Technical White Paper: **June 2022**

How-To Guide: Day 1 Operations with VMware Tanzu Mission Control

Getting started

vmware®

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Executive summary

Regardless of whether you're focused on operations or application development, organizations are looking to ensure they make sustainable and future-proof choices as they modernize their infrastructure. Infrastructure modernization goes together with application modernization and can yield substantial benefits.

No matter your industry or maturity level, organizations are winning customers by providing new applications faster. In fact, by 2022, the number of organizations that will release code to production daily for select applications will rise to 70%, up from 65% in 2021.[1]

With the introduction of containers, Infrastructure and Operations (I&O) teams need to keep pace with faster and more frequent development delivery. With more frequent infrastructure redeployment, I&O teams can get bogged down in manual processes. VMware® Tanzu Mission Control helps organizations by centralizing cluster redeployment and Day 2 management tasks so I&O teams can be more efficient and maintain velocity.

Tanzu Mission Control enables enterprises to manage all their Kubernetes clusters regardless of where they reside. In addition, Tanzu Mission Control facilitates delivery of infrastructure for multiple user audiences: Developers can access the resources they need, when they need them, and operators can apply consistent policy against single clusters or fleets of clusters.

Let's explore how Tanzu Mission Control meets the needs of both key user groups by creating a hybrid cloud development environment for two application teams. We're going to start with best practices by creating Cluster groups and Workspaces for the two application teams. We'll follow up by creating a cluster in vSphere, attaching an existing cluster from a hyperscaler, and creating application-specific Namespaces.

[1] Oct 2021 - IDC FutureScape: Worldwide Developer and DevOps 2022 Predictions – Doc #US47148521. IDC.

Activity checklist

Step 1: Create Cluster groups and Workspaces to begin organizing assets.

- ☐ Create Dev Cluster group
- ☐ Create Dev Workspace for App A
- ☐ Create Dev Workspace for App B

Step 2: Register Supervisor or Management clusters.

- ☐ Register vSphere with Tanzu Supervisor cluster
- ☐ Tanzu Kubernetes Management cluster

Step 3: Create a cluster.

- ☐ Provision a new cluster on vSphere
- ☐ Provision a new cluster on hyperscaler/private cloud

Step 4: Attach a cluster for management.

- ☐ Attach an existing Kubernetes cluster

Step 5: Create dedicated application Namespaces.

- ☐ Create Namespace for App A
- ☐ Create Namespace for App B

Step 1: Grouping team and deployment resources with Cluster groups and Workspaces for consistent policies

Tanzu Mission Control maintains consistency and control of all clusters in a fleet. However, clusters must be organized for maximum effect. To achieve this, Tanzu Mission Control introduces two key architectural concepts to meet the needs of both operators and developers:

Cluster groups: Platform operators can create logical Cluster groups which they can manage as a fleet (e.g., operators can apply a common set of access policies to a group of clusters such as dev, staging, or prod). A Cluster group can include clusters that exist in one or more environments and is shared across teams. Platform operators can create, view, and delete Cluster groups, or move a cluster from one group to another as needed.

Workspaces: Kubernetes Namespaces are a way to divide cluster resources for various purposes (e.g., many development teams organize application services by Namespaces). Often, developers must work across different clusters for certain projects. Tanzu Mission Control includes Workspaces to meet this need by allowing platform or application operators to group Namespaces from one or more clusters.

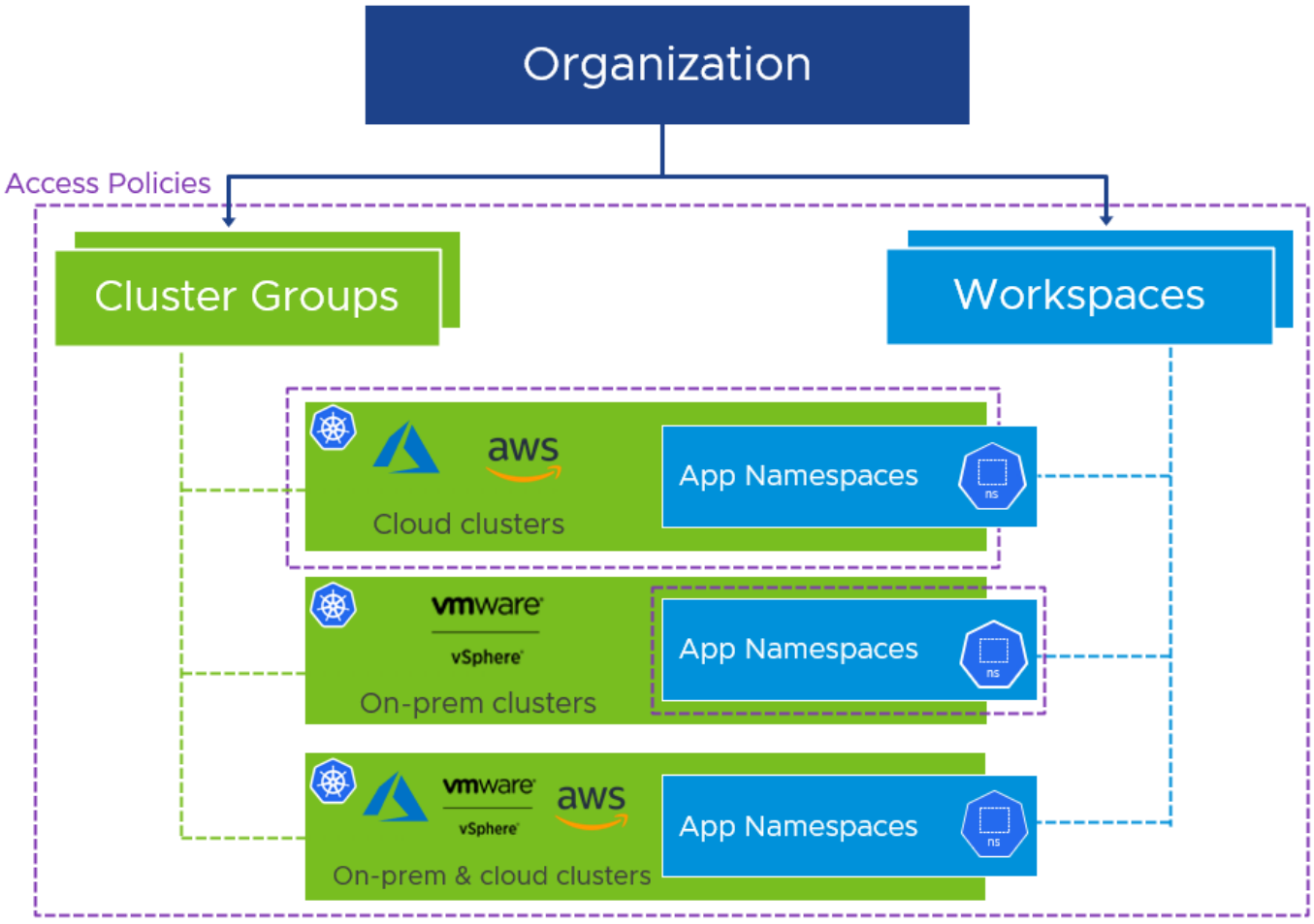

FIGURE 1: Example showing access policies applied to Cluster groups and Workspaces.

The next few steps show you how to create Cluster groups and Workspaces to organize your clusters.

Create a Dev Cluster group

1. Access the Tanzu Mission Control console and click **Cluster groups** on the left menu.
2. Click **Create Cluster group**.

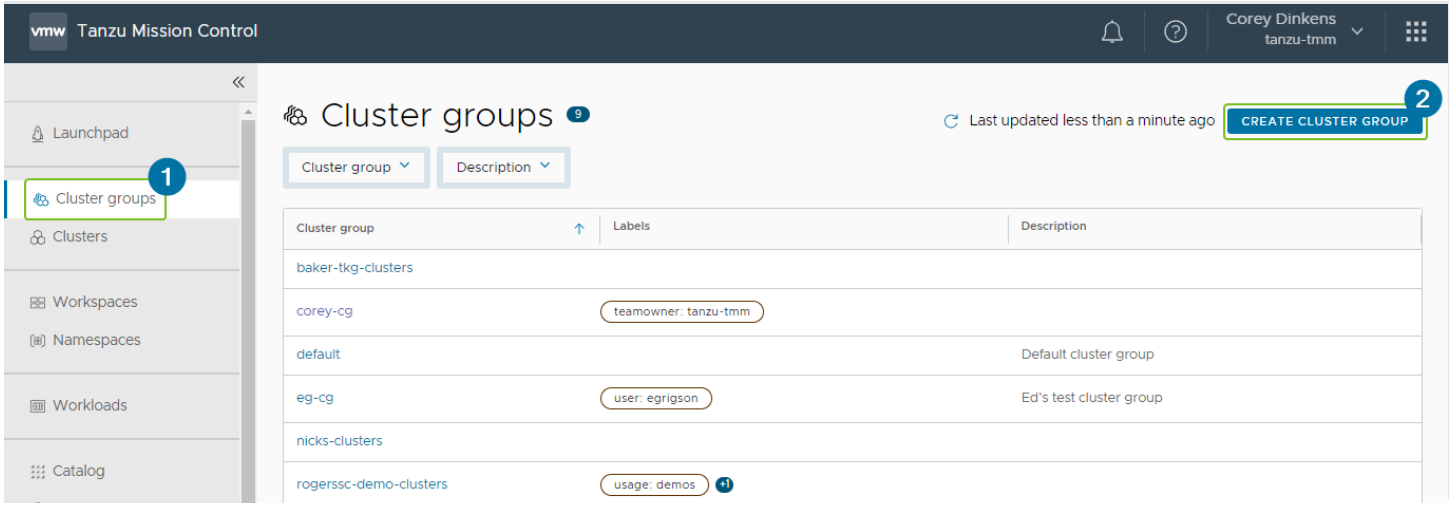

FIGURE 2: View Cluster groups.

3. Enter dev or development for the name and click **Next.**

Create team or application Workspaces

1. Within the Tanzu Mission Control console, click **Workspaces** on the left menu, then click **Create Workspace.**

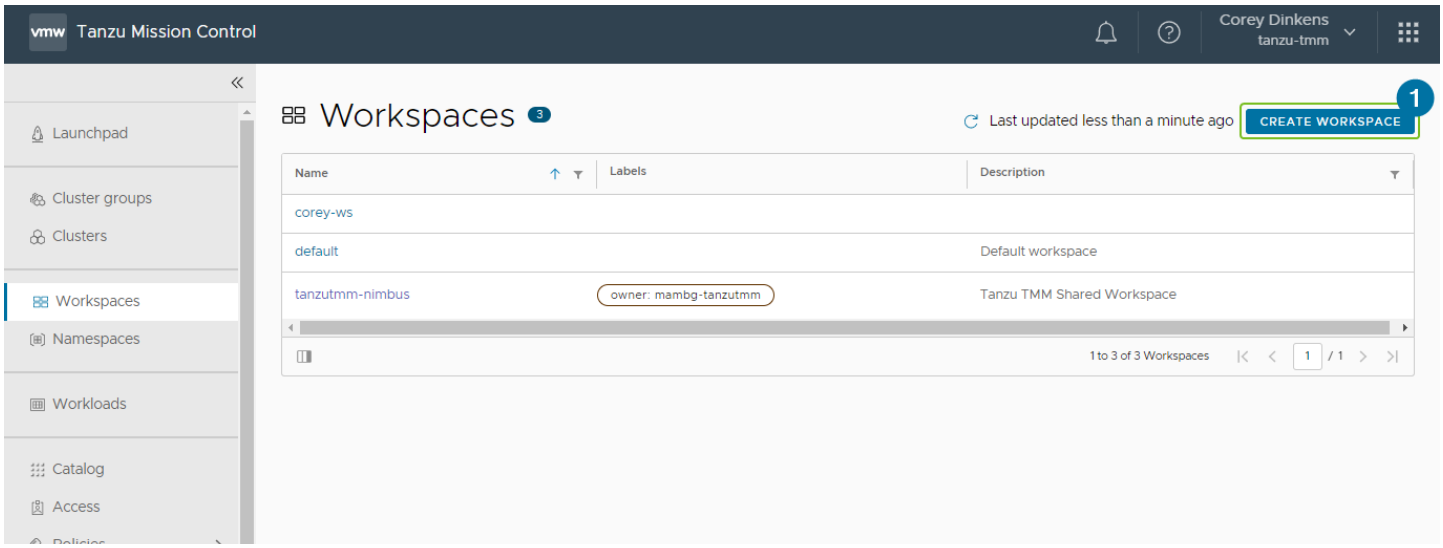

FIGURE 3: Workspaces list.

2. Enter a name such as “dev-app-a” or “app-a-ws,” add any desired labels, then click **Create.**

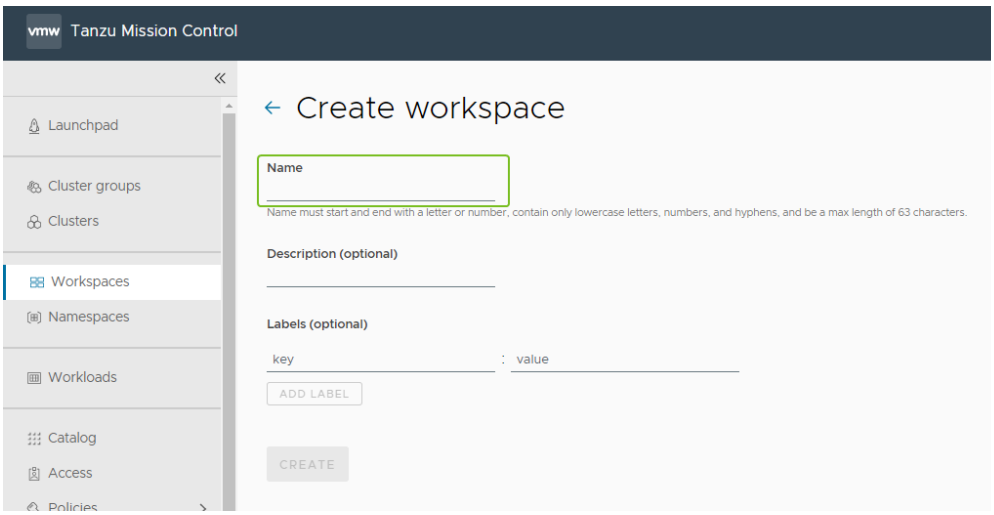

FIGURE 4: Create a Workspace.

3. Repeat Steps 1 and 2 to create the Workspace for application b.

Step 2: Enable Tanzu Kubernetes cluster lifecycle management

Kubernetes has officially entered the mainstream in 2022. A recent Gartner report revealed that by 2027, more than 90% of global organizations will be running containerized applications in production, and 25% of all enterprise applications will run in containers.[2] As a result, the typical enterprise may have development teams working with containers that span a packaged Kubernetes distribution, a managed Kubernetes service, and/or a DIY Kubernetes footprint.

How do you effectively manage a fleet of clusters, residing in disparate environments? Tanzu Mission Control enables you to bring clusters under management in two ways:

- Provision clusters directly through Tanzu Mission Control.
- Attach existing clusters that you’ve already created.

In the following steps, we’ll focus on the cluster registration workflows so that we can create a Tanzu Kubernetes cluster with Tanzu Mission Control in the following steps.

Here are the differences between the two registration options in this guide:

- Option 1: Tanzu Kubernetes Management cluster*

  You can run this multi-cloud Kubernetes footprint both on-premises on vSphere, Amazon EC2, and Microsoft Azure. These clusters are deployed with a standalone, web-based installer and managed with the Tanzu CLI instead of vSphere client.

- Option 2: vSphere with Tanzu Supervisor cluster enabled on vCenter version 7u3c and greater*

  Create and operate Tanzu Kubernetes clusters natively in vSphere with VMware Tanzu. You can verify if your vSphere instance has Tanzu Services enabled by clicking the hamburger (three horizontal lines) menu in the top left corner and selecting **Workload management,** then clicking the **Supervisor clusters** tab.

[2] Gartner - CTO's Guide to Containers and Kubernetes May 2022 – Doc ID G00763328

**If you don't have a Management cluster to register, you can create one for free with VMware Tanzu Community Edition. If you're a licensed VMware Tanzu user, you can download the VMware Tanzu Kubernetes Grid installer.*

Option 1: Register a Tanzu Kubernetes Management cluster

This section covers how to register a Tanzu Kubernetes Grid Management cluster with Tanzu Mission Control. This provides Tanzu Mission Control the capability to provision and deploy Kubernetes clusters directly from the Tanzu Mission Control interface without using the Tanzu CLI.

Create the registration link in Tanzu Mission Control

Create the registration link for the Management cluster so that Tanzu Kubernetes Grid clusters can be lifecycle managed and deployed through Tanzu Mission Control.

1. Click **Administration** in the left menu bar, then **Management clusters**.

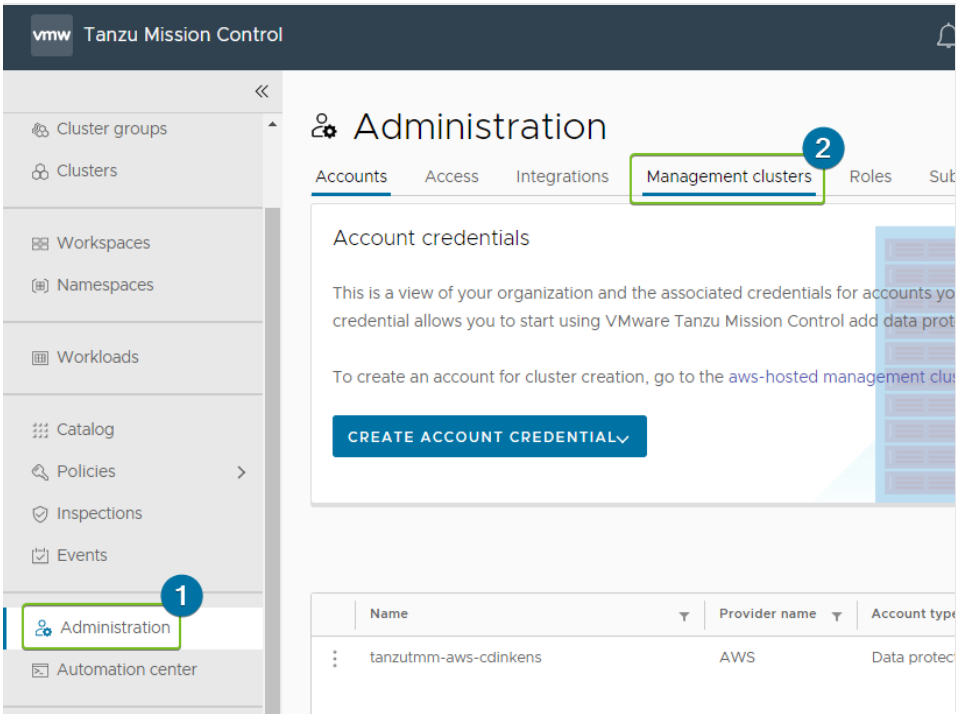

FIGURE 5: Administration view: Accounts tab.

2. Next, click on the **Register Management cluster** dropdown and click **Tanzu Kubernetes Grid.**

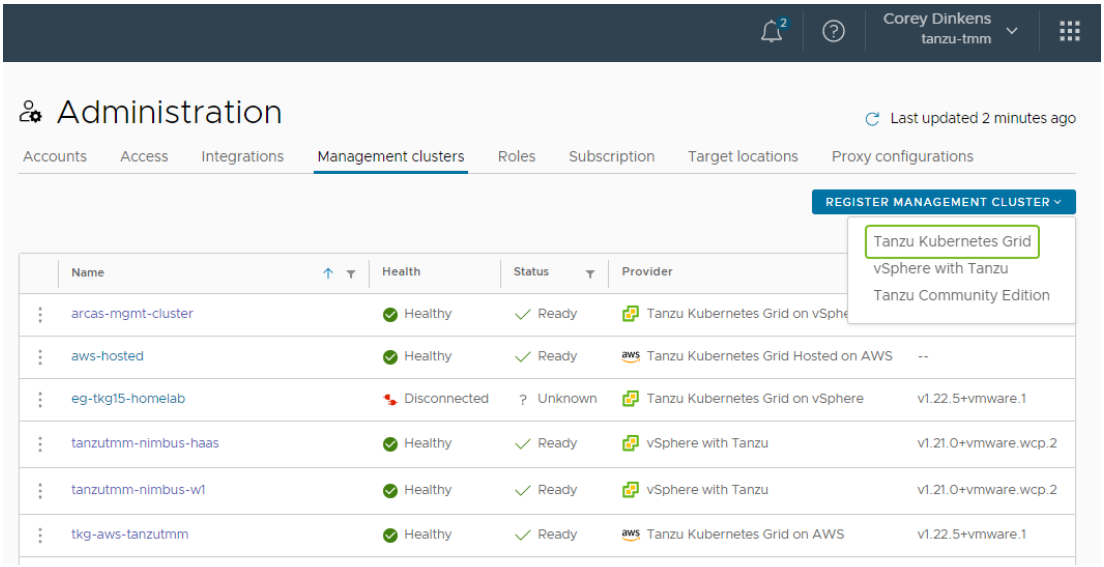

FIGURE 6: Register Management cluster view: Register Management cluster dropdown.

3. In the first step of the registration wizard, select the Cluster group created in earlier steps for the **Default Cluster group for managed workload clusters,** then click **Next**.

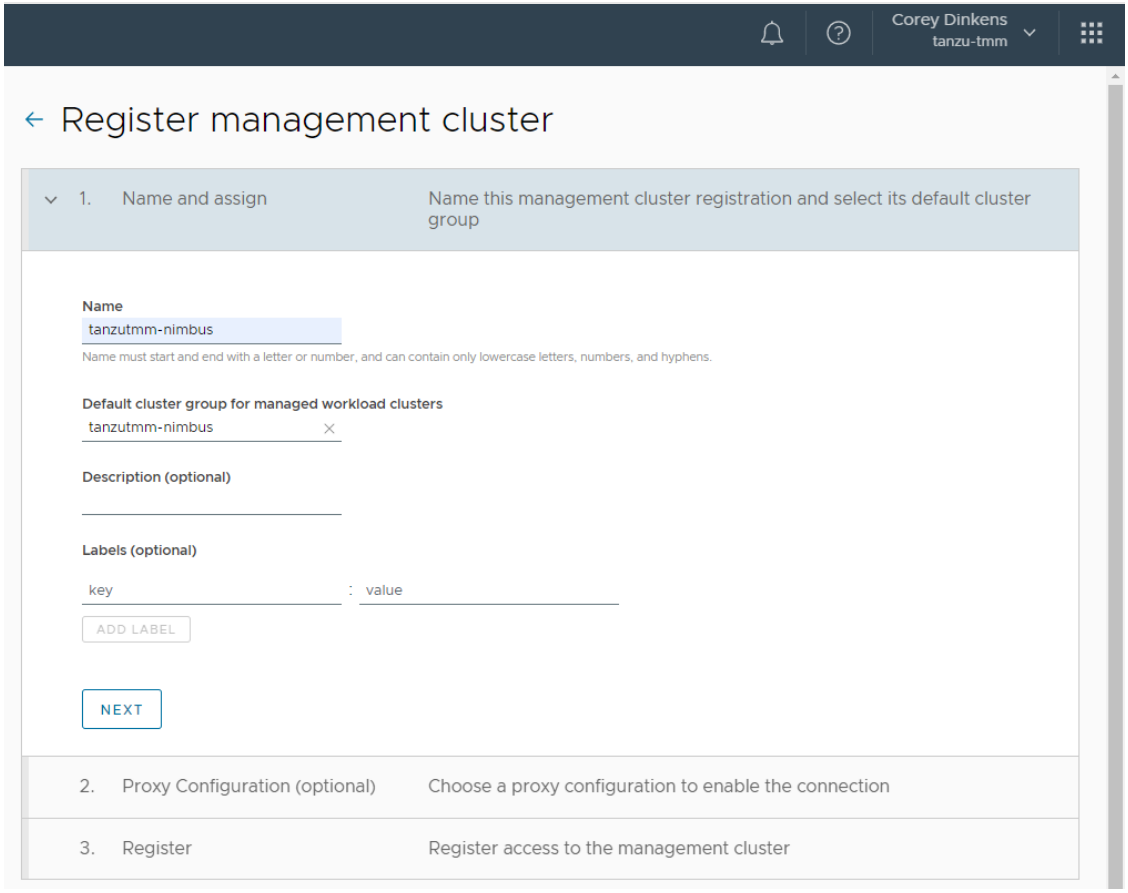

FIGURE 7: Registering a Management cluster: Selecting a default Cluster group.

4. Select any proxy configurations if applicable, then click **Next.**
5. In the final step of the wizard, copy the registration URL that generates, as you'll need it in the following step.

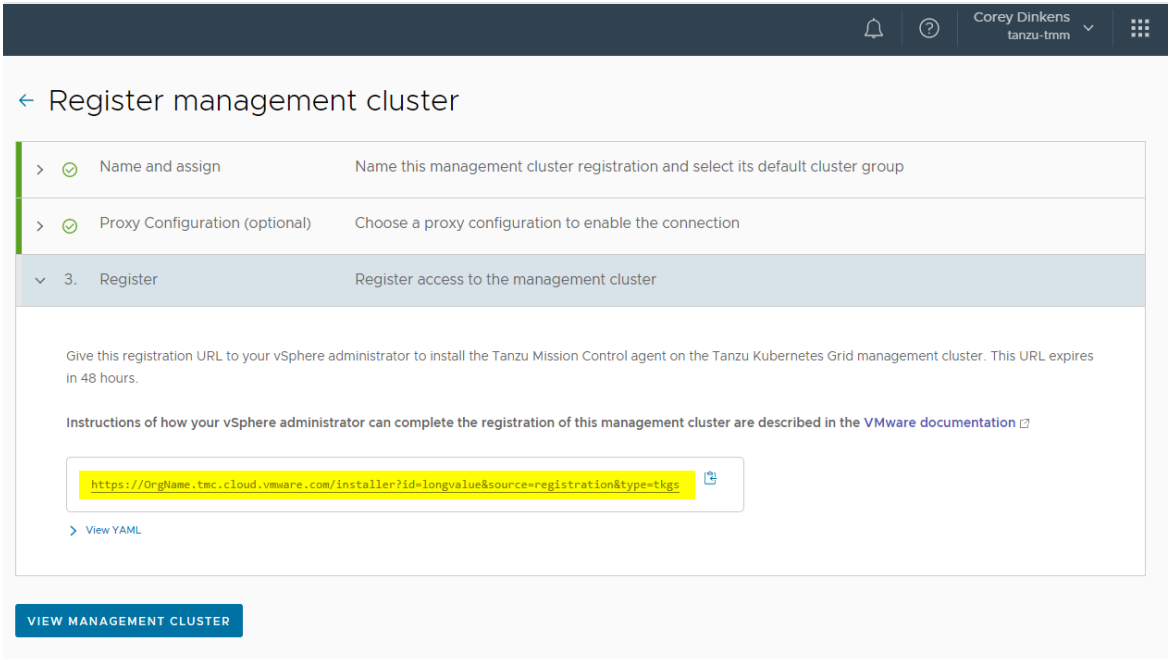

FIGURE 8: Generating the registration URL for a Management cluster in Tanzu Mission Control.

Registering the Tanzu Kubernetes Grid Management cluster

1. Continuing from the registration wizard, open a terminal and log in to the Tanzu Kubernetes Grid Management cluster Namespace. If you're unsure how, follow these steps.
2. Next, apply the Tanzu Mission Control configuration YAML to the cluster:

   kubectl apply -f "<Insert registration URL here>"
3. After waiting about 30–60 seconds, switch back to the Tanzu Mission Control console, click **View Management cluster**, then click **Verify connection** to check if the Tanzu Mission Control agent has finished installation on the cluster. You'll see their health icons begin to update:

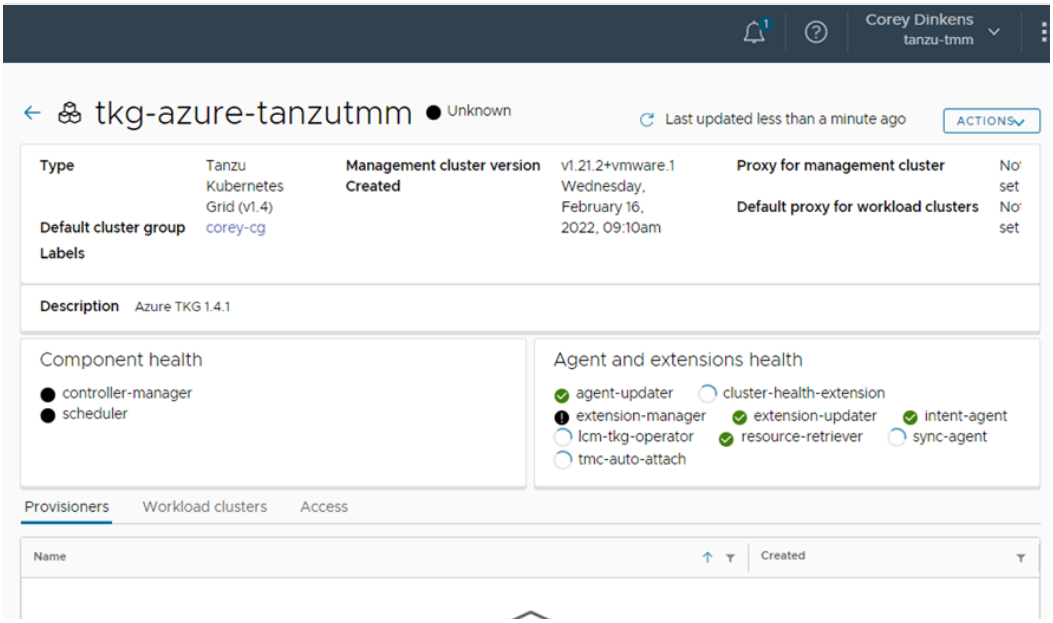

FIGURE 9: Registering a cluster in Tanzu Mission Control.

4. Verify that the cluster is appearing in Tanzu Mission Control. Open Tanzu Mission Control and click **Administration** in the left-hand menu, then **Management clusters**, and verify that your cluster shows in the list.

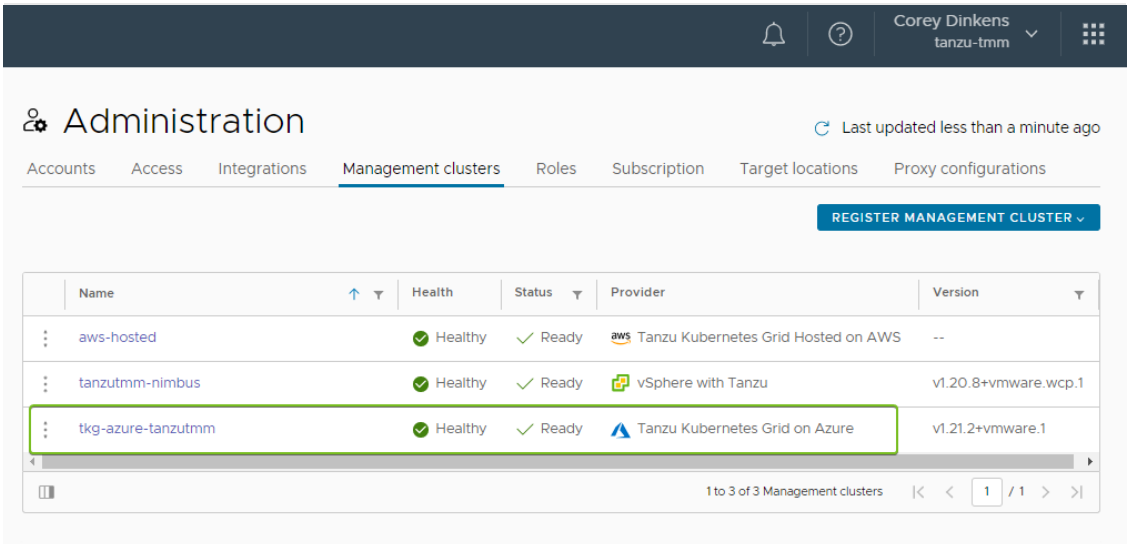

FIGURE 10: Verifying that your Management cluster appears in Tanzu Mission Control.

5. Follow these steps to create workload Namespace(s) on the Tanzu Kubernetes Management cluster. The Namespace you create is referred to as a *provisioner* from within Tanzu Mission Control. Depending on the desired configuration, you might want to create a workload Namespace on a per-application basis.

Option 2: Register a vSphere with Tanzu Supervisor

These steps will cover registering a vSphere Supervisor cluster with Tanzu Mission Control. This provides Tanzu Mission Control the capability to provision and upgrade Kubernetes clusters directly from the Tanzu Mission Control interface without using the Tanzu CLI.

It's important to note that going forward, two types of clusters will be referenced: *Supervisor clusters* and *Management clusters*. Once a Supervisor cluster is registered, it becomes a Tanzu Mission Control Management cluster that can provision other Tanzu Kubernetes clusters.

Create the registration link in Tanzu Mission Control

1. Click **Administration** in the left menu bar, then click the **Management clusters** tab.

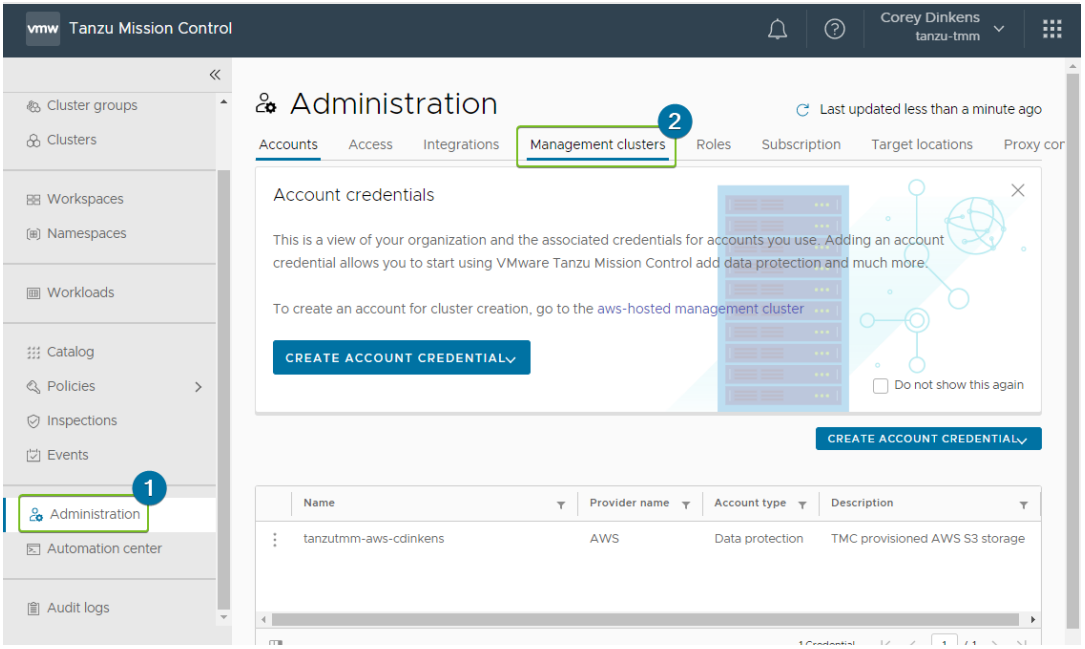

FIGURE 11: Creating a registration link for a Supervisor cluster in Tanzu Mission Control.

2. Next, click on the **Register Management cluster** dropdown and click **vSphere with Tanzu** (vSphere 7 with workload management enabled).

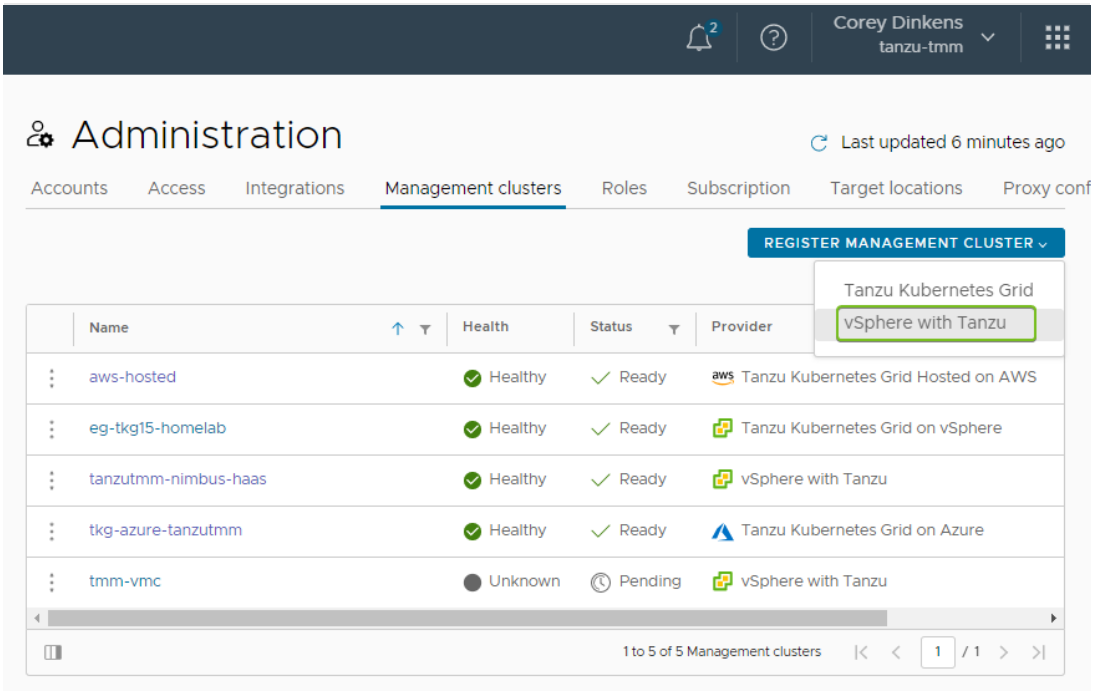

FIGURE 12: Registering a Management cluster in Tanzu Mission Control.

3. In the first step of the registration wizard, select the name of the desired Cluster group for the **Default Cluster group for managed workload clusters**.

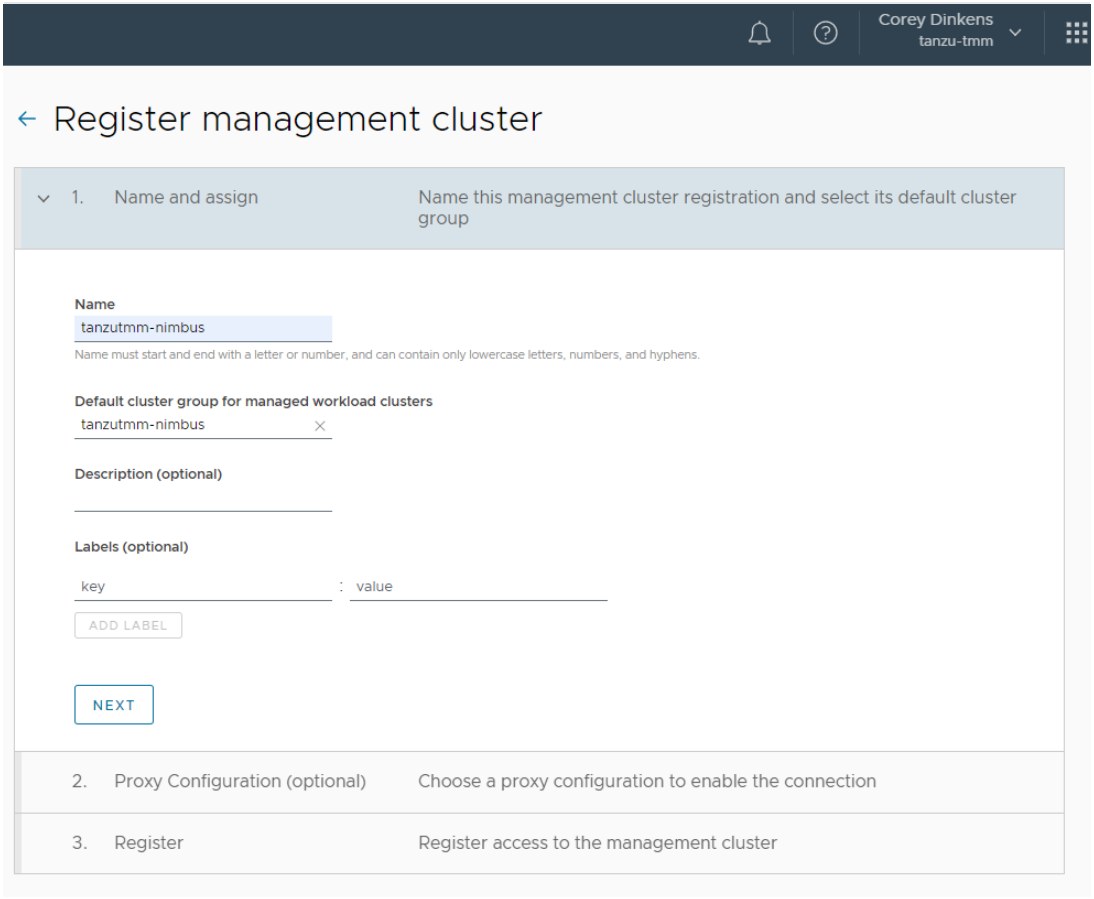

FIGURE 13: Selecting a Cluster group in Tanzu Mission Control.

4. Copy the registration URL generated in the final step of the wizard, as you'll need it for the next steps.

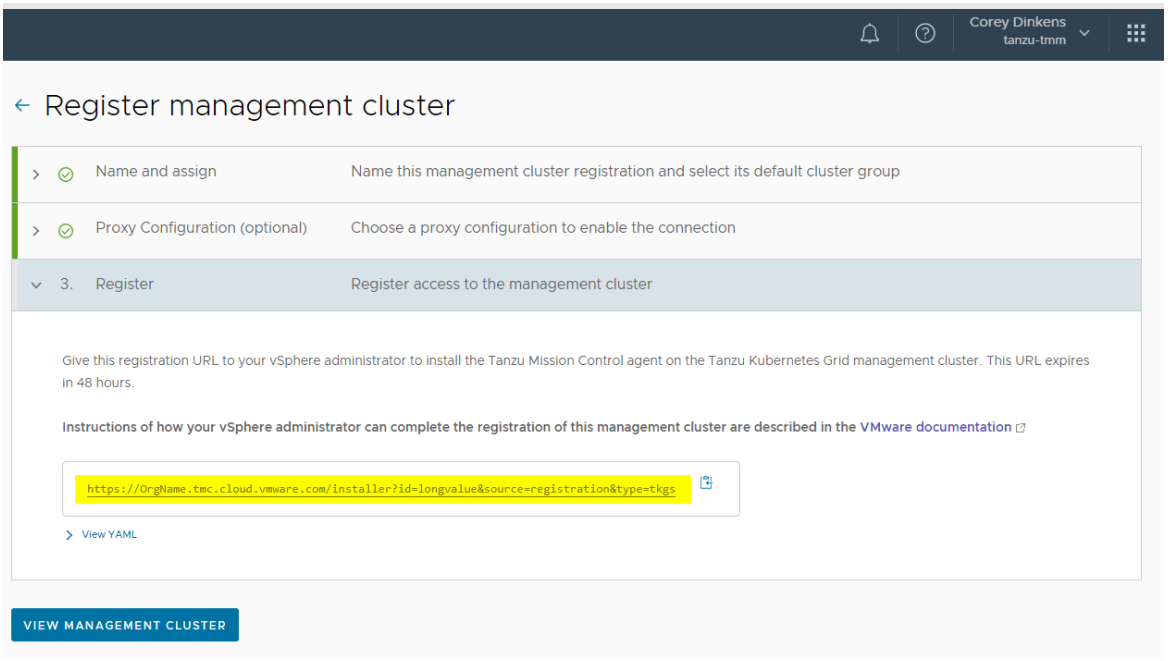

FIGURE 14: The generated URL used to register a Management cluster in Tanzu Mission Control.

Registering vSphere with Tanzu Services

1. Log in to your vCenter Server, click on the **Inventory** view, and click on the cluster with workload management enabled.
2. Click the **Configure** tab, then scroll down to the **TKG Service** section, click **Tanzu Mission Control**, and paste the URL copied in the first step into the **Registration URL** box. Then click **Register**.

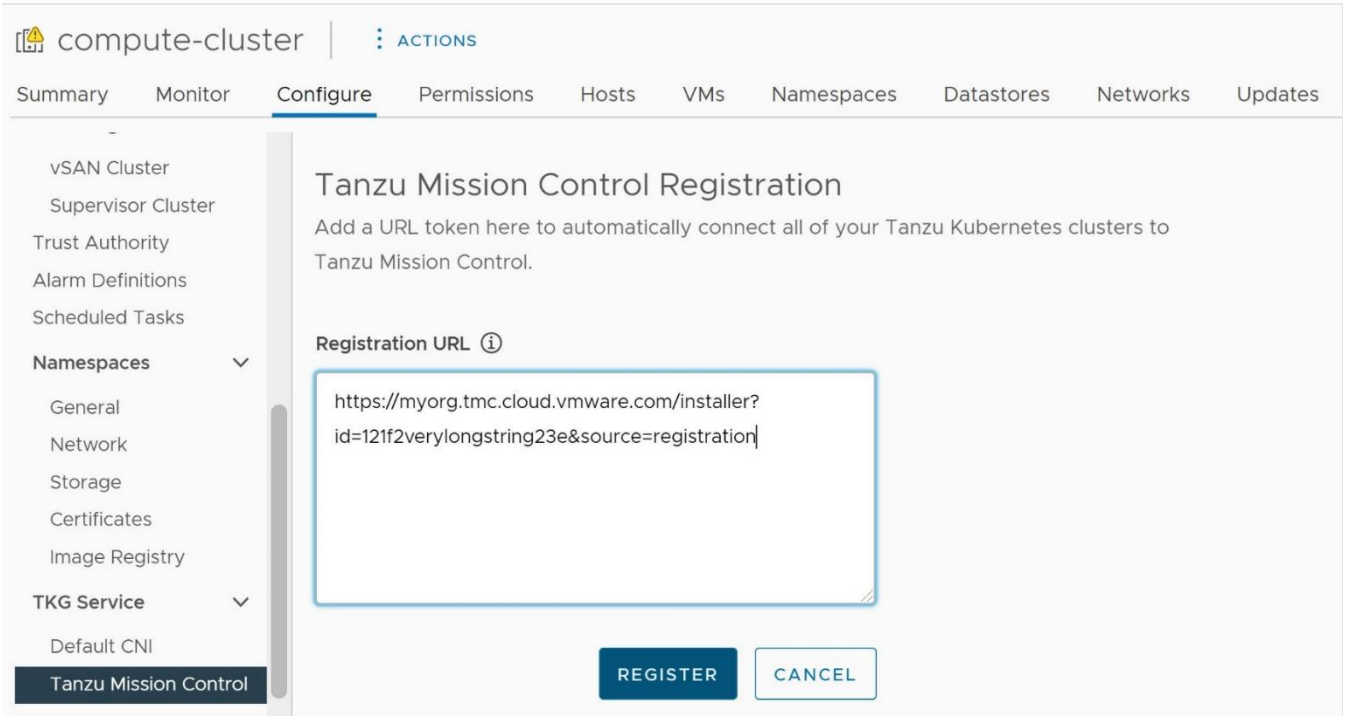

FIGURE 15: Tanzu Mission Control Registration in vSphere.

3. Once registration has been completed, you'll verify that the cluster is appearing in Tanzu Mission Control. Open Tanzu Mission Control and click **Administration**, then **Management clusters,** and verify your cluster shows in the list.

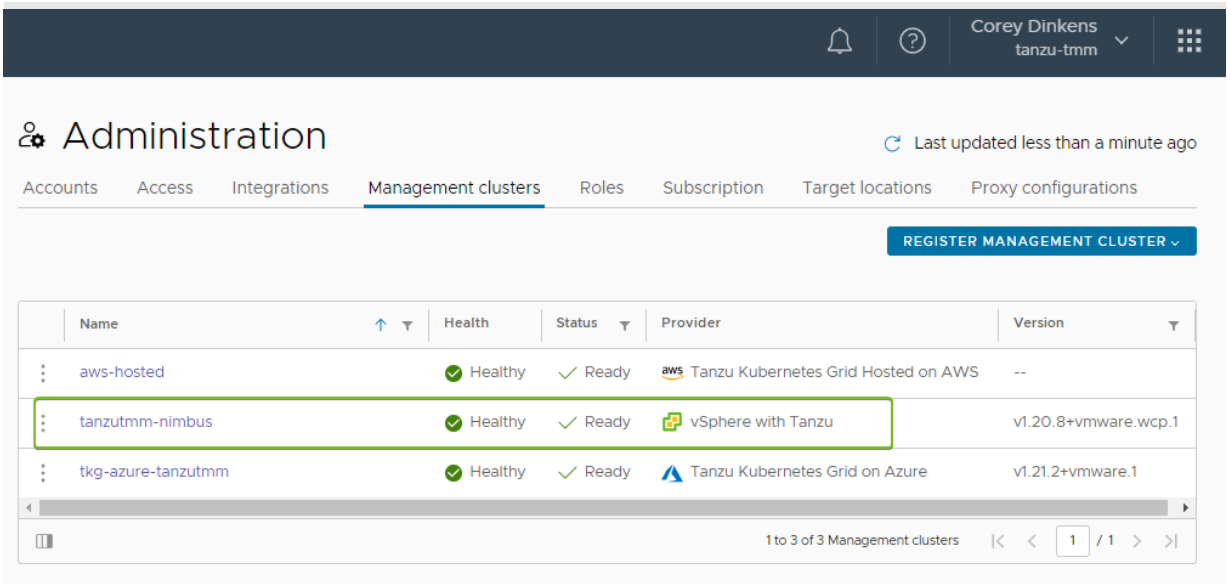

FIGURE 16: Administration view—Management clusters tab.

6. Follow these steps to create workload cluster Namespace(s) on the vSphere Supervisor. The Namespace you create is referred to as a *provisioner* from within Tanzu Mission Control. Depending on the desired configuration, you might want to create a workload Namespace on a per-application basis.

Step 3: Create a cluster

To begin deploying application workloads on Tanzu Kubernetes Grid, you must create a Tanzu Kubernetes cluster.

This next step assumes that a Namespace has already been created on the vSphere Supervisor or Management cluster; if you've not already created one, you can follow the steps here or here to create a vSphere Namespace for Tanzu Kubernetes Grid. The Namespace you create is referred to as a *provisioner* from within Tanzu Mission Control.

1. In Tanzu Mission Control, click **Clusters** on the left, then click **Create cluster** in the top right corner.

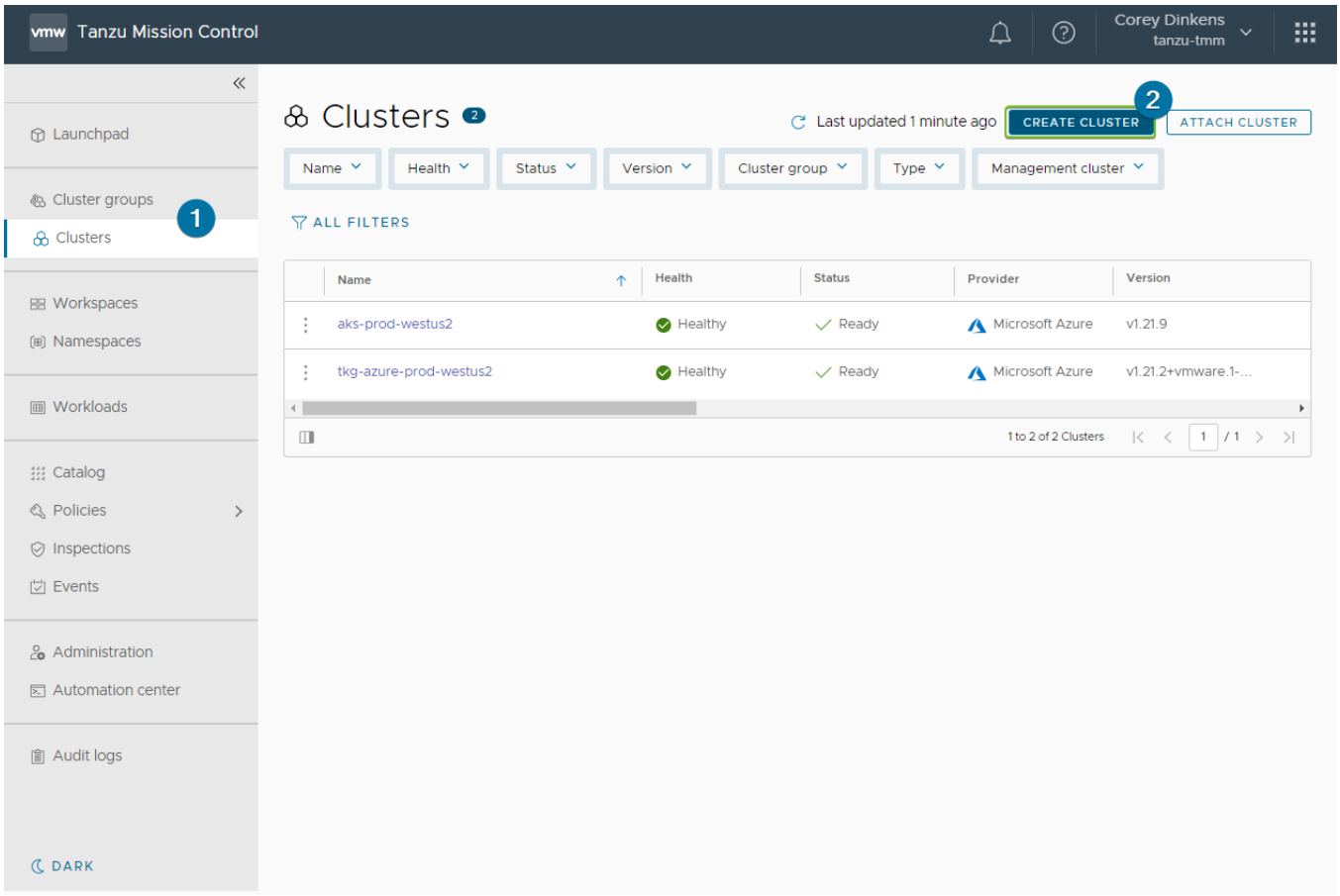

FIGURE 17: Clusters view.

2. Select the desired Management cluster and click **Continue to create cluster**.

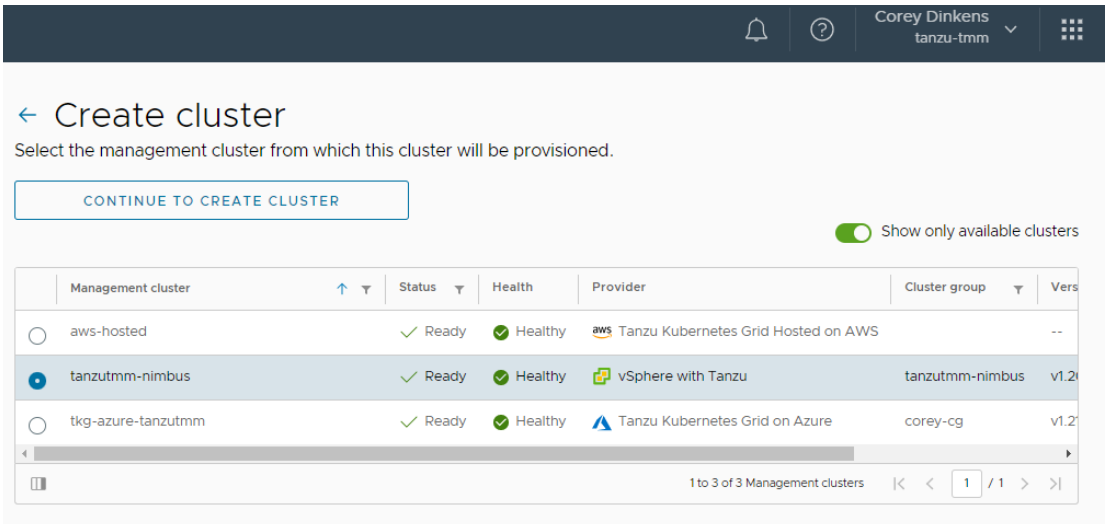

FIGURE 18: Selecting a Management cluster in Tanzu Mission Control.

3. In the next step, select the *provisioner* (which is the desired workload *cluster* Namespace) and click **Next**.
4. Provide a cluster name and select the desired default Cluster group. Click **Continue to create cluster.**
5. If you're using AWS, follow sub-step A below; if using Azure, follow sub-step B. Otherwise, select the desired Kubernetes version and network settings.
    A. *For Tanzu Kubernetes Management clusters on AWS*: Select the same region where your Management cluster was deployed and select the correct SSH key.
    B. *For Tanzu Kubernetes Management clusters on Azure*: Select the region and enter a name for the resource group. Select versions, enter the same public SSH key that was used to deploy the Tanzu Kubernetes Management cluster, and select the cluster VNET configuration.
6. If you're using vSphere with Tanzu Services, complete sub-steps A and B below. Otherwise, continue to Step 7.
    A. For vSphere with Tanzu Services: Add the desired storage class in the dropdown, then click **Add storage class**. You'll know the storage class was added properly if the trash icon appears to the right of it.

    Note: *If you don't select a* ***Default storage class*** *when using vSphere with Tanzu Services, you may run into issues deploying pods with dynamic persistent volumes.*

    B. Under **Default storage class**, select the desired default. As you can see here, we're using "vsan-default-storage-policy."

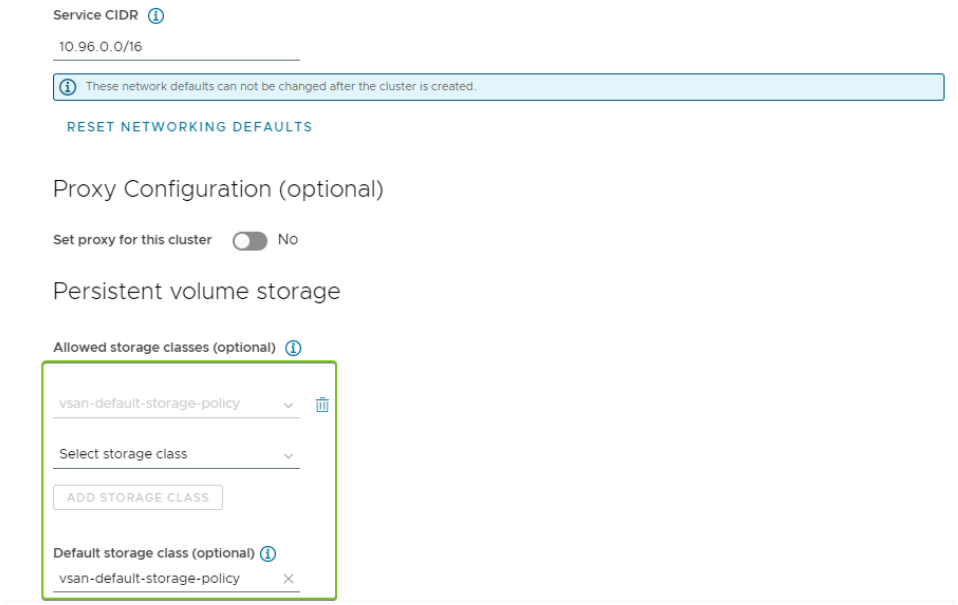

FIGURE 19: Confirming correct storage class.

7. Click **Next** and select the deployment plan that fits your needs. Sub-step A only applies to vSphere with Tanzu Services clusters.

   A. *Add data volumes to control plane nodes (available on vSphere with Tanzu Services):* Add data volumes to your control plane nodes by clicking **Add Volume** and enter the desired parameters. A common use is to add a dedicated volume for /var/lib/etcd in case /var fills up.

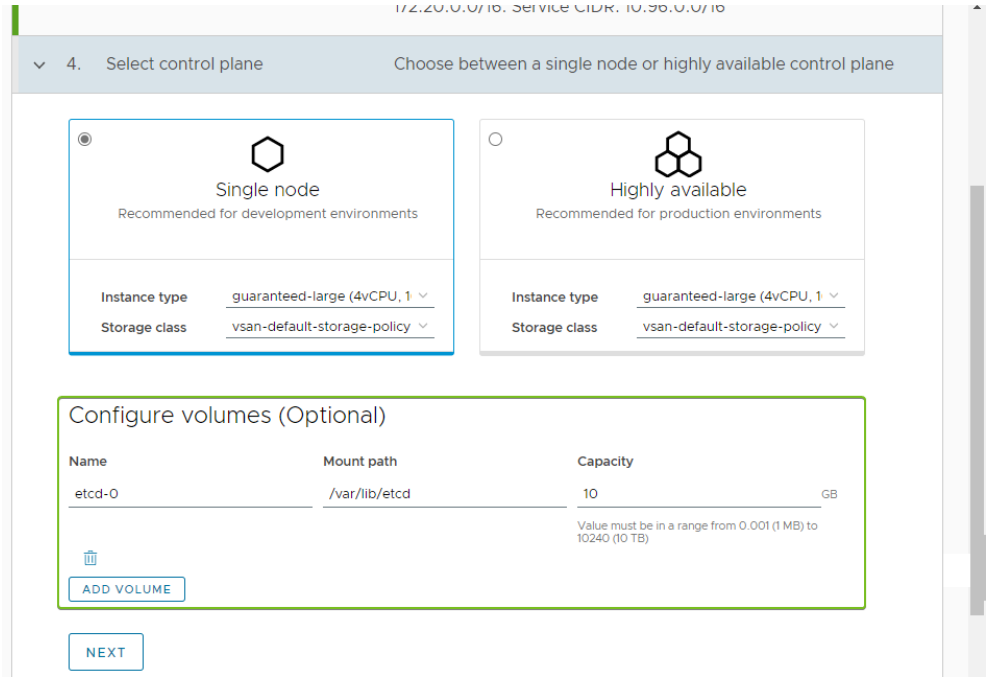

FIGURE 20: Selecting a deployment plan in Tanzu Mission Control.

8. Click **Next** and select the desired node pool settings, such as worker count. Sub-step A only applies to vSphere with Tanzu Services clusters.

    A. *Add data volumes to nodes in a vSphere with Tanzu cluster nodepool:* Add data volumes to your worker nodes by expanding the desired nodepool, click **Add Volume,** and enter the desired parameters. A common use is adding a dedicated volume for /var/lib/containerd in case /var fills up.

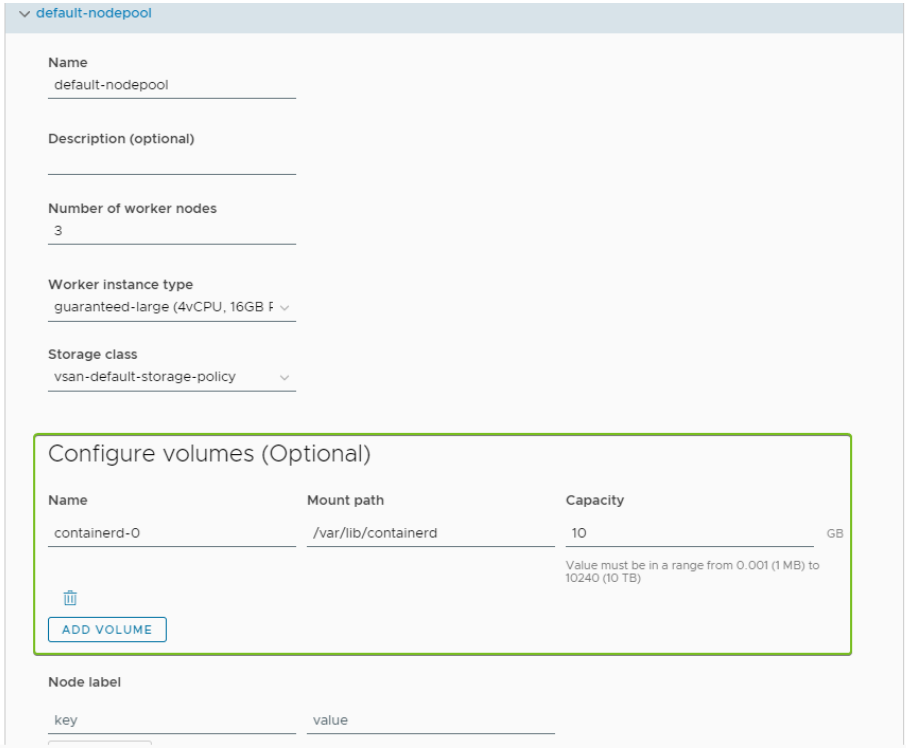

FIGURE 21: Configure additional nodepool volumes.

9. Click **Create cluster**.

You'll be taken to the status of the cluster where you can observe baseline health statistics once creation has completed.

Step 4: Attaching any CNCF-conformant Kubernetes cluster

Tanzu Mission Control helps I&O teams increase management efficiency and consistency across their clusters by allowing you to attach any Cloud Native Computing Foundation (CNCF)-conformant Kubernetes cluster living on any environment—whether on-premises, in public clouds, or at the edge. Amazon Elastic Kubernetes Service (EKS), Azure Kubernetes Service (AKS), Google Kubernetes Engine (GKE), or OpenShift clusters can be attached to Tanzu Mission Control to enable global management of packages, policies, data protection, and more.

Here's how to attach clusters in Tanzu Mission Control:

1. Log in to your Tanzu Mission Control console and click **Clusters** in the left-hand menu. Then click the **Attach cluster** in the top right corner to start attaching existing clusters.

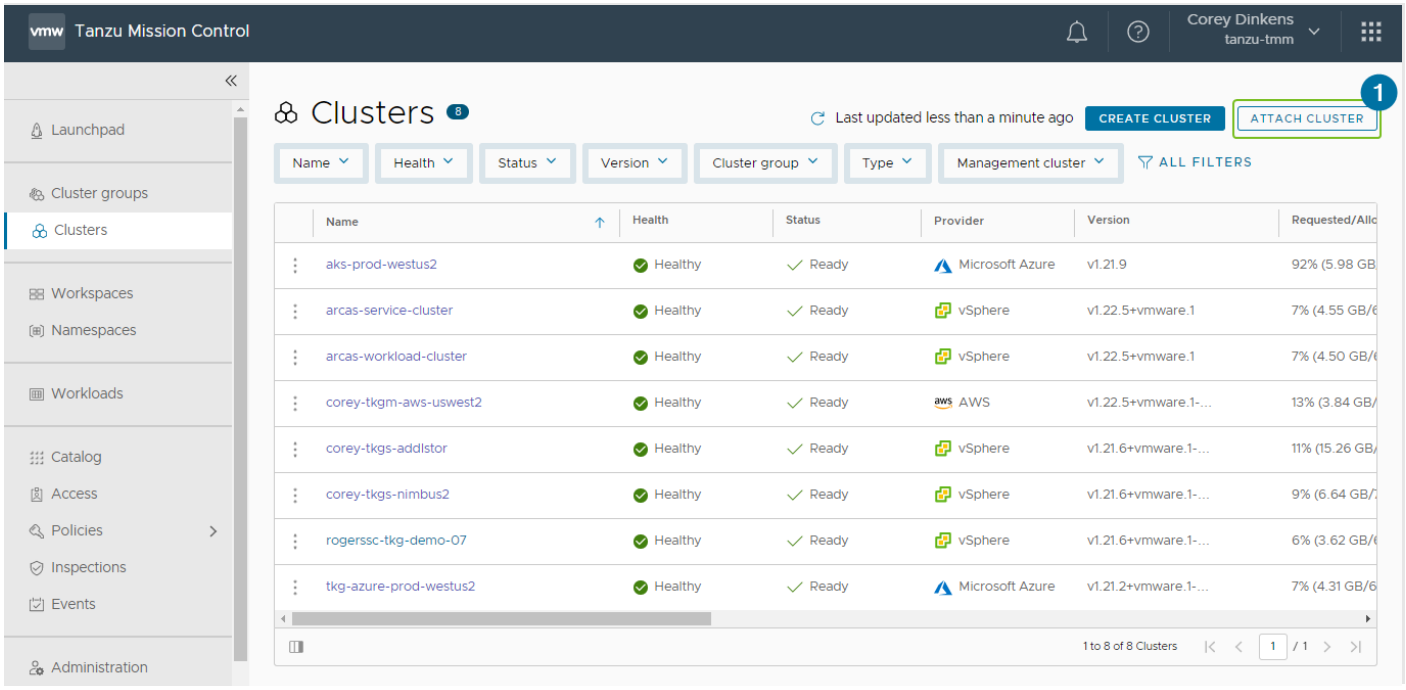

FIGURE 22: View Clusters.

2. Select a Cluster group, provide a unique cluster name and description, and add labels as needed.

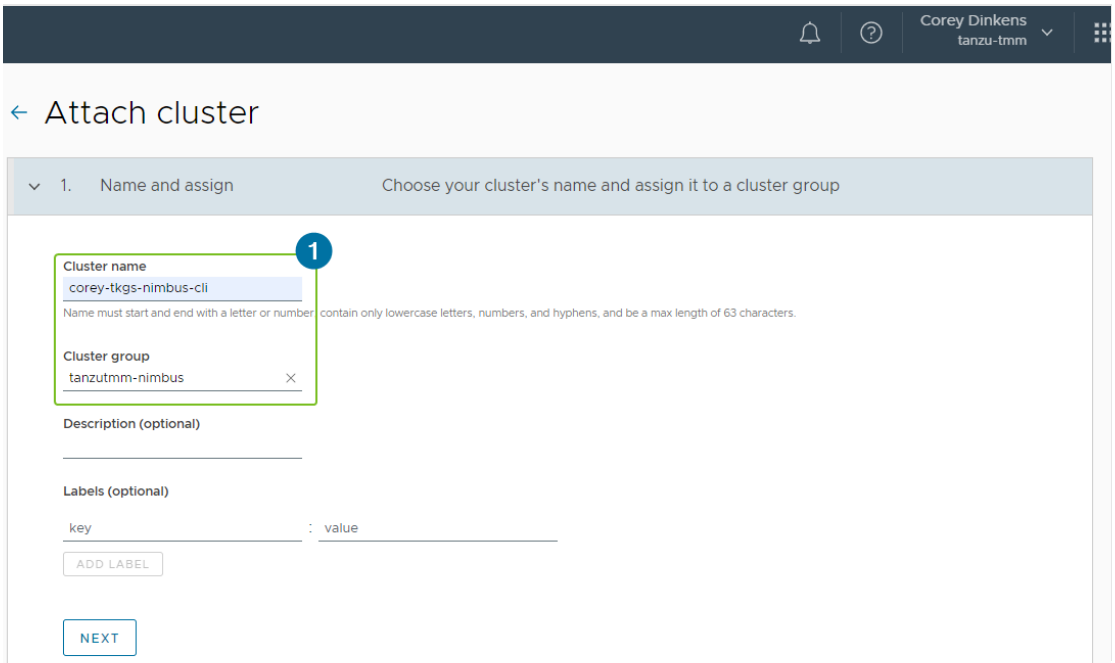

FIGURE 23: Attach a cluster.

3. If you require a proxy configuration, complete Step 2; otherwise, click **Next.**
4. Tanzu Mission Control generates a YAML script specifically for your cluster and displays the *kubectl* command to run the script. Open a Terminal window and execute the *kubectl* command against the desired cluster context. The YAML script runs a small set of extensions in your cluster to connect it with the Cluster Agent service.

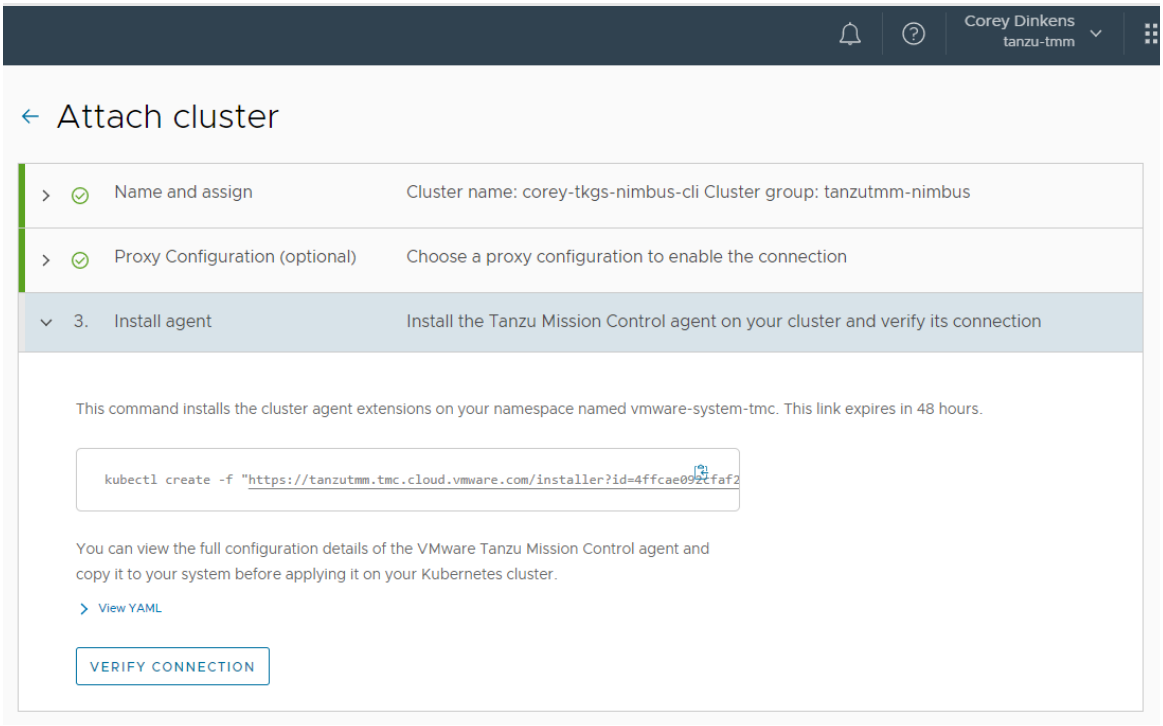

FIGURE 24: Attach a cluster—Install agent CLI command.

5. After a minute or two, return to Tanzu Mission Control console and click **Verify Connection**. You can now start taking advantage of Tanzu Mission Control to manage clusters and users.

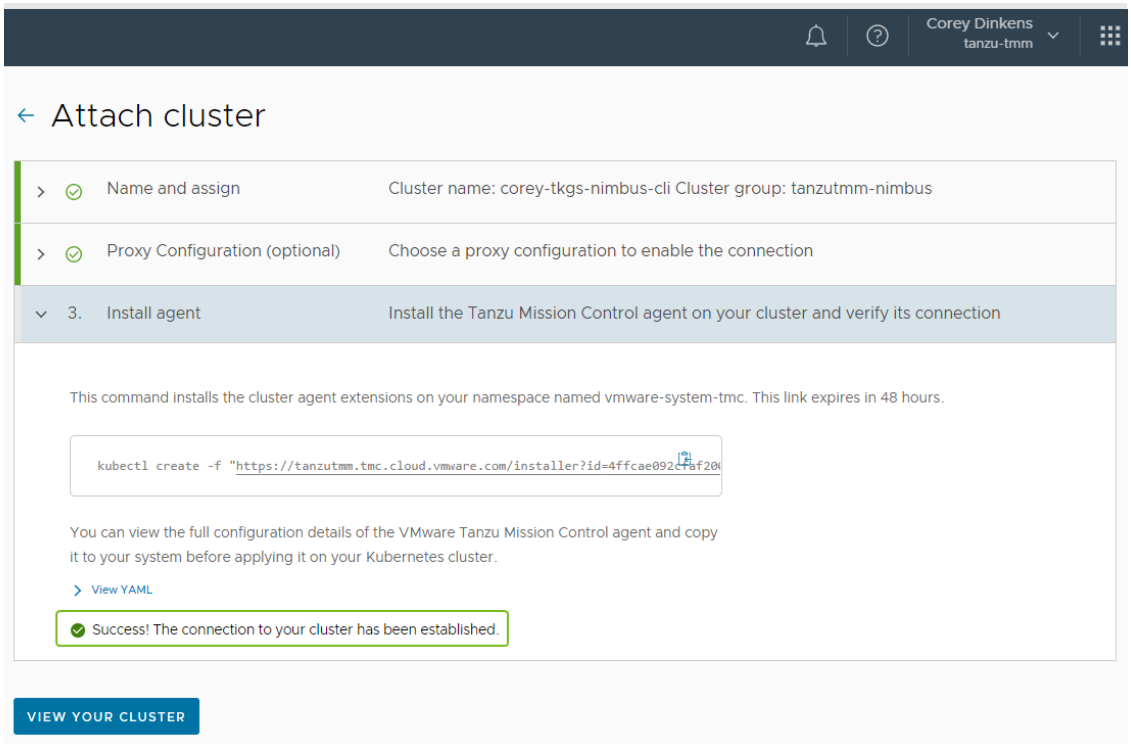

FIGURE 25: Verifying Cluster connection to Tanzu Mission Control.

Step 5: Create dedicated application Namespaces for consistent policies

When you create a new **Namespace**, you can specify which **Workspace** you'd like to associate it with and apply policies against. For example, we can specify that images can only be pulled from specific trusted repositories. We'll create a Namespace for the corresponding application and assign it to the Workspaces we created in the previous steps.

1. In the Tanzu Mission Control console, click on **Namespaces.**
2. Then click on **Create Namespace.**

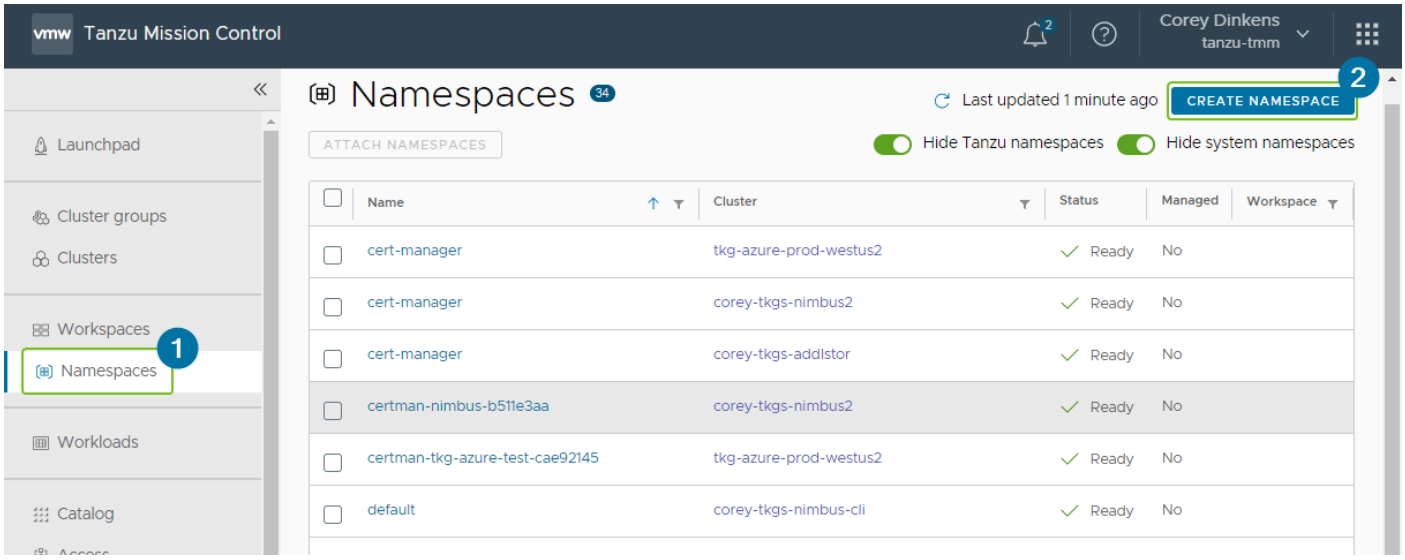

FIGURE 26: Namespace view.

3. Enter the name of the first application Namespace, such as app-a or application-a, select the corresponding Workspace, and click **Create.**

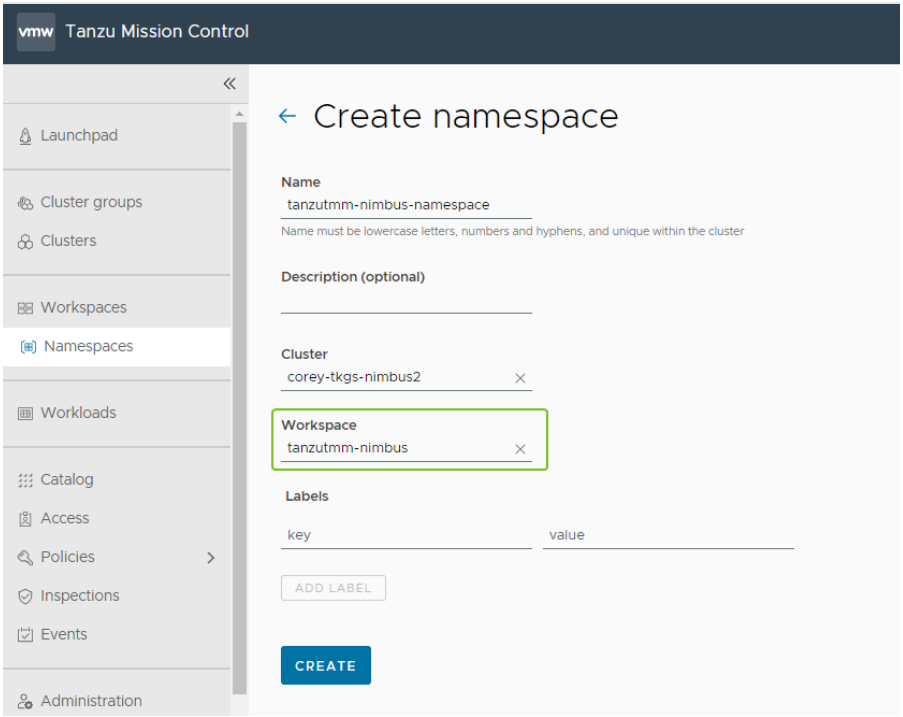

FIGURE 27: Create a Namespace.

4. Repeat Steps 1–3 again for application b and any additional desired Namespaces.

Conclusions

VMware Tanzu Mission Control allows you to consistently manage all your Kubernetes clusters from a single control point.

If you're an operator, you'll have complete visibility of your entire Kubernetes estate, always know the health of each cluster, and have consistent policy application for access, container registry, network, security, and more. That's remarkable control over a diverse environment.

If you're a developer, you'll have the freedom to use modern constructs and the self-service access to Kubernetes resources. You won't need to worry about infrastructure and can instead focus on what you do best—writing code.

The bottom line is that Tanzu Mission Control helps your organization build modern applications on a modern infrastructure.

Glossary

vSphere with Tanzu Services	Use your existing vSphere environment to manage Kubernetes clusters alongside virtual machines through vCenter.
IDC	International Data Corporation (IDC) is the premier global provider of market intelligence, advisory services, and events for the information technology, telecommunications, and consumer technology markets.
Cluster group	This is a logical grouping of clusters that can include clusters in different environments and shared across teams.
Workspace	This is a logical grouping of Namespaces that spans clusters and that policies can be applied against.
Supervisor cluster	When a vSphere cluster is configured for Kubernetes workloads, it becomes a Supervisor cluster and adds objects to the vCenter Server inventory, such as Namespaces, vSphere Pods, and Tanzu Kubernetes. vSphere with Tanzu creates a Kubernetes control plane directly on the hypervisor, creating a Kubernetes layer within the ESXi hosts that are part of the cluster.
Management cluster	A Management cluster is a Kubernetes cluster that runs and operates Tanzu Kubernetes Grid. The Management cluster runs Cluster API to create and manage workload clusters that host application and deploys and manages shared and in-cluster services that the workloads use. The Management cluster is purpose-built for managing workload clusters and packaged services, and for running container networking and other system-level agents.
Tanzu Kubernetes cluster	A Tanzu Kubernetes cluster is a full distribution of the open source Kubernetes container orchestration platform that is built, signed, and supported by VMware. You can provision and operate Tanzu Kubernetes clusters on the Supervisor cluster by using the Tanzu Kubernetes Grid Service.
Cluster attach	This is the process of connecting a cluster to Tanzu Mission Control for management, excluding any lifecycle management capabilities such as cluster create, update, or delete.
Cluster registration	This is the process of connecting a vSphere with Tanzu Supervisor cluster or Tanzu Kubernetes Grid Management cluster to Tanzu Mission Control for management. This enables the ability to create, update, and delete clusters with Tanzu Mission Control.

Provisioner	This is a Namespace on a Supervisor or Management cluster that is used for deploying Tanzu Kubernetes clusters.

Version table

vCenter Enterprise+	7u3d - 7.0.3 build 19480866
Tanzu Kubernetes Cluster	1.21.6+vmware.1-tkg.1.b3d708a
Virtual Distributed Switch	7.0.2
NSX Advanced Load Balancer	21.1.4-9210
Tanzu Kubernetes Grid Management cluster	1.4.1

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