

Getting Started

Welcome to the Nutanix Enterprise Private Cloud Bootcamp! This workbook accompanies an instructor-led session that introduces Nutanix Core technologies, and many common management tasks.

You will explore Prism Central, and become familiar with its features and navigation. You will use Prism to perform basic cluster administration tasks, including storage and networking. You will also walk through basic VM deployment and management tasks with Prism and AHV. The instructor explains the exercises, and answers any additional questions that you may have.

At the conclusion of the bootcamp, attendees should understand the Core concepts and technologies that comprise the Nutanix Enterprise Cloud stack. They should also be well-prepared for a proof-of-concept (POC) engagement.

What's New - Last updated 11-03-22

Labs are updated for the following software versions:

- AOS - 6.5 LTS
- PC - pc.2022.6

Agenda

- Introductions
- Nutanix Presentation
- A Day in the Life

Introductions

Last Updated: 5/2/2023, 11:07:35 AM

[Configuring Storage & Networking, Creating VMs →](#)

Configuring Storage & Networking, Creating VMs

In this lab, you will follow along with Kara O'Kay, a ten-year veteran of administering virtual environments on 3-tier architecture, who has recently deployed her first Nutanix cluster. The Nutanix cluster is being used for a mix of production IT workloads, including its primary application, an inventory management solution called Fiesta, which is vital to their retail storefronts.

Note

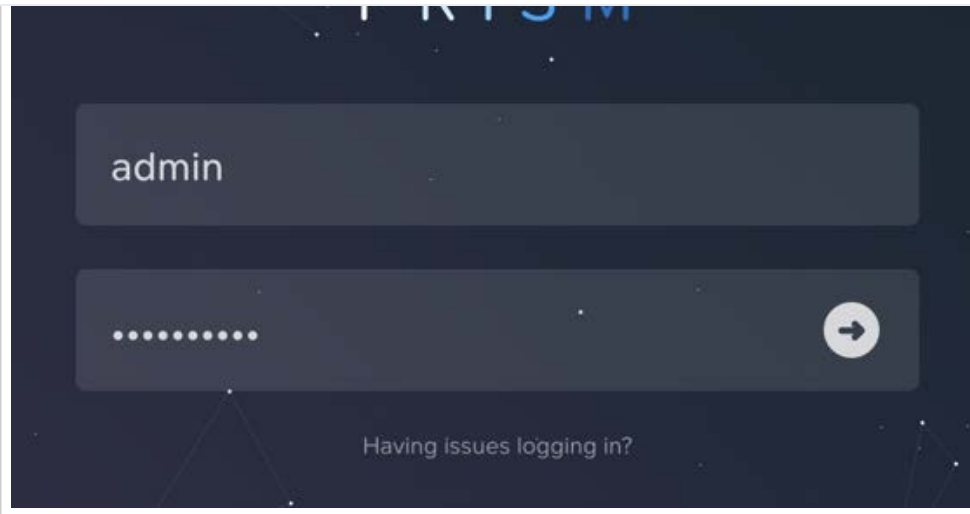
If multiple people utilize the same Nutanix cluster to complete this lab, specific steps may have already been completed. If this occurs, skip that particular step, and continue with the lab after you've verified the action was completed correctly.

Configuring Storage

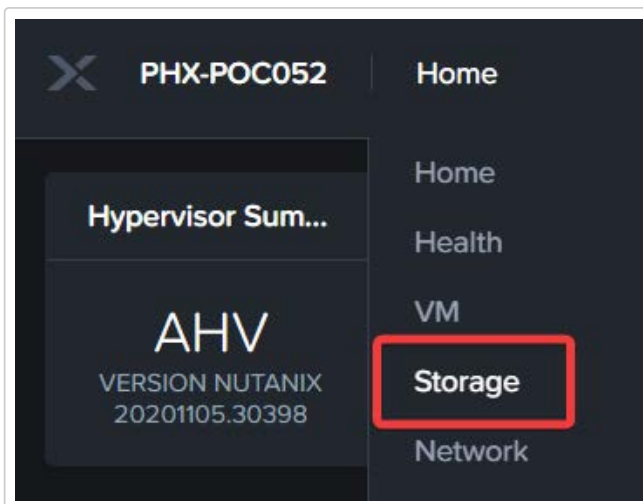
In this exercise, you will experience how to provision and monitor primary storage for virtualized environments through Prism - in just a few clicks. In stark contrast to what is typically required regarding time investment and specialized skills to planning and managing traditional SAN storage.

1. In a browser, type in the IP address for *Prism Element*, and log in.

- **Username** - admin
- **Password** - HPOC-PASSWORD

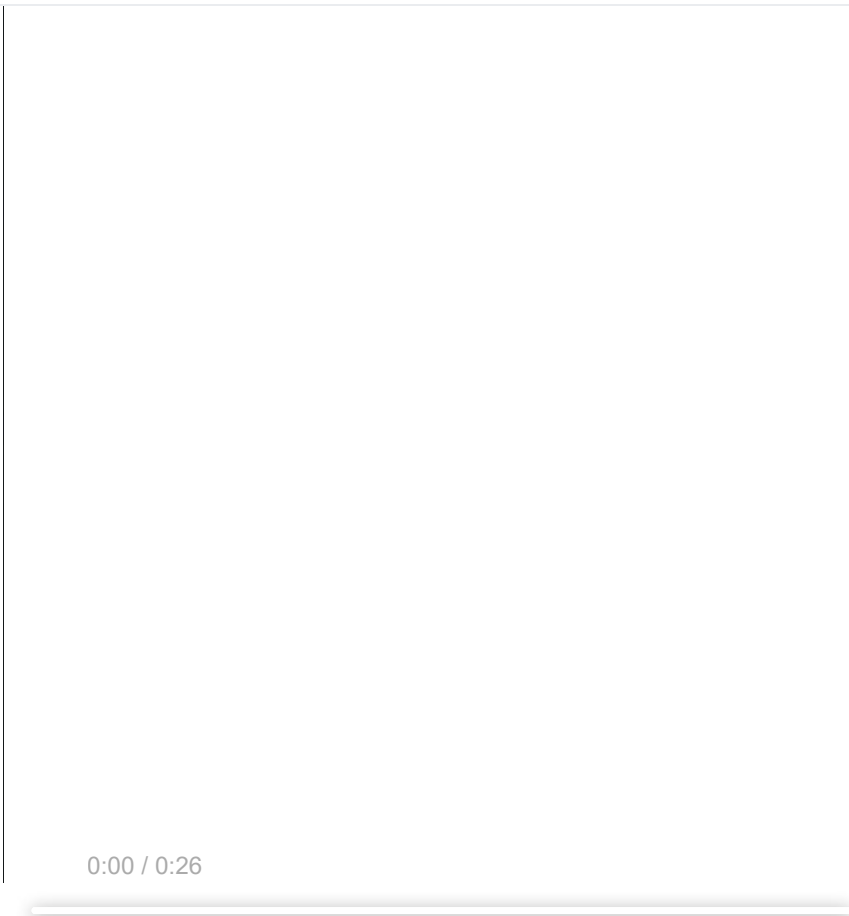


2. Select **Storage** from the drop-down menu.

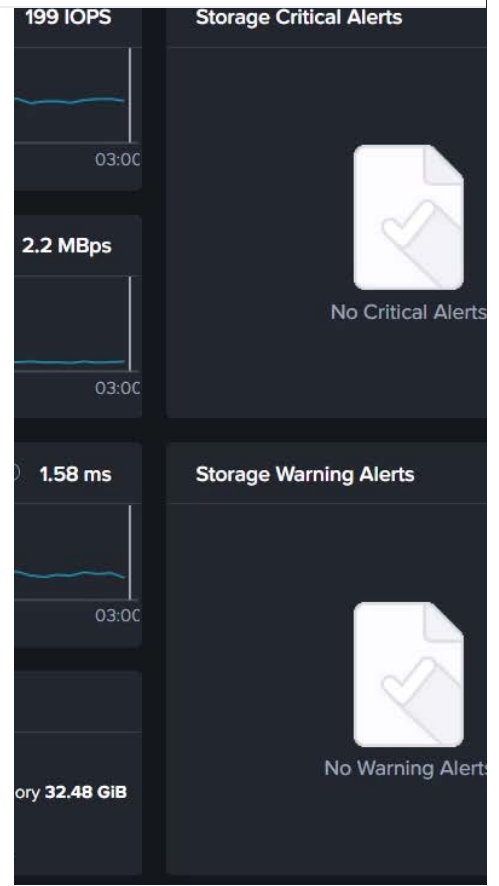


3. Mouse over the *Storage Summary* and *Capacity Optimization* widgets to see an explanation of what each is displaying. This is also demonstrated below.

It's important to understand that Nutanix considers the *Data Reduction* ratio as savings only from compression, deduplication, and erasure coding. The *Overall Efficiency*, comparable to what other vendors believe "Data Reduction" is, incorporates the data efficiency and avoidance features like thin provisioning, intelligent cloning, and zero suppression.



0:00 / 0:26




Note

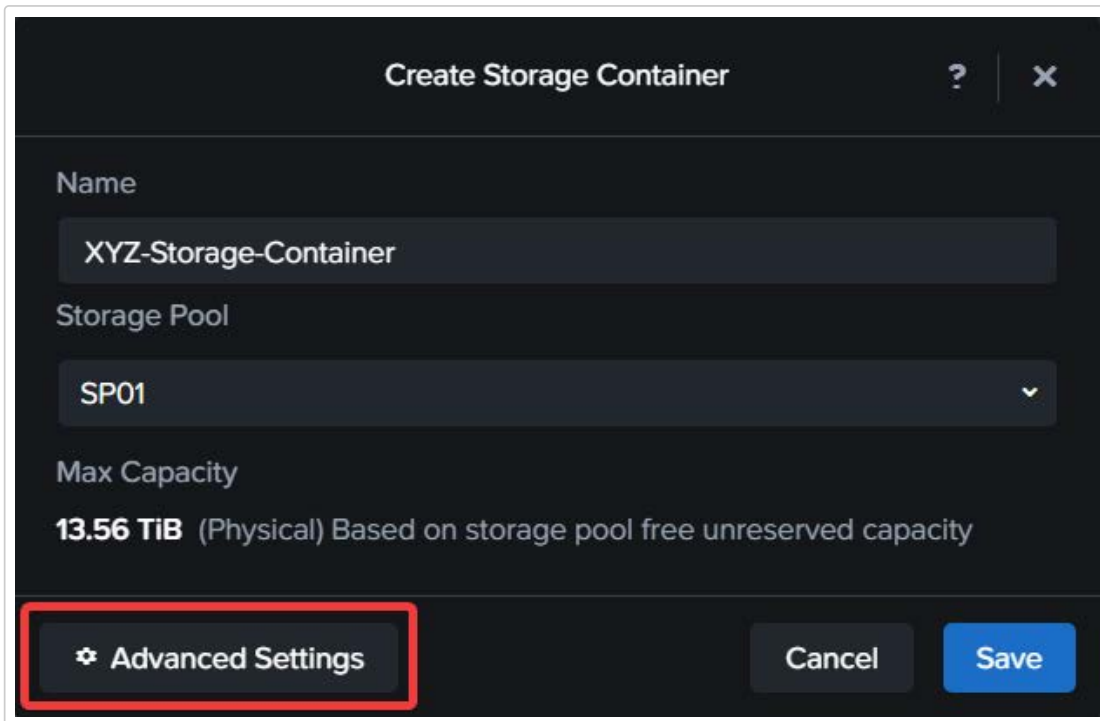
Within the *Storage Summary* widget, you will notice a gear icon and a drop-down that displays *Logical*. The gear icon allows you to set a custom warning threshold for resilient capacity, and above which, the widget will turn amber. The drop-down will enable you to display either the *Logical* (replication factor included) or *Physical* (raw disk capacity).

4. Click **+** Storage Container.

Storage Containers represent logical policies for storage, allowing you to create reservations, enable/disable data efficiency features like compression, deduplication, and erasure coding, and configure the Redundancy Factor (RF). Every Storage Container on a Nutanix cluster still leverages all physical disks, referred to as the Storage Pool. A typical Nutanix cluster will have a small number of Storage Containers, typically corresponding to workloads that benefit from different data efficiency technologies.

Simply put, think of Containers as how we assign settings to VMs.

5. Provide `Initials -Storage-Container` as the name for the Storage Container, and then click  **Advanced Settings** to explore additional configuration options.




Create Storage Container

Name
XYZ-Storage-Container

Storage Pool
SP01

Max Capacity
13.56 TiB (Physical) Based on storage pool free unreserved capacity

 **Advanced Settings** Cancel Save

Note

Nutanix provides different ways to optimize storage capacity that are intelligent and adaptive to workload's characteristics. Nutanix uses native data avoidance (thin provisioning, intelligent cloning, and zero suppression) and data reduction (compression, deduplication, and erasure coding). All data reduction optimizations are performed at the container level, so different containers can use different settings.

Compression

Nutanix provides two choices - inline or post-process data compression. Irrespective of inline or post-process compression, write data coming into OpLog that is >4k and shows good compression will be written compressed in OpLog. For inline compression (Delay=0), sequential streams of data or large size I/Os (>64K) will be compressed when writing to the Extent Store. For post-process (Delay>0), data is compressed after being drained from OpLog to the Extent Store after compression delay is met.

Compression provides on-disk space savings for databases applications, resulting in fewer writes being written to storage. Post-process compression is turned on by default on all containers. Starting with AOS 5.18, inline compression will be turned on by default on all

Erasure Coding

To provide a balance between availability and the amount of storage required, the Nutanix Distributed Storage Fabric (DSF) provides the ability to encode data using erasure codes (EC). Similar to RAID (levels 4, 5, 6, etc.), where parity is calculated, EC encodes a strip of data blocks across different nodes and calculates parity. The parity data is used to calculate any missing data blocks (decoding) in a host or disk failure. In the case of DSF, the data block must be on a different node and belong to a different vDisk. EC is always a post-process operation, only performed on write-cold data (i.e., data that hasn't been overwritten in more than seven days). The system automatically chooses the number of data and parity blocks in a strip based on the number of nodes and configured failures to tolerate.

Turn on EC for non-mission-critical workloads and workloads with a significant amount of write-cold data since erasure coding works on write-cold data to provide more usable storage. For more information, refer to [application-specific best practice guides](#).

Deduplication

Capacity-tier and performance-tier deduplication are both options. Data is fingerprinted on ingesting using an SHA-1 hash, which is then stored as metadata. A background process removes the duplicates when duplicate information is detected (multiple copies with the same fingerprint). When deduplicated data is read, it is placed in a unified cache, and any subsequent requests for data with the same fingerprint are satisfied directly from the cache.

Deduplication is recommended for full virtual desktop clones, physical to virtual (P2V) migrations, and persistent virtual desktops.

Redundancy Factor

Redundancy Factor controls the number of data copies. Observe that the Redundancy Factor cannot be configured for this particular cluster due to this cluster having four nodes, and the minimum number of nodes required to support RF3 is 5.

6. Click **Save** to create the container, which will also mount it to all available hosts within the cluster.

In a vSphere or Hyper-V environment, creating the Storage Container will also automate mounting the storage to the hypervisor.

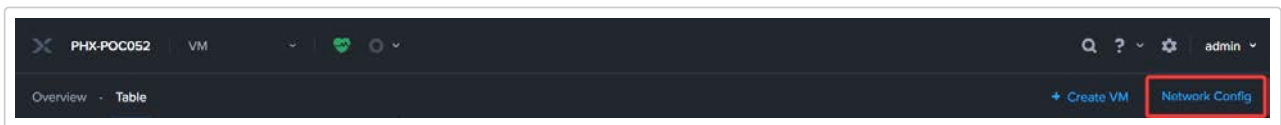
7. Click **Table** and select your **Initials -Storage-Container**. Review the individual savings from different data reduction/avoidance features and the Effective Capacity, a projection of available storage based on the overall efficiency. These values are found in the Storage Container Details table.

Provisioning A New Network

In this exercise, Kara will use Prism to configure a new VM Network for the cluster.

AHV leverages Open vSwitch (OVS) for all VM networking. OVS is an open-source software switch implemented in the Linux kernel and designed to work in a multi-server virtualization environment. Each AHV server maintains an OVS instance, and all OVS instances combine to form a single logical switch. Each node is typically uplinked to a physical switch port trunked/tagged to multiple VLANs, exposed as virtual networks.

1. Select **VM** from the drop-down menu, and then click on **Network Config**.



2. Click **+ Create Subnet**, and then fill out the following fields, using the details from your cluster assignment:

- o **Name** - Initials -Network-IPAM
- o **VLAN ID** - A value (< 4096) other than your *Primary* or *Secondary* network VLANs
- o Select **Enable IP Address Management**
- o **Network IP Address / Prefix Length** - 10.0.0.0/24

Subnet Name

XYZ-Network-IPAM

Virtual Switch

vs0

VLAN ID ?

1234

☒ Enable IP address management

This gives AHV control of IP address assignments within the network.

Network IP Prefix

10.0.0/24

Gateway IP Address

10.0.0.1

Cancel Save

- Select **+ Create Pool**
 - Start Address - 10.0.0.100
 - End Address - 10.0.0.150

Add IP Pool

Start Address

10.0.0.100

End Address

10.0.0.150

Cancel Submit

- Click **Submit**

Note

AHV can provide integrated DHCP services via IP Address Management (IPAM), allowing virtualization administrators to allocate IPs to VMs from a configured pool or easily specifying IPs as DHCP reservations when adding virtual NICs to VMs.

3. Click **Save**.

configure the same settings on each host within the cluster. Instead, you create this network, and it exists on every AHV host.

4. Close the *Network Configuration* window.

Responding to VM Creation Requests

Virtualization administrators are commonly tasked with the deployment of new VMs. In this exercise, Kara walks through the deployment of two VMs in Prism as a Nutanix administrator.

1. Click **+ Create VM**.



2. Fill out the following fields to complete the user VM request:

- **Name** - Initials -WinToolsVM
- **Description** - Manually deployed Windows Tools VM
- **vCPU(s)** - 2
- **Number of Cores per vCPU** - 1
- **Memory** - 4 GiB
- Select **+ Add New Disk**
 - **Type** - DISK
 - **Operation** - Clone from Image Service
 - **Image** - WinToolsVM-Q1CY21.qcow2
 - Select **Add**
- Select **+ Add New NIC**
 - **Subnet Name** - Secondary
 - Select **Add**

3. Click **Save** to create the Windows Tools VM.

Note

Nutanix AHV provides an *Image Service* feature that allows you to build a store of imported files that you can use to mount a CD-ROM device from an ISO image or an operating system disk from a disk image when creating a VM. The Image Service supports raw, vhd, vhdx, vmdk, vdi, iso, and qcow2 disk formats.

4. Click **+ Create VM**.

5. Fill out the following fields to complete the user VM request:

- **Name** - `Initials -LinuxToolsVM`
- **Description** - Manually deployed Linux Tools VM
- **vCPU(s)** - 2
- **Number of Cores per vCPU** - 1
- **Memory** - 4 GiB
- Select **+ Add New Disk**
 - **Type** - DISK
 - **Operation** - Clone from Image Service
 - **Image** - Linux_ToolsVM
 - Select **Add**
- Select **+ Add New NIC**
 - **Subnet Name** - Secondary
 - Select **Add**

6. Click **Save** to create the Linux Tools VM.

Note

Many VM operations, including VM creation, can be scripted using the AHV CLI, `accli`. The ACLI Reference Guide can be found [here](#).

7. Click **Table** to change views. Using the search field in the top right-hand corner, enter `Initials`.

Right-click the `Initials -WinToolsVM` VM, and then select **Power On** from the pop-up menu.

Repeat for the `Initials -LinuxToolsVM` VM.

8. Once the VMs have completed booting, note their IP addresses.

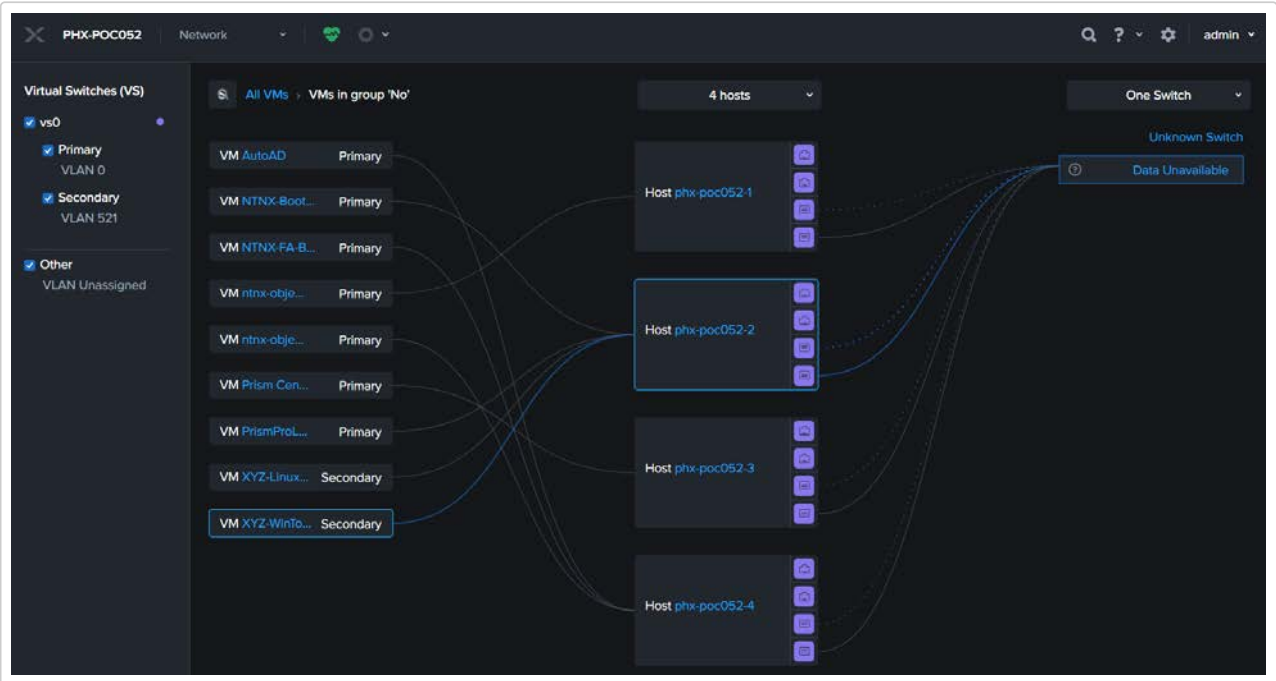
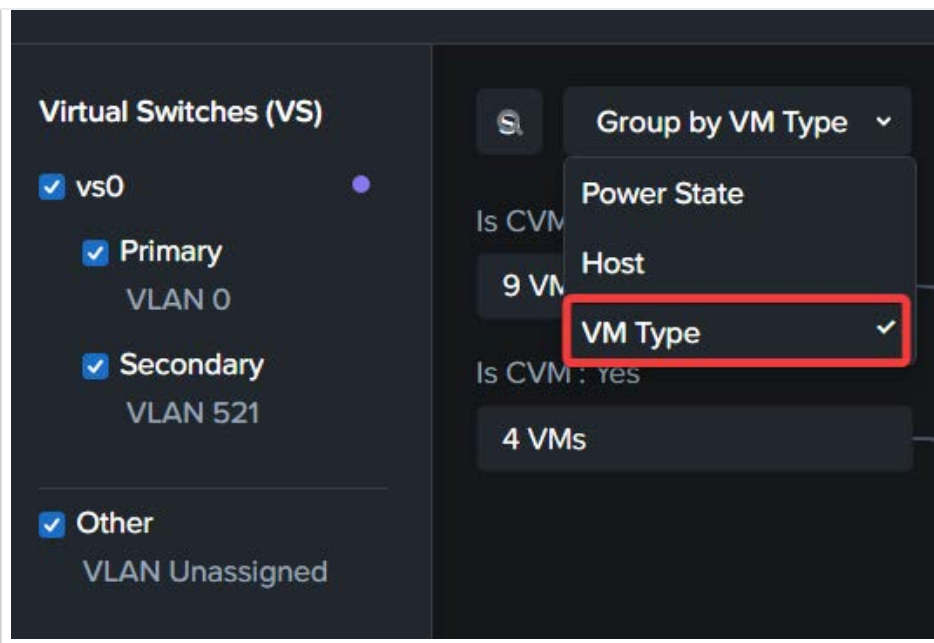
Overview · Table

VM

VM Name	Host	IP Addresses	Cores	Memory Capacity	
XYZ-LinuxToolsVM	phx-poc052-2/AHV	10.42....			2.09
XYZ-WinToolsVM	phx-poc052-2/AHV	10.42....	2	4 GiB	19.82

In the past, Kara has experienced issues with newly created VM networks not working as expected and has had to engage in lengthy troubleshooting sessions with her network administrator counterpart to identify the source of the issue. This situation required additional unplanned time, taking them both away from other projects and adding a level of frustration and uncertainty. With AHV, Kara can easily visualize the complete network path of the virtual machine that she's provisioned and can complete many tasks without attention from the network administrator.

9. Select **Network** from the drop-down menu, and then **Group by VM Type**. This diagram illustrates the path to and from the VM, including the host ports traversing and the network switch.



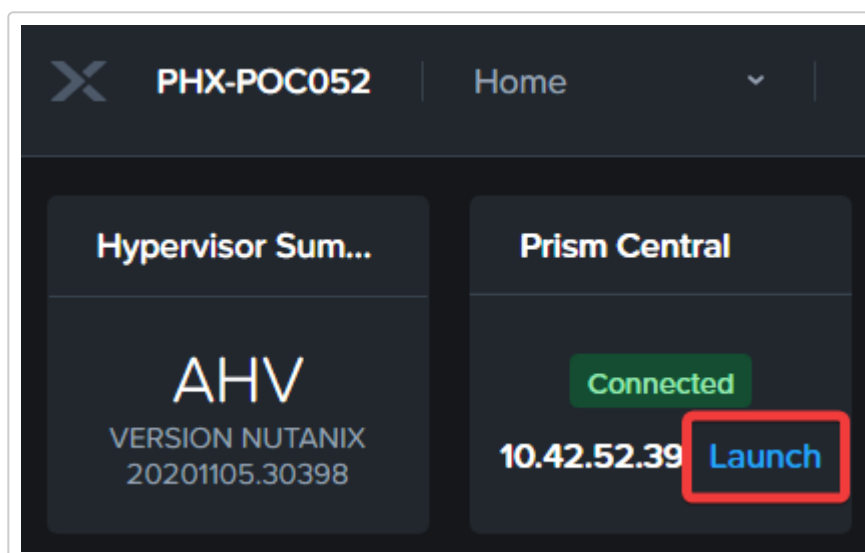
Self-Service, Categories, Roles & Projects

Enabling User Self Service

While Prism and `accli` provide simple workflows for creating VMs, Kara is regularly inundated with these requests. She would love to focus more of her time on modernizing other parts of her organization's aging infrastructure and maybe even attending her son's soccer games for a change.

In the following exercises, Kara will level up her Private Cloud game by providing Infrastructure as a Service (IaaS) self-service capabilities to her users by leveraging the native capabilities in *Prism Central*.

1. Select **Home** from the drop-down menu.
2. Access Prism Central by clicking the **Launch** button and logging in with the following credentials:
 - **User Name** - admin
 - **Password** - HPOC-PASSWORD




Exploring Categories

A *Category* is a key-value pair. Categories are assigned to entities (ex. VMs, networks, or images) based on some criteria (ex. location, production level, app name). Policies can then be mapped to those entities that are assigned a specific category value.

For example, you might have a department category that includes engineering, Finance, and HR values. In this case, you could create one backup policy that applies to Engineering and HR and a separate (more stringent) backup policy that applies to just Finance. Categories allow you to implement various policies across entity groups, and Prism Central will enable you to view any established relationships quickly.

In this exercise, you'll create a custom category for Kara to help align access to the proper resources for the Fiesta app team.

1. Within Prism Central, select  > **Administration** > **Categories**.
2. Click **New Category**, fill out the following fields, and click **Save**:
 - o **Name** - Initials -Team
 - o **Purpose** - Allows resource access based on application team
 - o **Values** - Fiesta

Name ?

XYZ-Team

Purpose ?

Allows resource access based on application team

Values ?

Fiesta

Value of the category

Cancel Save

- Click on the **Environment** category, and note the available values. *Environment* is a system category, and while you can add additional values, you cannot modify or delete the category or any out-of-the-box values.

Category Environment Summary

Update Delete

Policies ? None

All Types

No matching policies.

Values 4

Dev

Production

Staging

Testing

Entities 4

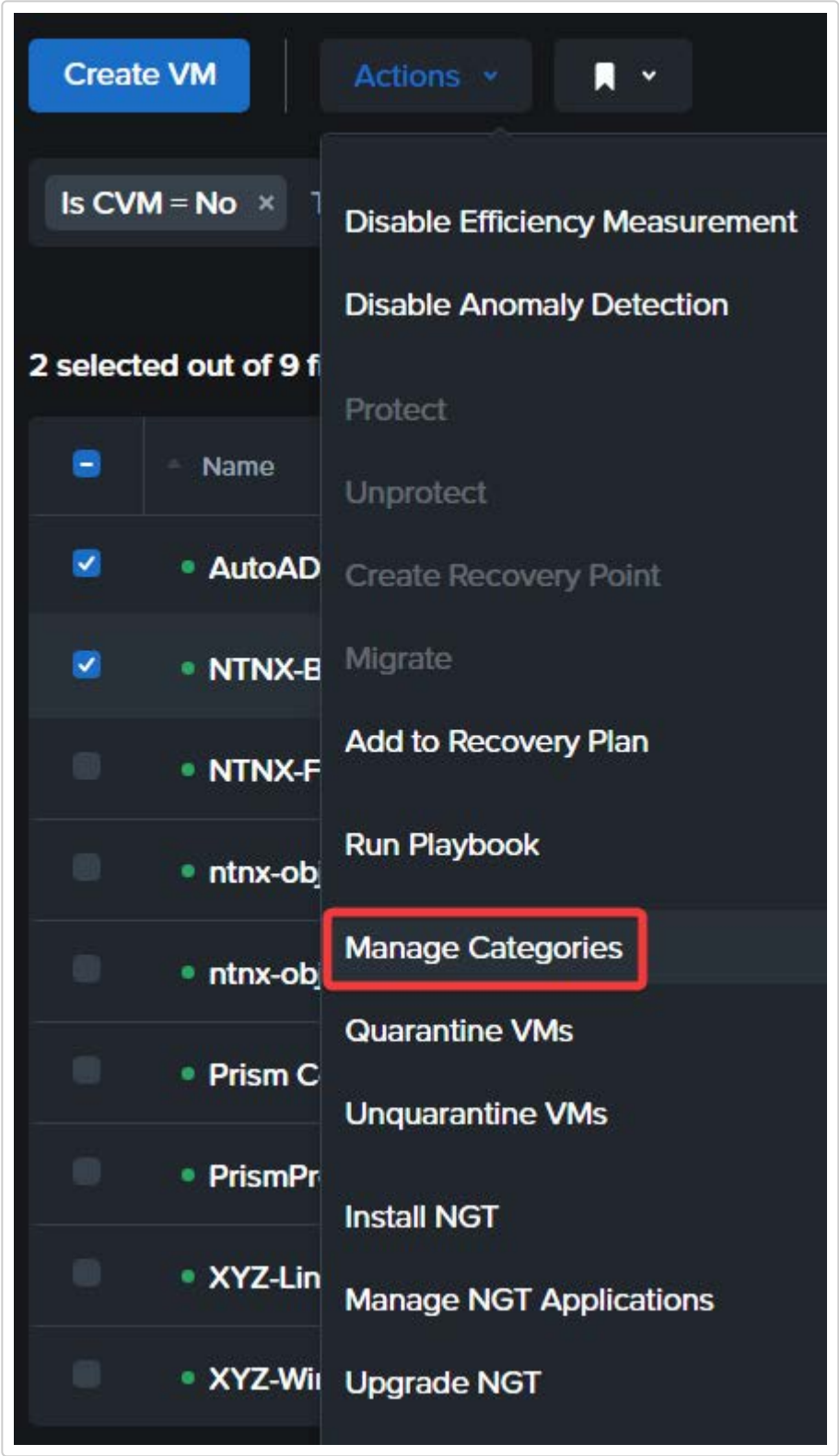
No associated entities

No associated entities

No associated entities

No associated entities

- Select > Compute & Storage > VMs.

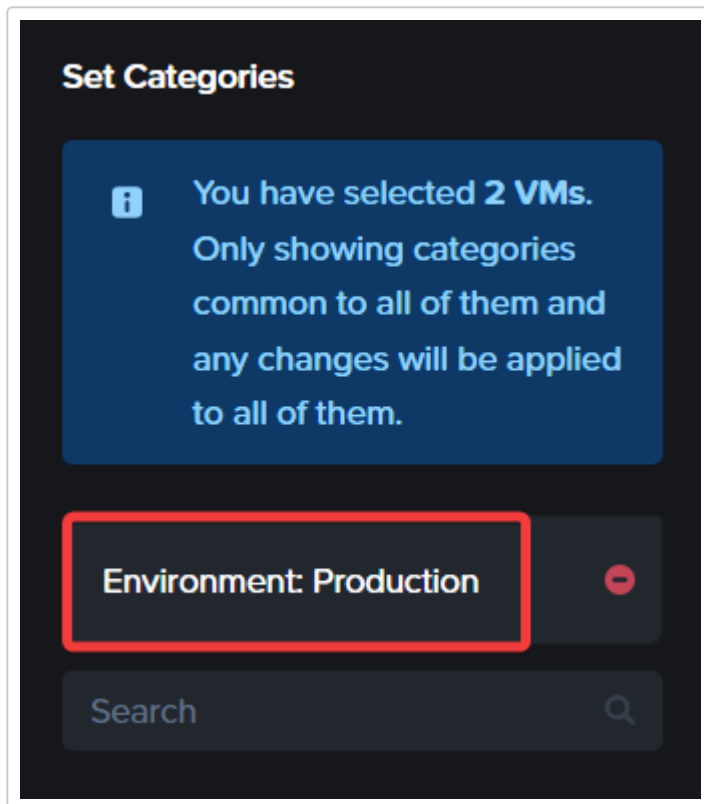


Note

NUTANIX BOOTCAMPS

pages to select the VM, or choose to show other rows. Any of these techniques can be accomplished at the upper right-hand portion of the interface.

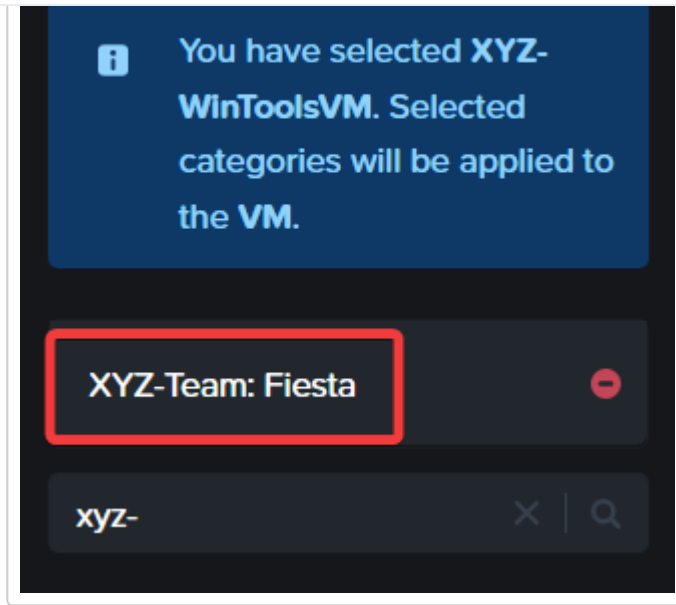
6. In the *Search for a category* field, enter `Environment` . Select the **Environment: Production** value, and click **Save**.



Note

For categories tied to Security, Protection, or Recovery policies, related policies will appear in this window to show the impact of applying a category to an entity.

7. Using the checkboxes, de-select both the **AutoAD** and `Initials -LinuxToolsVM` VMs.
8. Using the checkbox, select the `Initials -WinToolsVM`, and then click **Actions > Manage Categories**.
9. Assign the `Initials -Team: Fiesta` category, and click **Save**.



Exploring Roles

By default, Prism Central ships with several roles that map to typical user personas. Roles define which actions a user can perform and are mapped to categories or other entities.

Kara needs to support two types of users working on the Fiesta team:

- Developers who need to provision VMs for test environments
- Operators who monitor multiple environments within the organization have minimal capabilities to modify each environment.

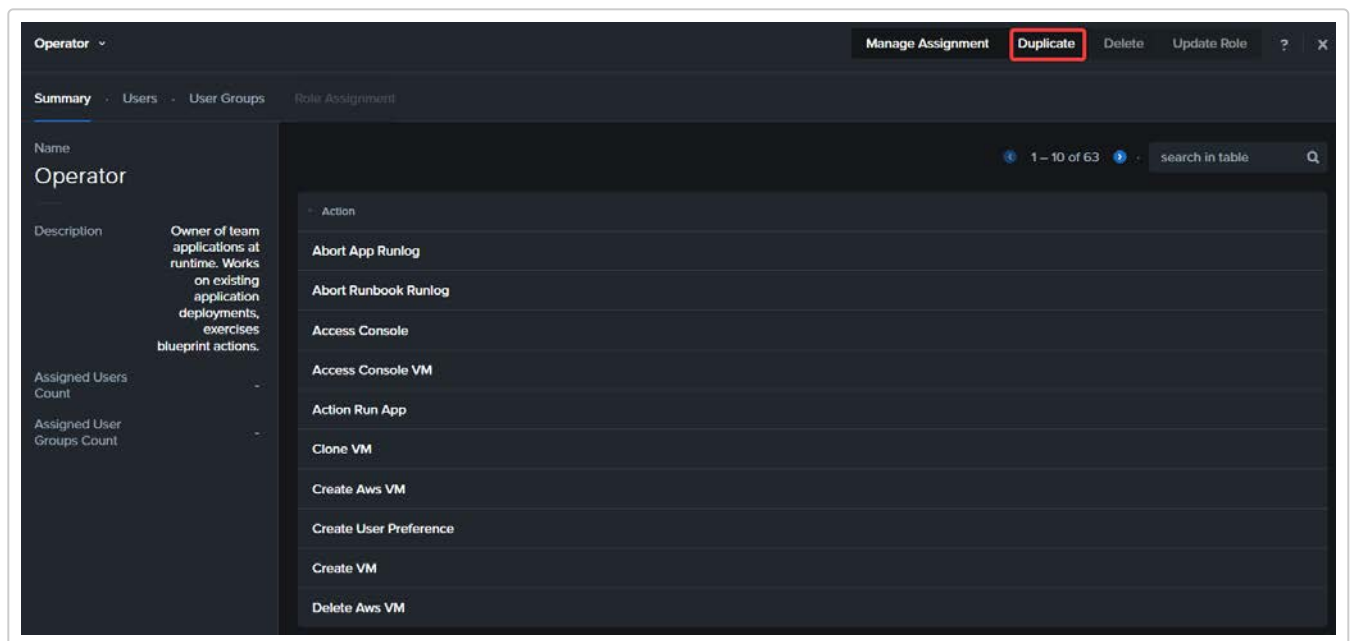
1. Within Prism Central, select **☰ > Administration > Roles**.

The built-in Developer role allows users to create and modify VMs, create, provision, and manage Calm Blueprints, and more.

2. Click on the built-in **Developer** role, review the approved actions for the role, and then click **Manage Assignment**.

The default *Operator* role includes deleting VMs and applications deployed from Blueprints, which isn't desired in our environment. Rather than building a new role from scratch, we can clone an existing role and modify it to suit our needs. The desired operator role should only have the rights to view VM metrics, perform power operations, and update VM configurations such as vCPU or memory to address application performance issues.

6. Click the built-in *Operator* role, and then click **Duplicate**.



7. Fill out the following fields, and then click **Save** to create your custom role.

- **Role Name** - Initials -SmoothOperator
- **Description** - Limited operator account
- **App** - No Access
- **VM** - Edit Access

Note

The *App* access will change to *Set custom permissions* once you select *Edit* access with the *VM* section.

Role Name

XYZ-SmoothOperator

Description

Limited operator account



Filter Entities

Search



App

● Partial Access ▾

- No Access ?
- Basic Access ?
- Full Access ?
- Set custom permissions [Change](#)

VM Recovery Point

● Partial Access ▾

VM

● Edit Access ▾

- No Access ?
- View Access ?
- Basic Access ?
- Edit Access ?
- Full Access ?
- Set custom permissions [Change](#)



Allow VM creation ?

8. Close this screen by clicking on the **X** at the top right-hand corner.
9. Select your `Initials` -**SmoothOperator** role, and click **Manage Assignment**.
10. Click on **Add New**.
11. Create the following assignment:
 - **Select Users or Groups** - `operator01@ntnslab.local`
 - **Select Entities > AHV VM > In Category** - Environment:Production, Environment:Testing, Environment:Staging, Environment:Dev

Operator01 has access to VMs within any *Environment* category but lacks generic access to specific clusters.

12. Click on **Add New** to add an additional assignment to the same role:
 - **Select Users or Groups** - `operator02@ntnslab.local`
 - **Select Entities > AHV VM > In Category** - Environment:Dev, `Initials` -Team:Fiesta

Operator02 will have access to VMs within the *Environment: Dev* or *Fiesta* category.

Users and groups
Select the users on whom this role will be applied

Select Users or User Groups or OUs

ntnslab (AD) Search User

ntnslab

operator02@ntnslab.local x

Entities
Select the entities or groups of entities on which this role will be applied.
Groups can be defined based on entity attributes like categories, clusters, owners etc.

Select Entities

AHV VM In Category Search Category

AHV VM

Environment:Dev x XYZ-Team:Festa x

Automatic access

Entities created by selected users

Delete Duplicate

ntnslab

operator01@ntnslab.local

AHV VM

Environment:Production Environment:Testing Environment:Staging Environment:Dev

Automatic access

Entities created by selected users

Delete Duplicate Edit

13. Click **Save**, and then close this screen by clicking on the **X** at the top right-hand corner.
14. For infrastructure administrators such as Kara, you can map AD users to the *Prism Admin* or *Super Admin* roles through selecting **≡ > Prism Central Settings > Users and Roles > Role Mapping** and adding a new *Cluster Admin* or *User Admin* mapping to AD accounts.

Note

This is for illustration purposes only. No action is required

Enter the attributes for this role mapping.

Directory or Provider

ntnslab

Type

user

Role

Cluster Admin

Values

adminuser01

< Back

Save

Exploring Projects


The previous exercises are sufficient to provide essential VM creation self-service to Kara's users, but much of their work involves applications that consist of multiple VMs. Manual deployment of numerous VMs for a single development, testing, or staging environment is slow and subject to inconsistency and user error. To provide a better experience for her users, Kara will introduce Nutanix Calm into the environment.

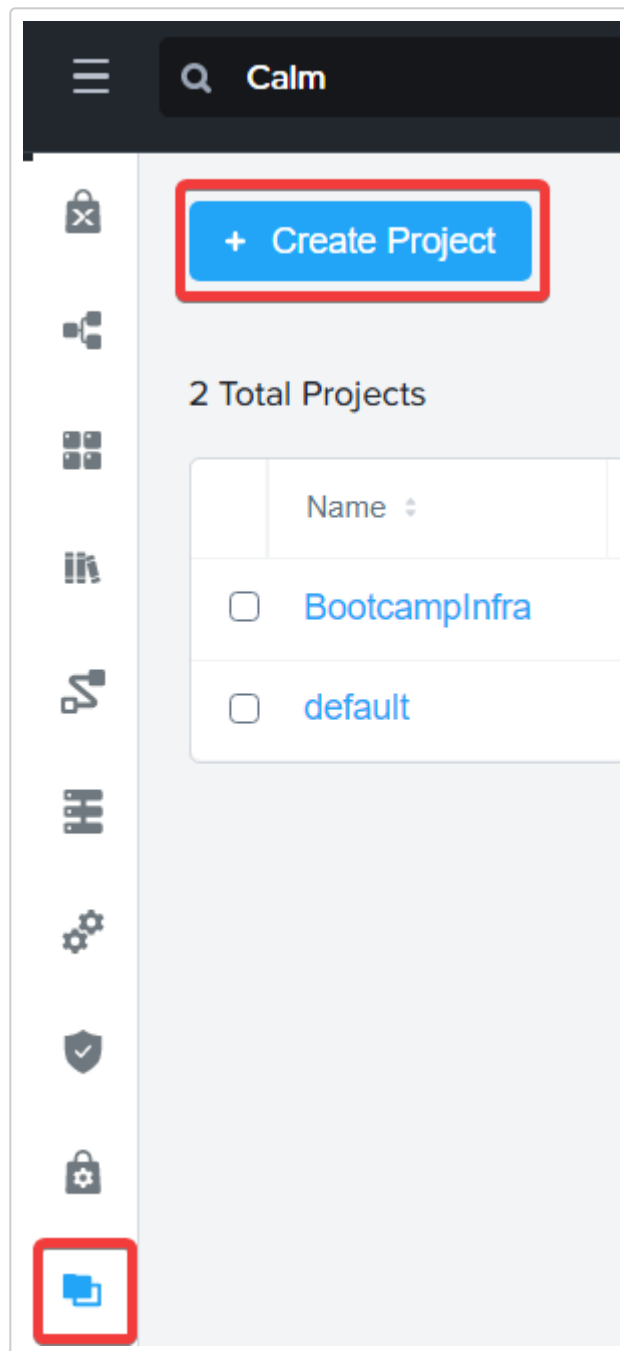
Nutanix Calm allows you to build, provision, and manage your applications across private (AHV, ESXi) and public cloud (AWS, Azure, GCP) infrastructure.

For non-infrastructure administrators to access Calm, allowing them to create or manage applications, users or groups must first be assigned to a *Project*, which acts as a logical container to define user roles, infrastructure resources, and resource quotas. Projects represent

Achievement Unlocked: I wear my sunglasses at night

Calm does not currently support *Dark Theme*.

1. Within Prism Central, select  > **Services** > **Calm**.
2. Select **Projects** from the left-hand menu, and then click **+ Create Project**.



Create Project

?

X

Project Name

XYZ-FiestaProject

Description (Optional)

View

A description for the project

Project Admin (Optional)

⚙️ AD Service: ntnxlab

Select

ℹ️

You will be automatically added to the project. You can add more users later

API Equivalent

Cancel

Create


4. Click **+ Add Infrastructure** and fill out the following fields:

Description

No description added


Edit

Summary



Users, Groups and Roles

+ Add Users



Infrastructure

+ Add Infrastructure

- Click on the **Select Infrastructure** drop-down, and choose **NTNX_LOCAL_AZ**.
- Click the **Configure Resources** button, and select your cluster from the drop-down.
- Click **+ Select VLANs**. Check the **Secondary** box. Click **Confirm and Select Default >> Confirm**.
- Click the ★ for *Secondary* within the *Default* column and click **Confirm**.
- Within the *Quotas (optional)* section, specify the following:
 - **vCPUs** - 100
 - **Memory** - 100
- Click **Save**.

5. Click **Environments** from the top menu, click **Create Environment** and fill out the following fields:

- Enter `Initials - Environment`, and then click **Next**.

- Click anywhere in the *VM Configuration* box to expand it.
- Perform the following for the *Windows* section.
 - Within the *Cluster* drop-down, choose your cluster.
 - Within the *VM Configuration* section, specify the following:
 - **vCPUs** - 2
 - **Cores per vCPU** - 1
 - **Memory (GiB)** - 4
 - Scroll down to the *Disks* section, and choose **Windows2016.qcow2** from the *Image* drop-down.
 - Scroll down to the *Network Adapters (NICs)* section, and click the **+**.
 - Choose **Secondary** from the *NIC 1* drop-down.
- Perform the following within the *Linux* section.
 - Within the *Cluster* drop-down, choose your cluster.
 - Within the *VM Configuration* section, specify the following:
 - **vCPUs** - 2
 - **Cores per vCPU** - 1
 - **Memory (GiB)** - 4
 - Scroll down to the *Disks* section, and choose **CentOS7.qcow2** from the *Image* drop-down.
 - Scroll down to the *NETWORK ADAPTERS (NICs)* section, and click the **+**.
 - Choose **Secondary** from the *NIC 1* drop-down.
- Click **Next**.
- Click **+ Add Credential**, and specify the following:
 - **Credential Name** - CENTOS
 - **Username** - `centos`
 - **Secret Type** - Password
 - **Password** - `nutanix/4u`
- Click **Save Environment & Project**.

Click **+** Add User before entering each entry.

Note

You may need to utilize more than one scroll bar along the right-hand side.

- o **Name** - Administrators (group)
- o **Role** - Project Admin
- o **Name** - Operator02 (person)
- o **Role** - *Initials* -SmoothOperator
- o **Name** - SSP Developers (group)
- o **Role** - Developer

Add/Edit Users & Groups

+ Add User

⚙️ AD Service: ntnxlab

Name	Role	
operator02@ntnxlab.local	XYZ-SmoothOperator	⌵ Delete
SSP Developers	Developer	⌵ Delete
Administrators	Project Admin	⌵ Delete

☒ Allow Collaboration ⓘ

Cancel

Save Users and Project

7. Click **Save Users and Project**.

Note that we've only granted *Operator02* to the *Calm* Project, rather than all *Operator* accounts.

← [Configuring Storage & Networking, Creating VMs](#)

[Blueprints & Developer Workflow](#) →


Blueprints & Developer Workflow

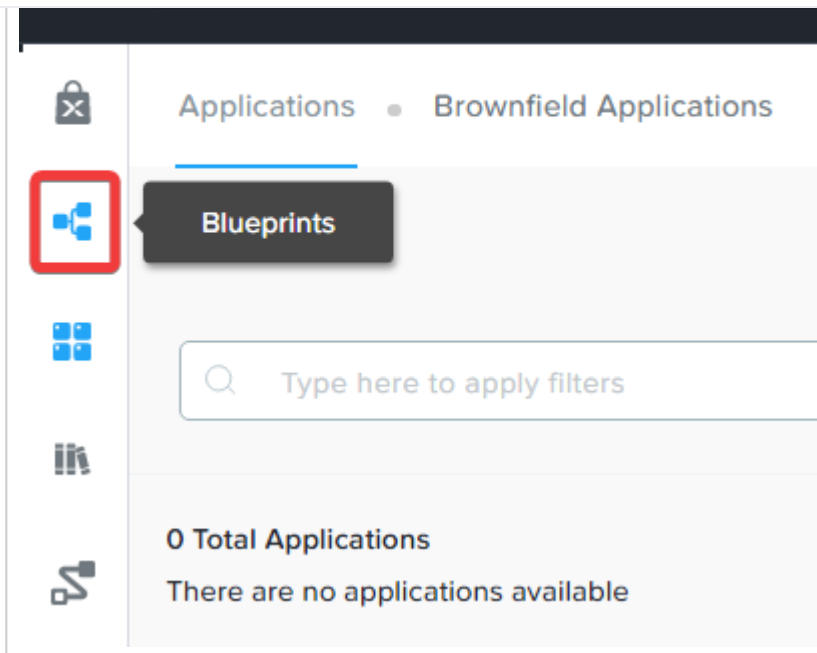
Staging Blueprints

A Blueprint is a framework for every application that you model by using Nutanix Calm. Blueprints are templates that describe all the steps required to provision, configure, and execute tasks on the services and applications created. A Blueprint also defines the lifecycle of an application, and its underlying infrastructure, starting from the creation of the application to the actions carried out on an application (updating software, scaling out, etc.), all the way through the termination of the application.

You can use Blueprints to model applications of various complexities, from simply provisioning a single VM to provisioning and managing a multi-node, multi-tier, multi-cloud application.

While developers will create and publish their Blueprints, Kara wants to provide a standard Fiesta Blueprint available for the team.

1. Download the Fiesta-Multi Blueprint to your desktop by clicking [here](#). Save the *Fiesta-Multi.json* file in your **Downloads** folder.
2. Within Prism Central, select  **Services** > **Calm**, and then select **Blueprints** from the left-hand menu.
3. Click **Upload Blueprint**.



4. Select **Fiesta-Multi.json**.

5. Update the *Blueprint Name* to include your initials. Even across different projects, Calm Blueprint names must be unique.

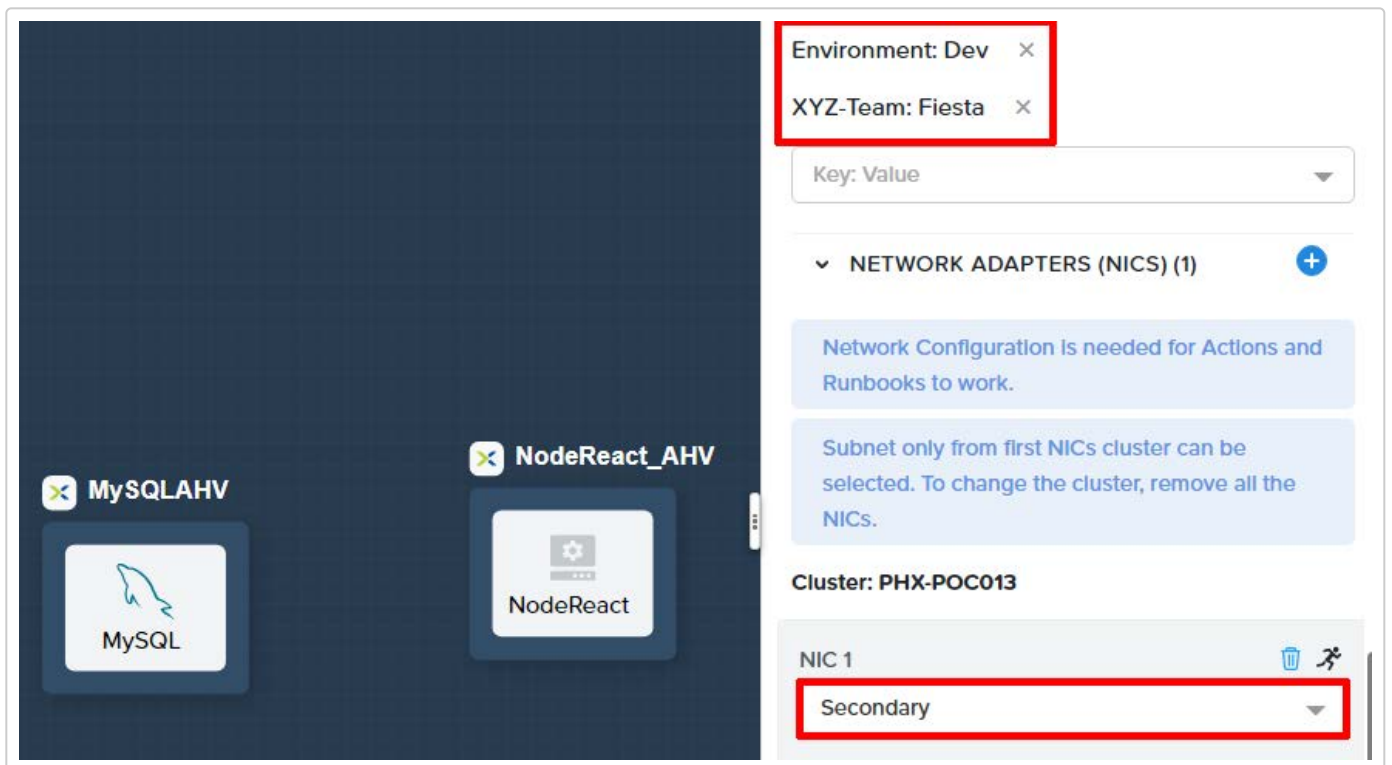
6. Select **Initials -FiestaProject**, and then click **Upload**.

A screenshot of the 'Upload Blueprint' dialog box. The title bar says 'Upload Blueprint' with a question mark and a close button. The 'Blueprint Name' field contains 'XYZ-Fiesta-Multi'. The 'Project' dropdown menu is open, showing 'XYZ-FiestaProject' as the selected option. At the bottom right, there are 'Cancel' and 'Upload' buttons.

7. Within the right-hand pane, expand the **db_password** selection by clicking **>**. Enter **nutanix/4u** within the *Value* text field.

NUTANIX BOOTCAMPS

9. Within the *CentOS (Default)* entry, click **Edit**.
10. Enter **nutanix/4u** within the *Password* text field.
11. Click **Done** and then click **Back**.
12. Select the **NodeReact_AHV** service within the main window.
13. Click the **VM** tab within the right-hand pane.
14. Scroll down to the *Disks* section, and choose **CentOS7.qcow2** from within the *Disk Images* section of the *Image* drop-down. Do not select **CentOS7** entry within the *Downloadable Images* section.
15. Scroll down to the *NETWORK ADAPTERS (NICs) (1)* section, choose **Secondary** from the *NIC 1* drop-down.
16. Within the *Categories* section (directly above) add both **Initials -Team: Fiesta** and **Environment: DEV** entries by using the drop-down menu.




17. Repeat steps 13 through 16 for the *MySQLAHV* service.
18. Click **Save**.

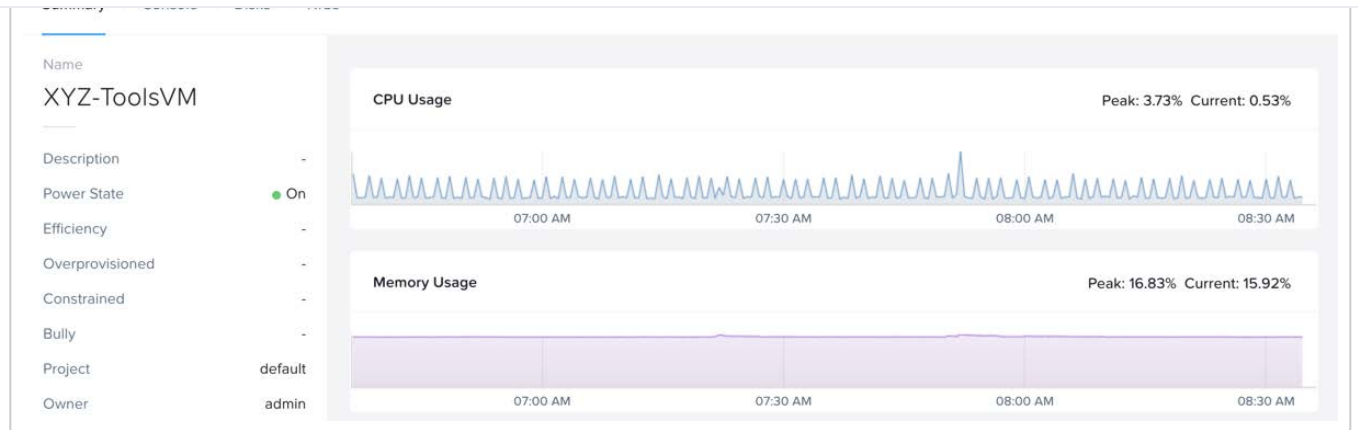
Developer Workflow

Meet Dan. Dan is a member of the Fiesta Engineering team. He's behind on testing a new feature, as his request to IT to deploy the virtual infrastructure he requires to perform the testing are several days overdue.

Dan has resorted to deploying VMs on a public cloud service outside of the heavily-secured corporate network and its security oversight. Dan is inexperienced with the public cloud, so he's putting the company at risk of having their intellectual property stolen because he's desperate to finish this project on time.

Kara is made aware of this and encourages Dan to follow the exercise below, which will allow him to deploy the resources he securely needs for his project quickly.

1. Within the *admin* drop-down at the top right-hand corner of the screen, choose **Sign Out**
2. Log in to Prism Central with Dan's credentials:
 - **User Name** - `devuser01@ntnslab.local`
 - **Password** - `nutanix/4u`
3. Click  and observe that you now have restricted access to the environment.
4. Within *Compute & Storage* > *VMs* your *Initials* -**WinToolsVM** is available to be managed by Dan. Click on the VM, and within the lower pane, observe that Dan can view basic metrics associated with this VM. He can also control the VM configuration, power operations, and even delete the VM.



Two workflows could be followed for self-service creation of VMs: Traditional VM creation wizard and Calm. Dan's requirement is a Linux virtual machine that runs multiple tools required for his development workflow.

5. Close this screen by clicking on the **X** at the top right-hand corner.
6. Click **Create VM**, and then fill out the following fields to provision a virtual machine.

This is similar to the manual VM deployment process Kara followed earlier in the lab.

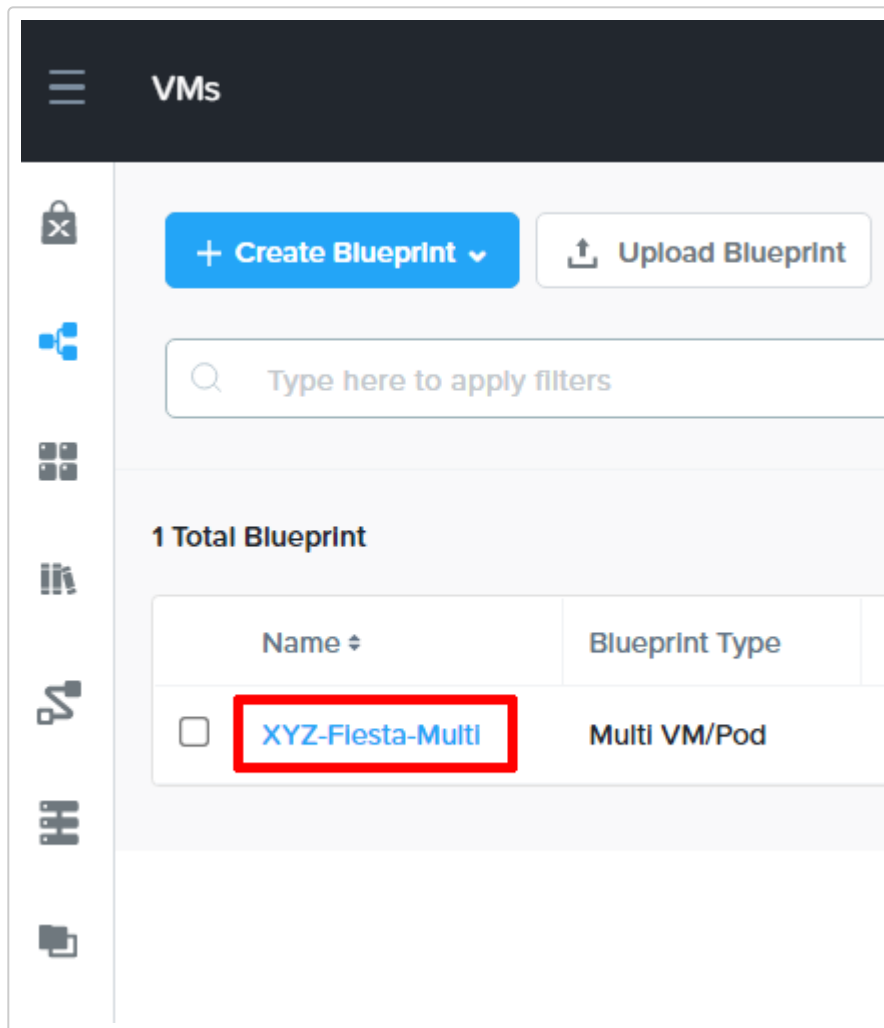
- Click **Create VM from Catalog Item**
- Select **Linux_ToolsVM.qcow2** from the *Catalog Item* drop-down
- Click **Begin**
- **Name** - `Initials -LinuxToolsVM`
- Within the *VM Properties* section set the following:
 - **CPU** - 2
 - **Cores Per CPU** - 1
 - **Memory** - 4 GiB
- Click **Next**
- Click **Attach to Subnet** within the *Network* section
 - Select **Secondary** from the *Subnet* drop-down
 - Click **Save**
- Click **Next**
- Within the *Categories* field enter `Environment: Dev`
- Click **Next**
- Click **Create VM**

NUTANIX BOOTCAMPS

single-VM provisioning and manual integration is slow, inconsistent, and doesn't result in high user satisfaction. Luckily, we can leverage the pre-created Blueprint for Fiesta, which was previously staged to our project by Kara.

7. Select **☰** > **Services** > **Calm**.

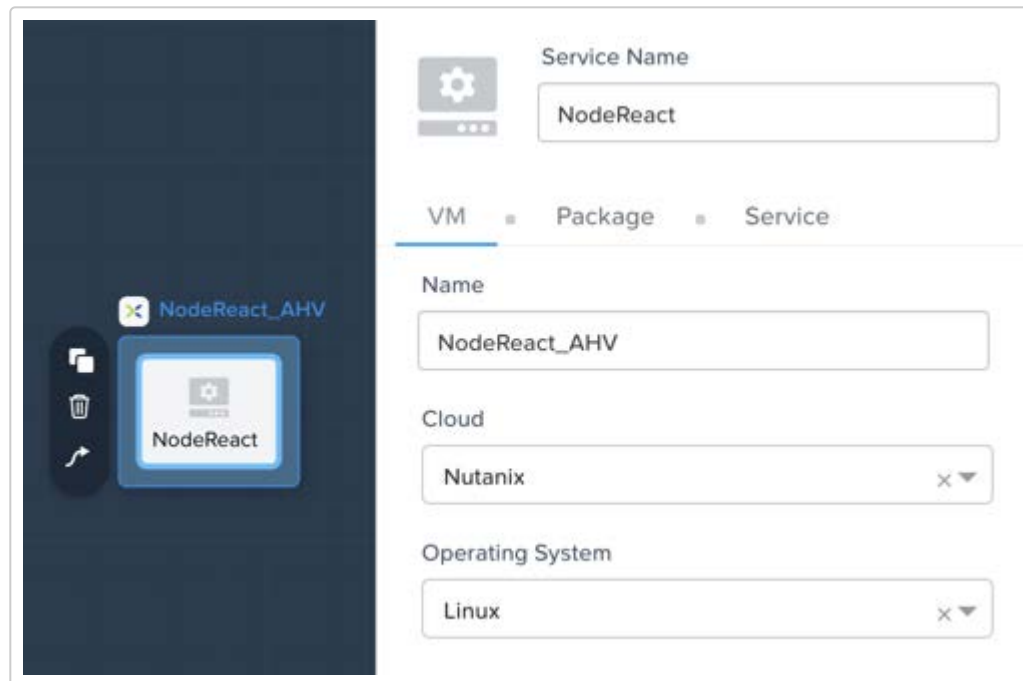
8. Select **Blueprints** from the left-hand menu and click on the **Initials -Fiesta-Multi** Blueprint.



Note

If you're unfamiliar with Calm Blueprints, take a moment to explore the following critical components of the *Fiesta-Multi* Blueprint:

NUTANIX BOOTCAMPS



- Select the **Package** tab, and then click **Configure Install** to view the installation tasks for the selected service. These are the scripts and actions associated with the configuration of each Service or VM.

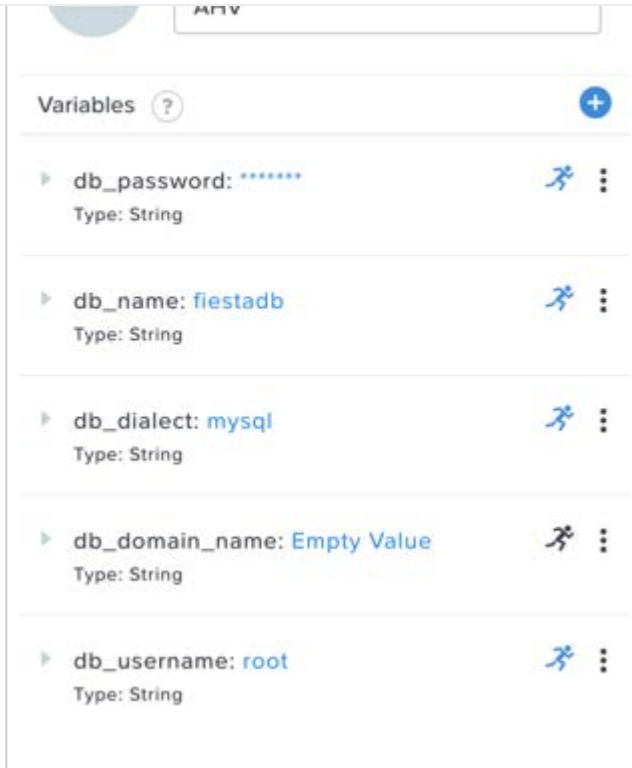
NUTANIX BOOTCAMPS

The screenshot displays the Nutanix Blueprint console interface. On the left, a dark-themed sidebar shows a hierarchy: 'NodeReact_AHV' (with a close icon) containing 'NodeReact' (with a play icon), which in turn contains a 'Package Install' section. This section lists three sequential tasks: '1InstallSoftware', '2ConfApp', and '3ConfNginx', each with a terminal icon and a downward arrow indicating flow. Below these tasks are buttons for '+ Task' and '+ Action'. On the right, a light-themed configuration panel is visible. It includes a 'Browse Library' button at the top. Below this, there are three dropdown menus: 'Type' set to 'Execute', 'Script Type' set to 'Shell', and 'Credential' set to 'CENTOS'. A 'Script' section contains a terminal window with the following bash script:

```
1 #!/bin/bash
2 set -ex
3
4 # Update and install packages
5 sudo yum -y update
6 sudo yum -y install wget git vim
7
8 # Install node
9 curl -sL https://rpm.nodesource.com/pub/rpm/node.repo > /etc/yum.repos.d/node.repo
10 sudo yum install -y nodejs
11 node --version
12
13 # Clone Repo
14 git clone https://github.com/shardul-94/Fiesta
15 cd ~/Fiesta
```

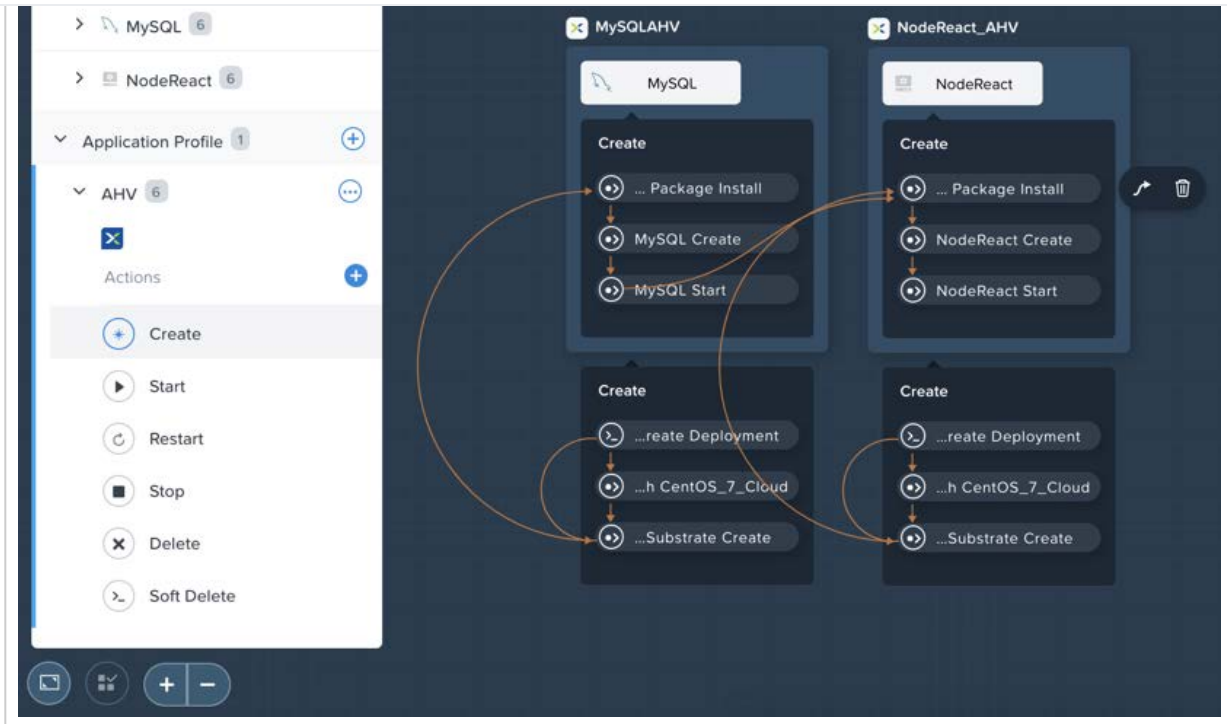
Below the script is a 'Test Script' button. At the bottom of the configuration panel is a 'Publish To Library' button.

- Under *Application Profile*, select **AHV** and view the variables defined for the Blueprint. Variables allow for runtime customization and can also be used on a per-application profile basis to build a single application Blueprint, enabling you to provision an application to multiple environments, including AHV, ESXi, AWS, GCP, and Azure.



- Select the **Create** action under *Application Profile* to visualize dependencies between services. Dependencies can be defined explicitly, but Calm will also identify implicit dependencies depending on the assignment of variables. In this Blueprint, you see the web tier installation process will not begin until the MySQL database is running.

NUTANIX BOOTCAMPS



- Click **Credentials** in the toolbar at the top of the Blueprint editor, and then expand the existing **CENTOS** credential. Blueprints can contain multiple credentials, authenticating to VMs to execute scripts or securely passing credentials directly into scripts.

▼ 🔑 CENTOS

Credential Name

CENTOS

Username

centos

🏃

Secret Type

Password ▼

Password

++++++

🏃

👁

Reset

Clear

Is used as the default credential

?

If you've made any changes, you may have noticed that the *Launch* button is now greyed out. You must click **Save** to capture your changes, before you will be able to launch the Blueprint.

9. Click **Launch** to provision an instance of the Blueprint.

10. Fill out the following fields, and then click **Deploy**.

- **Name of the Application** - `Initials` -FiestaMySQL
- **Initials** - `Initials`

NUTANIX BOOTCAMPS

XYZ-FiestaMySQL

Application Description


View

Application Description


Project

XYZ-FiestaProject

Environment

XYZ-Environment Default 

App Profile


AHV 

initials

XYZ

MySQL

Boot Configuration

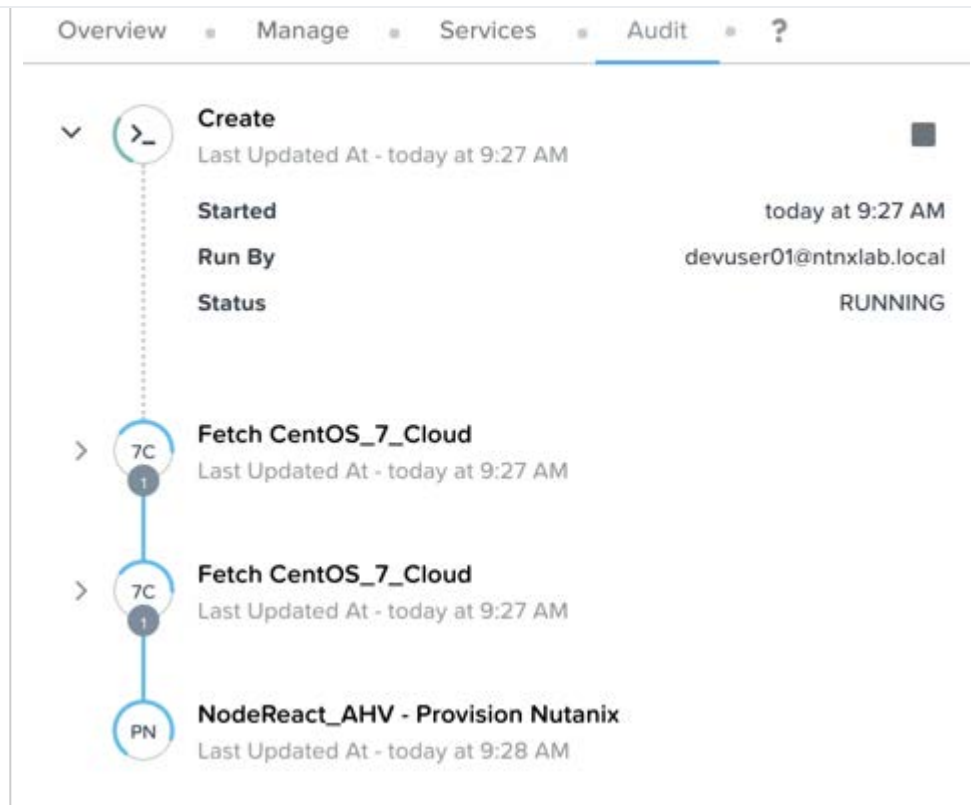
Total Cost: Not Available 


Cancel

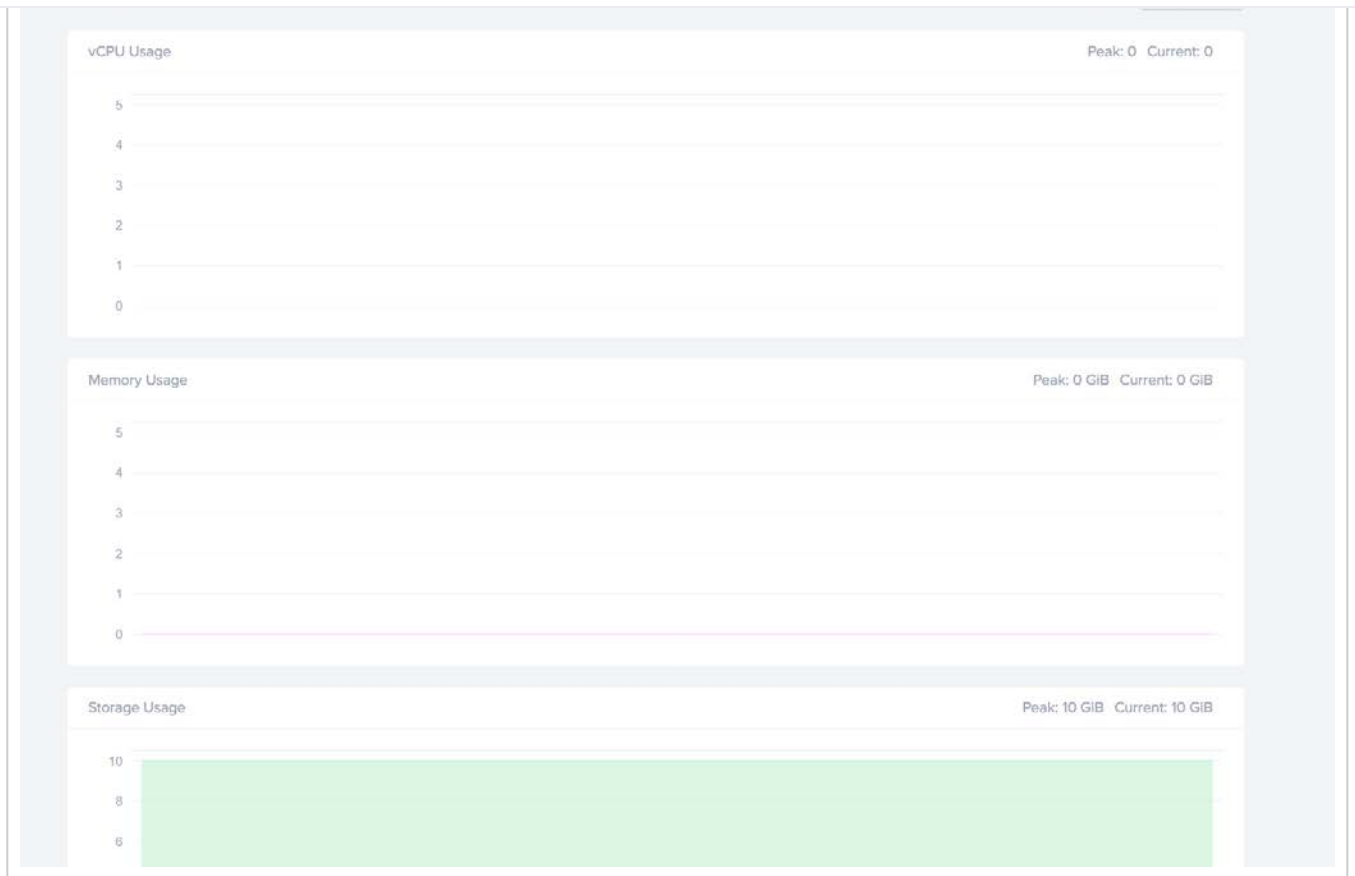
Deploy

11. Select the **Audit** tab to monitor the deployment of the Fiesta development environment. The provisioning of the app should take approximately 5 minutes.

NUTANIX BOOTCAMPS




12. While the application is provisioning, open  > **Administration** > **Projects** and select your project.
13. Review the *Summary*, *Usage*, *VMs*, and *Users* tabs to see what type of data is available. These breakouts make understanding the resources consumed on a per-project, VM, or user level.



14. Return to **Calm** > **Applications** > **Initials** -**FiestaMySQL** and wait for the application to move from *Provisioning* to *Running*.
15. Select the **Services** tab, and then select the **NodeReact** service to obtain the IP of the web tier.

RUNNING


**Service: NodeReact**

Name	NodeReact_AHV
Cloud	Nutanix
IP Address	10.38.113.28

Open Terminal

16. Open `<NODEREACT-IP>` in a new browser tab to validate that the app is running.

Global Inventory of Products:

					Add New Product
Image	Name	Unit Cost	Comment	Action	
	Single Banquet Chair Cover	\$2.99	Vendor in on Wednesdays only.	Delete From All Stores	

Instead of filing tickets and waiting days, Dan was able to get his test environment up and running himself - even before he could even finish his breakfast burrito!

Last Updated: 5/2/2023, 11:07:35 AM

Operator Workflow, Entity Browser, LCM

Operator Workflows

Meet Ronald and Elise. Ronald works as a Level 3 engineering with the corporate IT helpdesk, and Elise works as a QA intern on the Fiesta team. In the brief exercise below, you will explore and contrast their access levels based on the roles defined and categories assigned by Kara.

1. Log out of the *devuser01* account, and log back into *Prism Central* with Ronald's credentials:
 - **User Name** - `operator01@ntnslab.local`
 - **Password** - `nutanix/4u`
2. As expected, all VMs with Environment category values assigned are available. Note that you cannot create or delete VMs, but the ability to manage power and change VM configurations is still present.

What else can be accessed by this user? Is Calm available?

NUTANIX BOOTCAMPS

9 Total VMs

1 selected

Update

Delete

Clone VM

Launch console

Hard Power Off

Soft Shutdown

Create Recovery Point

Run Playbook

Manage Categories

Quarantine VMs

Unquarantine VMs

Install NGT

Manage NGT Applications

Upgrade NGT

Add to Catalog

Manage Ownership

Export as OVA

vCPU
2
4
2
2
2
2
2
2

3. Log out of the *operator01* account, and log back into *Prism Central* with Elise's credentials:

4. Note that only resources tagged with the `Initials -Team: Fiesta` category are available to be managed.

VMs

8 Total VMs

Actions ▾

Type text to filter by

Viewing all 8 VMs

<input type="checkbox"/>	▲ Name	vCPU
<input type="checkbox"/>	● XYZ-LinuxToolsVM	2
<input type="checkbox"/>	● XYZ-MYSQL	2
<input type="checkbox"/>	● XYZ-MYSQL	2
<input type="checkbox"/>	● XYZ-MYSQL	2
<input type="checkbox"/>	● XYZ-WebServer	2
<input type="checkbox"/>	● XYZ-WebServer	2
<input type="checkbox"/>	● XYZ-WebServer	2
<input type="checkbox"/>	● XYZ-WinToolsVM	2

Using Entity Browser, Search, and Analysis

NUTANIX BOOTCAMPS

Prism Central. In the exercise below, you will explore common workflows for working with entities across multiple clusters in a Nutanix environment.

1. Log out of the *operator02* account, and then log back into *Prism Central* with Kara's credentials:
 - **User Name** - adminuser01@ntnxlab.local
 - **Password** - nutanix/4u
2. Within Prism Central, select **≡ > Compute & Storage > VMs**. Prism Central's *Entity Browser* provides a robust UI for sorting, searching, and viewing entities such as VMs, Images, Clusters, Hosts, Alerts, and more.
3. Select **Modify Filters**, and explore the available options.

The screenshot shows the Nutanix Prism Central interface for the 'VMs' section. The top navigation bar includes 'VMs', 'Nutanix', 'Summary', 'List', 'Policies', 'Alerts', 'Events', and 'Metrics'. The 'List' tab is active. Below the navigation bar, there is a 'Create VM' button and an 'Actions' dropdown. A search bar contains 'Categories: XYZ-Team:Fiesta' and 'Name contains XYZ'. A 'Modify Filters' button is highlighted with a red box. Below the search bar, a table displays 'Viewing 1 filtered out of 35 total VMs'. The table has columns: Name, vCPU, Memory, IP Addresses, Cluster, Hypervisor, OS, NGT, Project, and Owner. The first row shows 'XYZ-WinToolsVM' with 2 vCPUs, 4 GiB memory, IP 10.42.52.139, Cluster PHX-POC052, Hypervisor AHV, OS -, NGT Not Installed, Project _internal, and Owner admin. On the right side, the 'Filters' panel is open, showing 'LABELS' and 'NAME' sections. The 'NAME' section has a 'Contains' filter selected with the value 'XYZ'. The 'CATEGORIES' section has a 'Contains' filter selected with the value 'XYZ-Team:Fiesta'. Both filter sections are highlighted with red boxes.

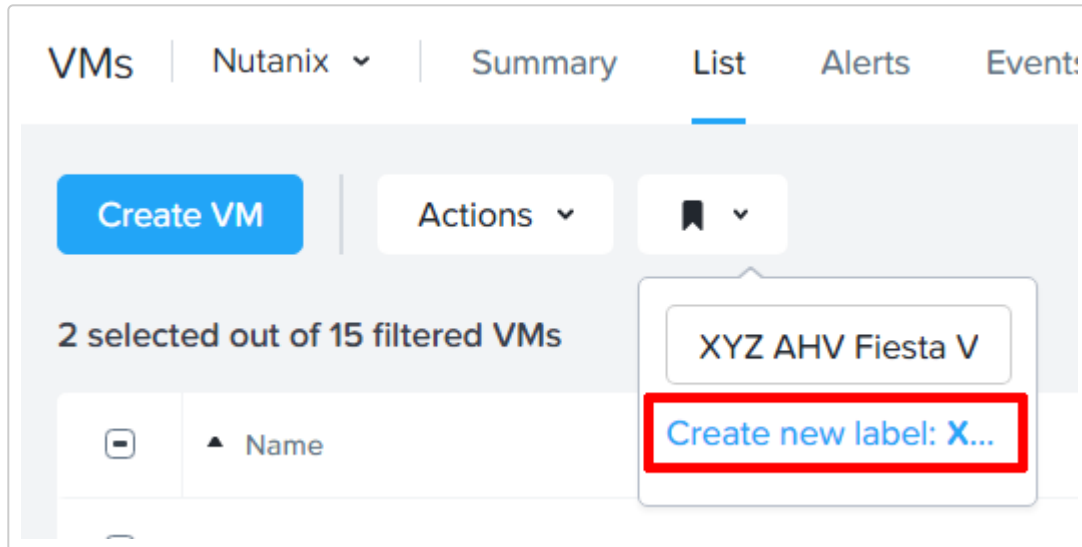
Name	vCPU	Memory	IP Addresses	Cluster	Hypervisor	OS	NGT	Project	Owner
XYZ-WinToolsVM	2	4 GiB	10.42.52.139	PHX-POC052	AHV	-	Not Installed	_internal	admin

4. Specify the following example filters, and verify the corresponding box is checked:
 - **Name** - Contains Initials
 - **Categories** - Initials -Team: Fiesta

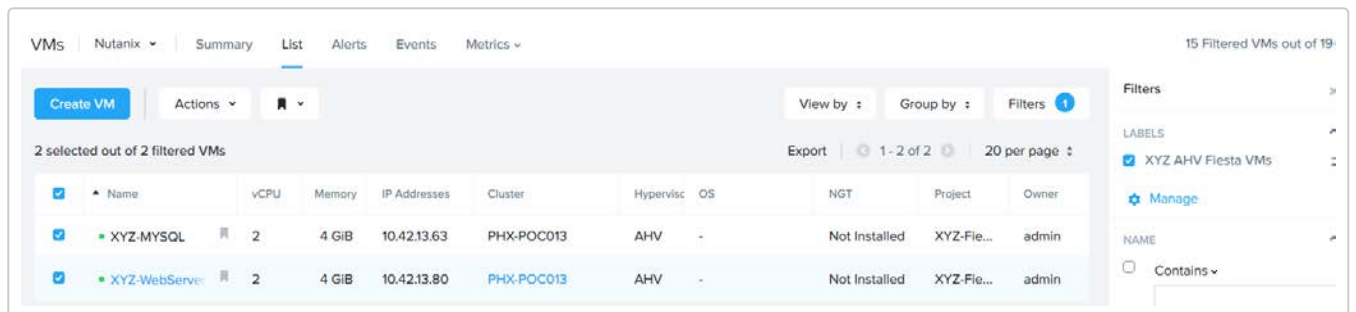
NUTANIX BOOTCAMPS

Take notice of other helpful filters available such as VM efficiency, memory usage, and storage latency.

5. Select the filtered VMs, and click the **Label** icon to apply a custom label to your group of filtered VMs (ex. `Initials` AHV Fiesta VMs). Click **Create new label** once you have typed the label name.



6. Clear all filters, and then select your new label to return to your previously identified VMs quickly. Labels provide an additional taxonomy for entities without tying them to specific policies as is with categories.



7. Select the **View by** dropdown to access the different out-of-box views. Which view should be used to understand if your VMs are included as part of a DR plan?
8. Click **View by > + Add Custom** to create a VM view (ex. XYZ-VM-View) that displays **CPU Usage**, **CPU Ready Time**, **IO Latency**, **Working Set Size Read**, and **Working Set Size Write**.
9. Click **Save**. This view could be used to helping to spot VM performance problems.

XYZ-VM-View

Choose the columns you wish to add from the left box by clicking the blue "+" button (Maximum of 10 allowed). To arrange the order of the selected columns, hover and click the up/down buttons.

Search

+

 Acropolis VM

+

 Anomalies (Last 24 Hours)

+

 Anomaly count

+

 AZ Location

+

 AZ Name

+

 Categories

+

 Cluster

+

 Constrained

SELECTED COLUMNS

10 MAX

1

+

 Name

2

+

 CPU Usage

3

+

 CPU Ready Time

4

+

 IO Latency

5

+

 Working Set Size Read

6

+

 Working Set Size Write

Cancel

Save

Life Cycle Manager

While not a daily activity, Kara previously dedicated 40% of her time planning and executing software and firmware updates to legacy infrastructure, leaving little time for innovation. In her Nutanix environments, Kara is leveraging the rules engine and rich automation in Life Cycle Manager (LCM) to take the hassle out of planning and applying her infrastructure software updates.

Wrap-up & Next Steps

You've now seen for yourself how:

- Prism delivers a frictionless experience for virtual infrastructure administrators, including deploying storage, networks, workloads, monitoring, and updating this environment.
- Prism Central capabilities, combined with Active Directory, can control access and enable self-service for non-administrator personas. Additionally, you helped rich application automation capabilities for your Private Cloud through Nutanix Calm.

Last Updated: 5/2/2023, 11:07:35 AM

[← Blueprints & Developer Workflow](#)

Glossary

Nutanix Core

AOS

AOS stands for Acropolis Operating System, and it is the OS running on the Controller VMs (CVMs).

Pulse

Pulse provides diagnostic system data to Nutanix customer support teams so that they can deliver proactive, context-aware support for Nutanix solutions.

Prism Element

Prism Element is the native management plane for Nutanix. Because its design is based on consumer product interfaces, it is more intuitive and easier to use than many enterprise application interfaces.

Prism Central

Prism Central is the multi-cloud control and management interface for Nutanix. Prism Central can manage multiple Nutanix clusters and serves as an aggregation point for monitoring and analytics.

Node

An industry-standard x86 server with server-attached SSD and optional HDD (All-Flash & Hybrid Options).

Block

2U rackmount chassis contains 1, 2, or 4 nodes with shared power and fans and no shared backplane.

Storage Pool

A storage pool is a group of physical storage devices, including PCIe SSD, SSD, and HDD devices for the cluster.

Storage Container

A container is a subset of available storage used to implement storage policies.

Anatomy of a Read I/O

Performance and Availability

- Data is read locally
- Remote access only if data is not locally present

Anatomy of a Write I/O

Performance and Availability

- Data is written locally
- Replicated on other nodes for high availability
- Replicas are spread across the cluster for high performance

Nutanix Flow

Application Security Policy

Isolation Environment Policy

Use an isolation environment policy when you want to block all traffic, regardless of direction, between two groups of VMs identified by their category. VMs within a group can communicate with each other.

Quarantine Policy

Use a quarantine policy when you want to isolate a compromised or infected VM and optionally wish to subject it to forensics. You cannot modify this policy, and the two modes to quarantine a VM are Strict or Forensic.

Strict: Use this value when you want to block all inbound and outbound traffic.

Forensic: Use this value when you want to block all inbound and outbound traffic except the traffic to and from categories that contain forensic tools.

AppTier

Add values for the tiers in your application (ex. web, application_logic, and database) to this category and use the values to divide the application into tiers when configuring a security policy.

AppType

Associate the VMs in your application with the appropriate built-in application type such as Exchange and Apache_Spark. You can also update the category to add values for applications not listed in this category.

Environment

Last Updated: 5/2/2023, 11:07:35 AM

[Accessing the Environment →](#)

Accessing the Environment

Nutanix employees are able to access the Hosted POC environment with the [corporate GlobalProtect VPN](#)[↗], or via either method covered below.

Environment Details

Nutanix Bootcamps are intended to be run within the Nutanix Hosted POC environment. Your cluster will be provisioned with all necessary images, networks, and VMs required to complete the exercises.

Credentials

Note

The `HPOC-PASSWORD` is unique to each cluster and will be provided by the leader of the Bootcamp.

Credential	Username	Password
Prism Element	admin	HPOC-PASSWORD
Prism Central	admin	HPOC-PASSWORD
Controller VM	nutanix	HPOC-PASSWORD
Prism Central VM	nutanix	HPOC-PASSWORD

Each cluster has a dedicated domain controller VM (AutoAD), responsible for providing AD services for the `NTNXLAB.LOCAL` domain. The domain is populated with the following users and groups:

NUTANIX BOOTCAMPS

Administrators	Administrator	nutanix/4u
SSP Admins	adminuser01-adminuser25	nutanix/4u
SSP Developers	devuser01-devuser25	nutanix/4u
SSP Consumers	consumer01-consumer25	nutanix/4u
SSP Operators	operator01-operator25	nutanix/4u
SSP Custom	custom01-custom25	nutanix/4u
Bootcamp Users	user01-user25	nutanix/4u

Access Instructions

The Nutanix Hosted POC environment can be accessed in several ways.

Lab Access User Credentials

PHX Based Clusters:

Username: PHX-POCxxx-User01 through PHX-POCxxx-User20 **Password:** HPOC-PASSWORD

Frame VDI

[Log in here](#)

Nutanix Employees - Use your **NUTANIXDC** credentials **Non-Employees** - Use **Lab Access User** credentials


Parallels VDI

- [PHX Based Clusters](#)
- [BLR Based Clusters](#)

Nutanix Employees - Use your **NUTANIXDC** credentials **Non-Employees** - Use **Lab Access User** credentials

Employee Pulse Secure VPN

Download the client

- [PHX Based Clusters](#) 
- [BLR Based Clusters](#) 

Nutanix Employees - Use your NUTANIXDC credentials Non-Employees - Use Lab Access User credentials

Install the client

In Pulse Secure Client, **Add** a connection:

PHX:

- **Type** - Policy Secure (UAC) or Connection Server
- **Name** - X-Labs - PHX
- **Server URL** - xlv-uswest1.nutanix.com

Last Updated: 5/2/2023, 11:07:35 AM

Network Configuration

The following tables detail the network IP Address assignments for multi-node and single-node environments.

Multi-Node Reservations

IP Range	Service	Comments
10.x.x.7	Hyper-V Failover IP	
10.x.x.8 - 10.x.x.14	Files	
10.x.x.15	File Analytics	
10.x.x.16 - 10.x.x.21	Objects	
10.x.x.22		
10.x.x.23	Beam	
10.x.x.25 - 10.x.x.28	Hosts	
10.x.x.29 - 10.x.x.32	CVMs	
10.x.x.33 - 10.x.x.36	IPMI	
10.x.x.37	Cluster IP	
10.x.x.38	Data Services IP	
10.x.x.39	Prism Central	
10.x.x.40	VCSA	vCenter
10.x.x.41	AutoAD	Windows Domain Controller

10.x.x.42	PrismOpsLabUtilityServer	Used for Prism Ops Labs
10.x.x.44	Era	
10.x.x.45	Citrix DDC	
10.x.x.50 - 10.x.x.125	Primary Network IPAM	VLAN 0
10.x.x.126 - 10.x.x.254	Secondary Network IPAM	Secondary VLAN

Single Node Reservations

Partition 1	Partition 2	Partition 3	Partition 4	Service	Comments
10.38.x.1	10.38.x.65	10.38.x.129	10.38.x.193	Gateway	
10.38.x.5	10.38.x.69	10.38.x.133	10.38.x.197	AHV Host	
10.38.x.6	10.38.x.70	10.38.x.134	10.38.x.198	CVM	
10.38.x.7	10.38.x.71	10.38.x.135	10.38.x.199	Cluster IP	
10.38.x.8	10.38.x.72	10.38.x.136	10.38.x.200	Data Services	
10.38.x.9	10.38.x.73	10.38.x.137	10.38.x.201	Prism Central	
10.38.x.11	10.38.x.75	10.38.x.139	10.38.x.203	AUTOAD	Windows Domain Controller
10.38.x.12	10.38.x.76	10.38.x.140	10.38.x.204	Utility Server	Prism Ops Lab
10.38.x.14	10.38.x.78	10.38.x.142	10.38.x.206	Era	
10.38.x.15	10.38.x.79	10.38.x.143	10.38.x.207	Citrix DDC	

NUTANIX BOOTCAMPS

10.38.x.32 - 10.38.x.37	10.38.x.96 - 10.38.x.101	10.38.x.160 - 10.38.x.165	10.38.x.224 - 10.38.x.229	Objects	
10.38.x.38 - 10.38.x.58	10.38.x.102 - 10.38.x.122	10.38.x.166 - 10.38.x.186	10.38.x.230 - 10.38.x.250	Primary Network IPAM	6 IPs free for static assignment

Last Updated: 5/2/2023, 11:07:35 AM

[← Accessing the Environment](#)

[Active Directory User and Groups →](#)

Active Directory User and Groups

Each cluster has a dedicated domain controller VM - AUTOAD - responsible for providing Active Directory services for the *ntnslab.local* domain. The domain is pre-populated with the following users and groups:

Group	Username(s)	Password
Administrators	Administrator	nutanix/4u
SSP Admins	adminuser01 -adminuser25	nutanix/4u
SSP Developers	devuser01 - devuser25	nutanix/4u
SSP Consumers	consumer01 - consumer-25	nutanix/4u
SSP Operators	operator01 - operator-25	nutanix/4u
SSP Custom	custom01 - custom25	nutanix/4u
Bootcamp Users	user01 - user25	nutanix/4u

Last Updated: 5/2/2023, 11:07:35 AM

Getting Help

[#rx-and-hpoc](#)

The cluster (ex. RX, password not working, Foundation failed, cluster in a degraded state, etc.).

[#technology-bootcamps:](#)

The lab content (ex. instructions incorrect or unclear, typos, feedback, etc.) or staging (ex. images or blueprints are missing).

Feedback and suggestions can also be submitted to bootcamps@nutanix.com.

[#x-labs](#)

Frame, Parallels VDI, or Pulse VPN access.

Last Updated: 5/2/2023, 11:07:35 AM