NCM-MCI 5.20 exam and is recommended for individuals who want to gain a good understanding of these objectives. However, it is not required. Please note that additional exposure to a Nutanix environment is highly recommended. More information on these courses, including delivery methods and pricing, can be found at [nutanix.com/training](https://nutanix.com/training).

### Nutanix® Advanced Administration and Performance Management (AAPM)

A four-day, hands-on training course that explores advanced administrative tasks and both virtualized workload and infrastructure optimization of a Nutanix Enterprise Cloud. The course covers the following objectives:

- Implement business continuity and disaster recovery strategies
- Analyze and configure Nutanix systems for peak operational efficiency
- Use Nutanix tools to analyze workloads and optimize cluster and VM sizing
- Perform advanced virtual machine administration
- Customize security for Nutanix systems
- Anticipate and plan for future resource needs

### Advanced Topics for the Enterprise Cloud

This free online course consists of the following modules:

1. Advanced Network Configuration and Management
2. Managing Clusters and VM Workloads
3. Deploying and Securing VM Workloads
4. Deploying Nutanix Volumes
5. Implementing Nutanix Files
6. Configuring Nutanix Objects
7. Implementing Data Protection
8. Understanding and Troubleshooting AOS Performance



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## 5. Resources

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### 5.1 NUTANIX COMMUNITY EDITION

The Nutanix Community Edition is a free product that allows you to deploy a Nutanix Enterprise Cloud. To download the software and build your own environment for exam preparation, [click here](#).

You can also take a 2-hour Hyperconverged Test Drive, which utilizes the Nutanix Community Edition, by [clicking here](#).

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### 5.2 THE NUTANIX NEXT COMMUNITY

The Nutanix Next Community is a social interaction site where professionals can connect with cloud builders from around the world, learn from IT Pros in the industry and share experiences. The community maintains an area focused on Nutanix certifications, which is located [here](#).



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Nutanix makes infrastructure invisible, elevating IT to focus on the applications and services that power their business. The Nutanix Enterprise Cloud OS leverages web-scale engineering and consumer-grade design to natively converge compute, virtualization, and storage into a resilient, software-defined solution with rich machine intelligence. The result is predictable performance, cloud-like infrastructure consumption, robust security, and seamless application mobility for a broad range of enterprise applications. Learn more at [www.nutanix.com](http://www.nutanix.com) or follow us on [Twitter @nutanix](https://twitter.com/nutanix).