Upgrade an Azure Kubernetes Service (AKS) cluster-Using Terraform Blueprint-BPAZR018

Overview

Platform	**Azure**
Owner of this SOP:	Fully Managed POD-B
Cloud Services	AKS

Tester	**Reviewer**
@ Sandeep Naidu Pinnenti	@ Irene Bogosi

Before you begin

- You must have an existing cluster. This page is about upgrading from Kubernetes 1.23.12 to Kubernetes 1.24.6
- Spin up a cluster using blueprint-bhp-cloudfactory / azure-blueprints / azr-aks-blueprint · GitLab
- Follow the prerequisites mentioned in README file for policy exemptions and other important things before creation.
- Define the below variables in the terraform module

```
  kubernetes_version         = var.kubernetes_version(To specify
control plane version)
  orchestrator_version       = var.orchestrator_version(To specify
Node Pool version)
```

Problem

AKS cluster lifecycle involves performing periodic upgrades to the latest Kubernetes version. It's important you apply the latest security releases, or upgrade to get the latest features. This article shows you how to check for, configure, and apply upgrades to your AKS cluster.

When you upgrade a supported AKS cluster, Kubernetes minor versions can't be skipped. All upgrades must be performed sequentially by major version number. For example, upgrades between *1.14.x* -> *1.15.x* or *1.15.x* -> *1.16.x* are allowed, however *1.14.x* -> *1.16.x* is not allowed.

Skipping multiple versions can only be done when upgrading from an *unsupported version* back to a *supported version*. For example, an upgrade from an unsupported *1.10.x* -> a supported *1.15.x* can be completed if available.

Solution

Step 1: Check for available AKS cluster upgrades

To check which Kubernetes releases are available for your cluster, please refer to Check for available AKS cluster upgrades

The following example output shows that the cluster can be upgraded to versions *1.24.3* and *1.24.6*:

```
C:\Users\podbadmin>az aks get-upgrades --name i[illegible]-podb-aks --resource-group it[illegible]-arg-podb-aks -o table
Name     ResourceGroup                 MasterVersion   Upgrades
-------  ----------------------------  --------------  --------------
default  it-it-it-aue1-npe-arg-podb-aks  1.23.12         1.24.3, 1.24.6

C:\Users\podbadmin>
```

Step 2: Customize node surge upgrade

By default, AKS configures upgrades to surge with one extra node. A default value of one for the max surge settings will enable AKS to minimize workload disruption by creating an extra node before the cordon/drain of existing applications to replace an older versioned node.

To know more about node surge configuration, refer to AKS Surge Node Recommendations . In this example, we are going with default value that is one.

Step 3: Check PodDisruptionBudget Configuration

Ensure that any `PodDisruptionBudgets` (PDBs) allow for at least 1 pod replica to be moved at a time otherwise the drain/evict operation will fail. If the drain operation fails, the upgrade operation will fail by design to ensure that the applications are not disrupted.

Step 4: Upgrade an AKS cluster

During the upgrade process, AKS will:

- Add a new buffer node (or as many nodes as configured in max surge) to the cluster that runs the specified Kubernetes version.
- Cordon and drain one of the old nodes to minimize disruption to running applications. If you're using max surge, it will cordon and drain as many nodes at the same time as the number of buffer nodes specified.
- When the old node is fully drained, it will be reimaged to receive the new version, and it will become the buffer node for the following node to be upgraded.
- This process repeats until all nodes in the cluster have been upgraded.
- At the end of the process, the last buffer node will be deleted.

As we are performing the upgrade from terraform, define the parameters `orchestrator_version`,`kubernetes_version` in terraform module.

Kubernetes_version: Version of Kubernetes specified when creating the AKS managed cluster.

Orchestrator_version: Version of Kubernetes used for the Agents. This version must be supported by the Kubernetes Cluster - as such the version of Kubernetes used on the Cluster/Control Plane may need to be upgraded first.

In this example, we have first defined kubernetes_version paramater to 1.24.6 and then ran terraform plan with subsequent apply which upgrades the control plane to 1.24.6 version.

GitLab Code:

```
9  - kubernetes_version         = "1.23.12" # Version of
   Kubernetes specified when creating the AKS managed
   cluster. If not specified, the latest recommended
   version will be used at provisioning time
```

```
9  + kubernetes_version         = "1.24.6" # Version of
   Kubernetes specified when creating the AKS managed
   cluster. If not specified, the latest recommended
   version will be used at provisioning time
```

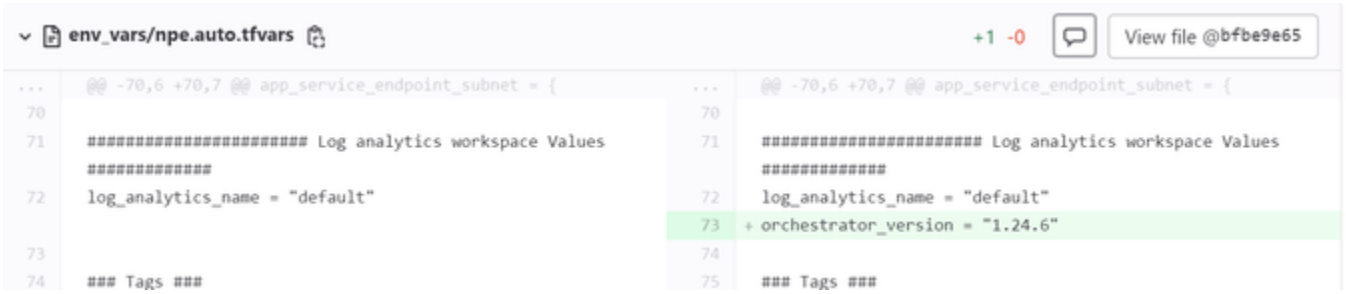
Terraform Plan:

```
~ module.aks.azurerm_kubernetes_cluster.this

      id :                  "/subscriptions/02edd368-8c77-4446-9165-f6e8ea5cbd86/resourceGroups/it-it-it
                            -aue1-npe-arg-podb-aks/providers/Microsoft.ContainerService/managedClusters/
                            it-aue1-npe-podb-aks"

  ~   kubernetes version :  "1.23.12" → "1.24.6"
```

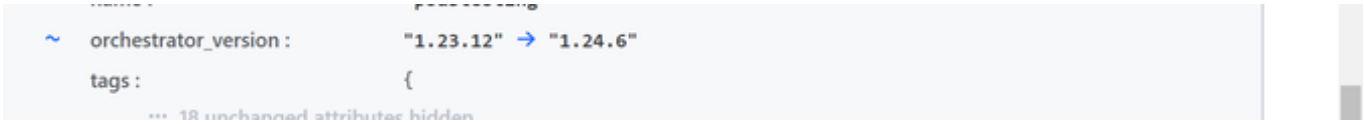
Once applied, control plane will be upgraded to version 1.24.6. Check the version in terraform state file or in the Azure portal.

Post upgrading control plane, set orchestrator_version parameter to desired version (1.24.6) to upgrade nodes in the node pools to the desired version.

GitLab Code:



Terraform Plan:



Once terraform apply is successful, nodes in the node pool will be upgraded to 1.24.6. Check the version in terraform state file or in the Azure portal.

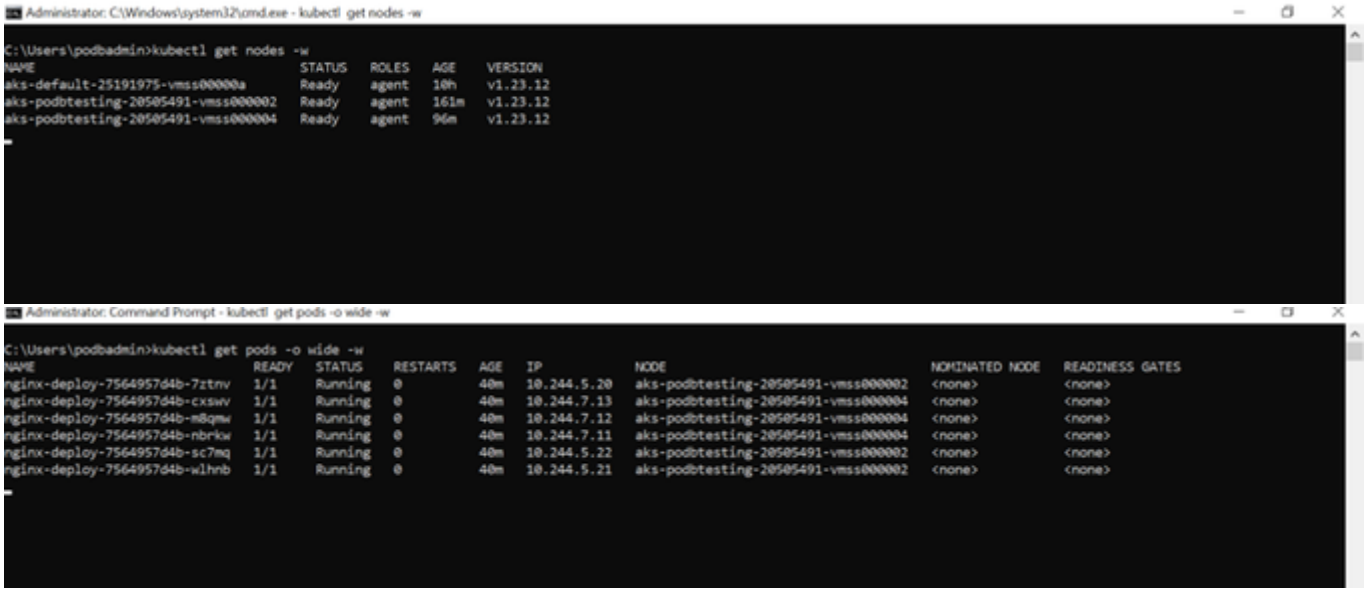
Node pool	Provisioning state	Power state	Node count	Mode	Kubernetes version	Node size
default	Succeeded	Running	1/1 ready	System	1.24.6	Standard_D4s_v3
podbtesting	Succeeded	Running	2/2 ready	User	1.24.6	Standard_D4s_v3

View the upgrade events

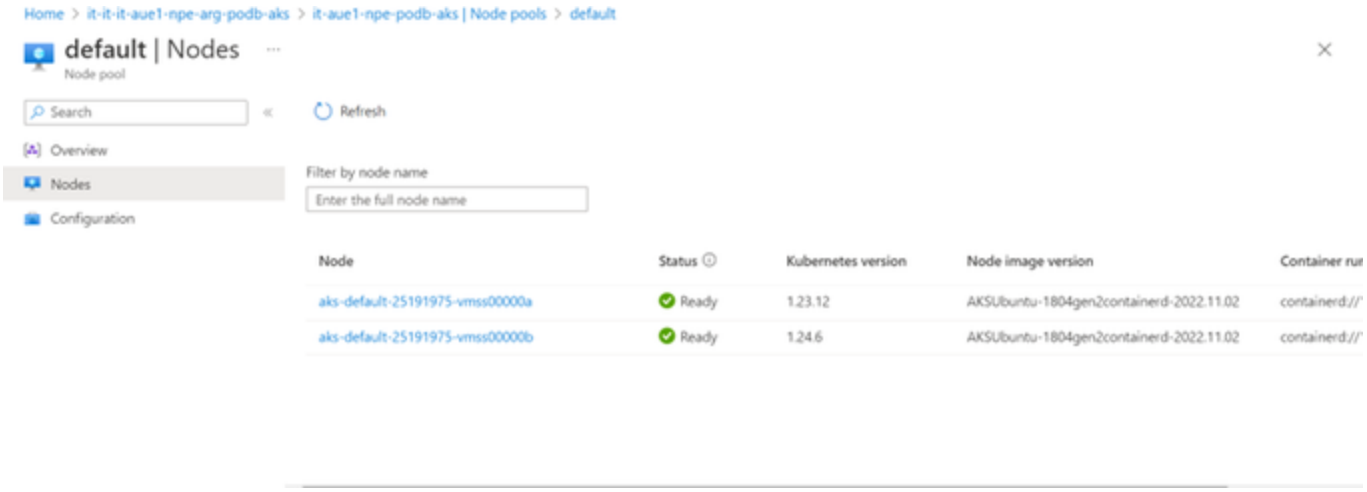
When you upgrade your cluster, the following Kubernetes events may occur on each node:

- Surge – Create surge node.
- Drain – Pods are being evicted from the node. Each pod has a 30-minute timeout to complete the eviction.
- Update – Update of a node has succeeded or failed.
- Delete – Deleted a surge node.

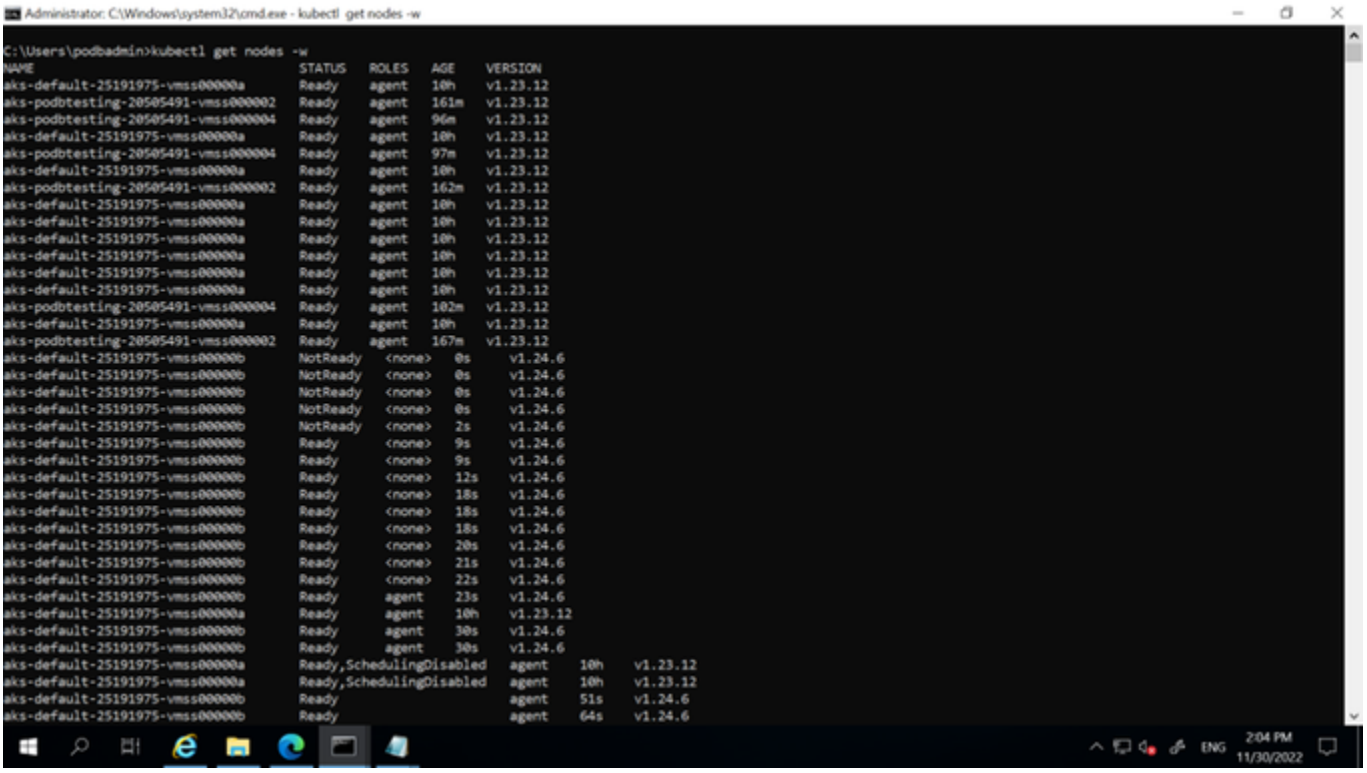
Refer to below screenshots for the events:



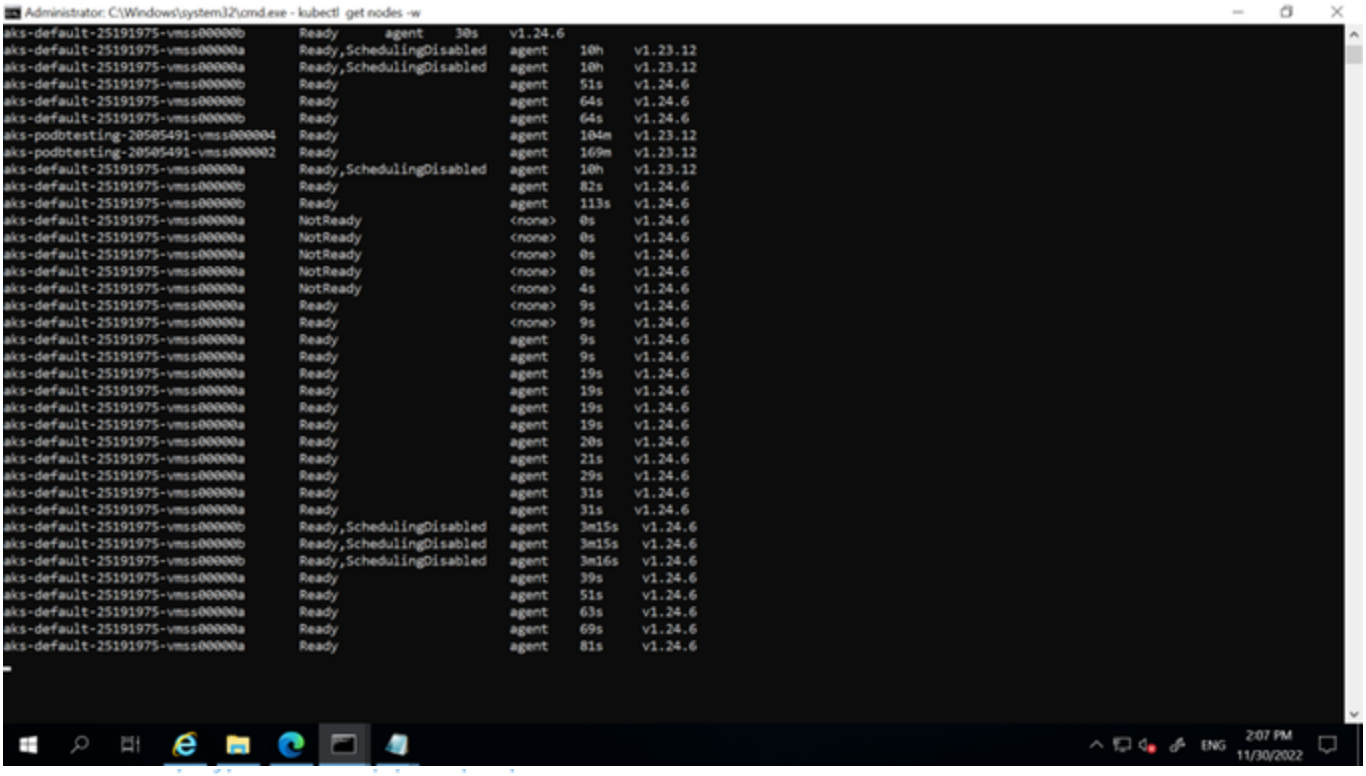
At this point, node pool upgrade run has been triggered from terraform. We can see a new buffer node has been added as aks will add one buffer node by default during upgrade.

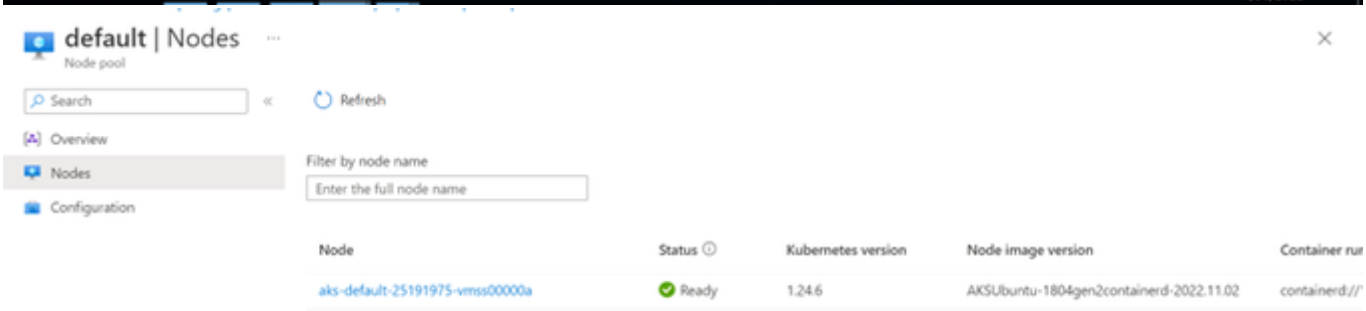


Now, the old node with version 1.23.12 will be drained and node version upgrade process start. Before that Kubernetes will ensure that all pods in the old node are evicted and are placed in the new node and are in running state.

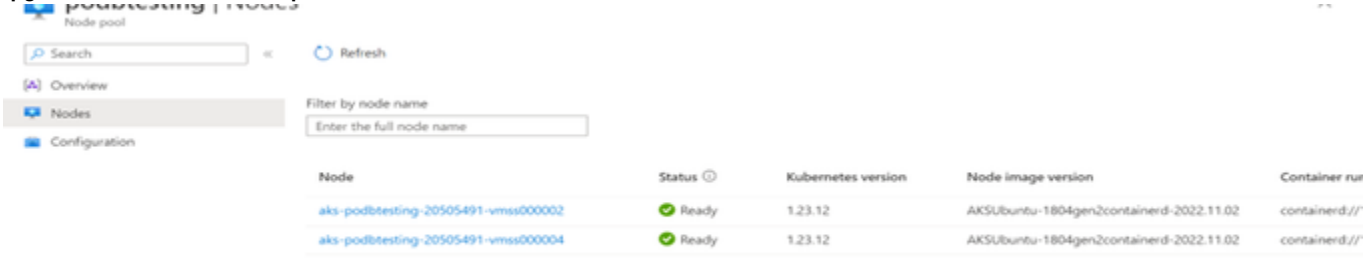


Once the old node has been upgraded to new version 1.24.6, the buffer node will be drained and removed.





Upgrade nodes in User node pool:



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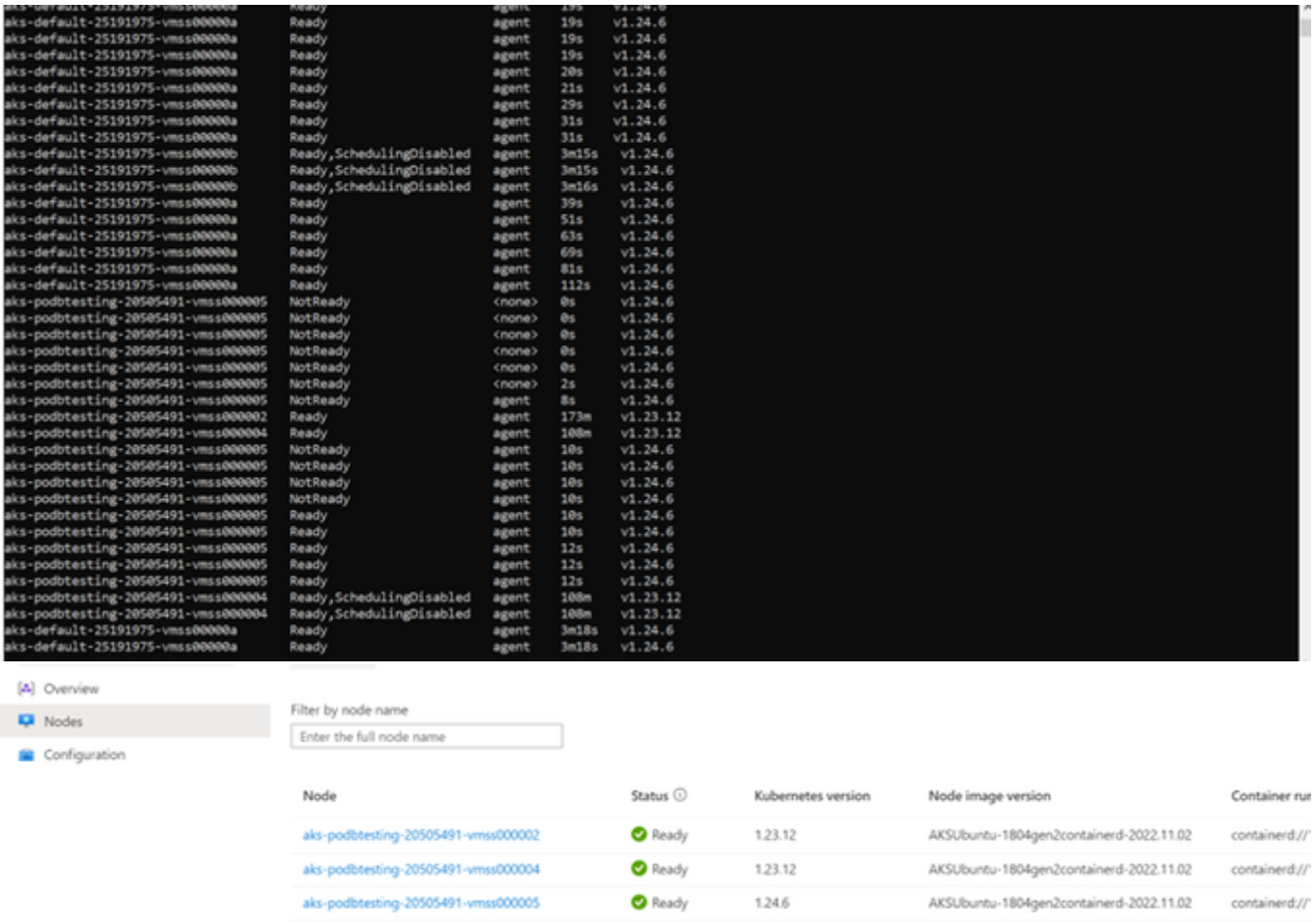

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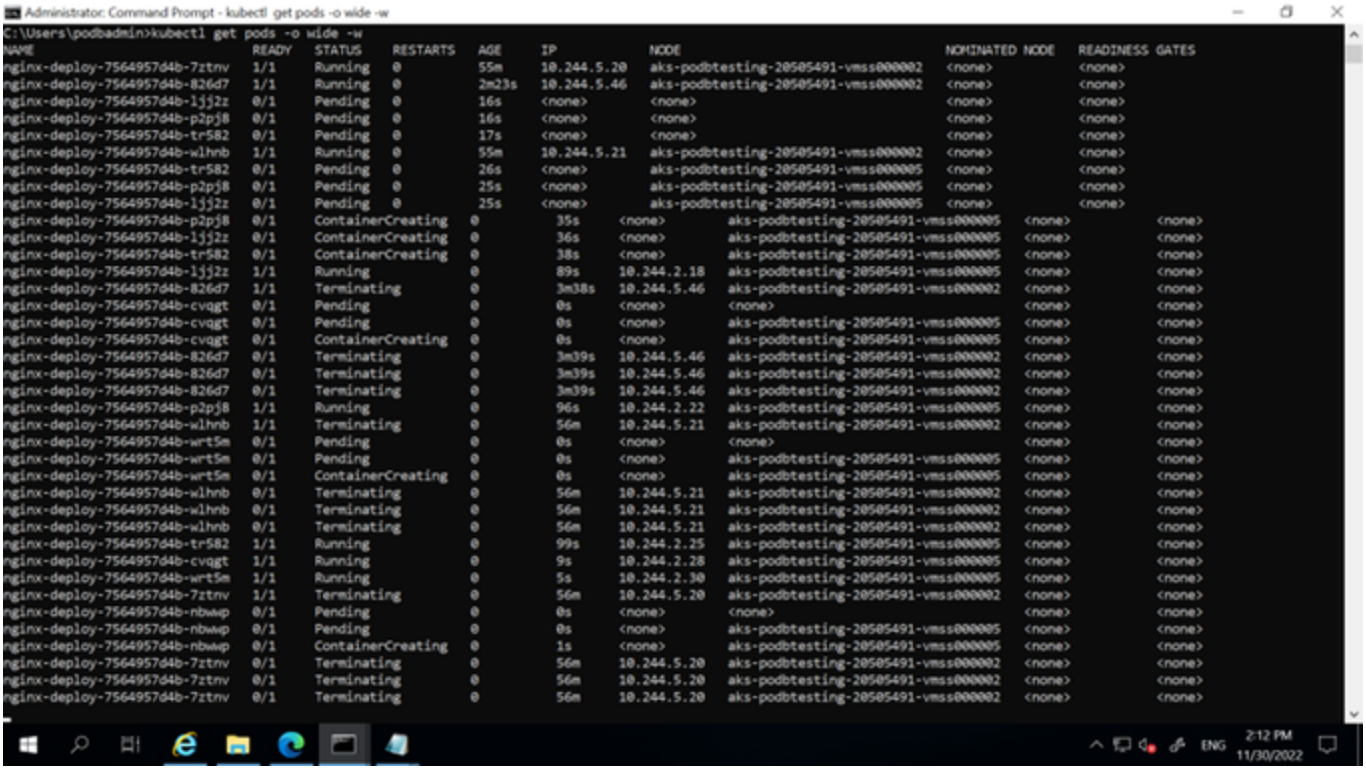
Administrator: Command Prompt - kubectl get pods -o wide -w
C:\Users\podbadmin>kubectl get pods -o wide -w
NAME READY STATUS RESTARTS AGE IP NODE NOMINATED NODE READINESS GATES
nginx-deploy-7564957d4b-7ztnv 1/1 Running 0 55m 10.244.5.20 aks-podbtesting-20505491-vmss000002 <none> <none>
nginx-deploy-7564957d4b-826d7 1/1 Running 0 2m23s 10.244.5.46 aks-podbtesting-20505491-vmss000002 <none> <none>
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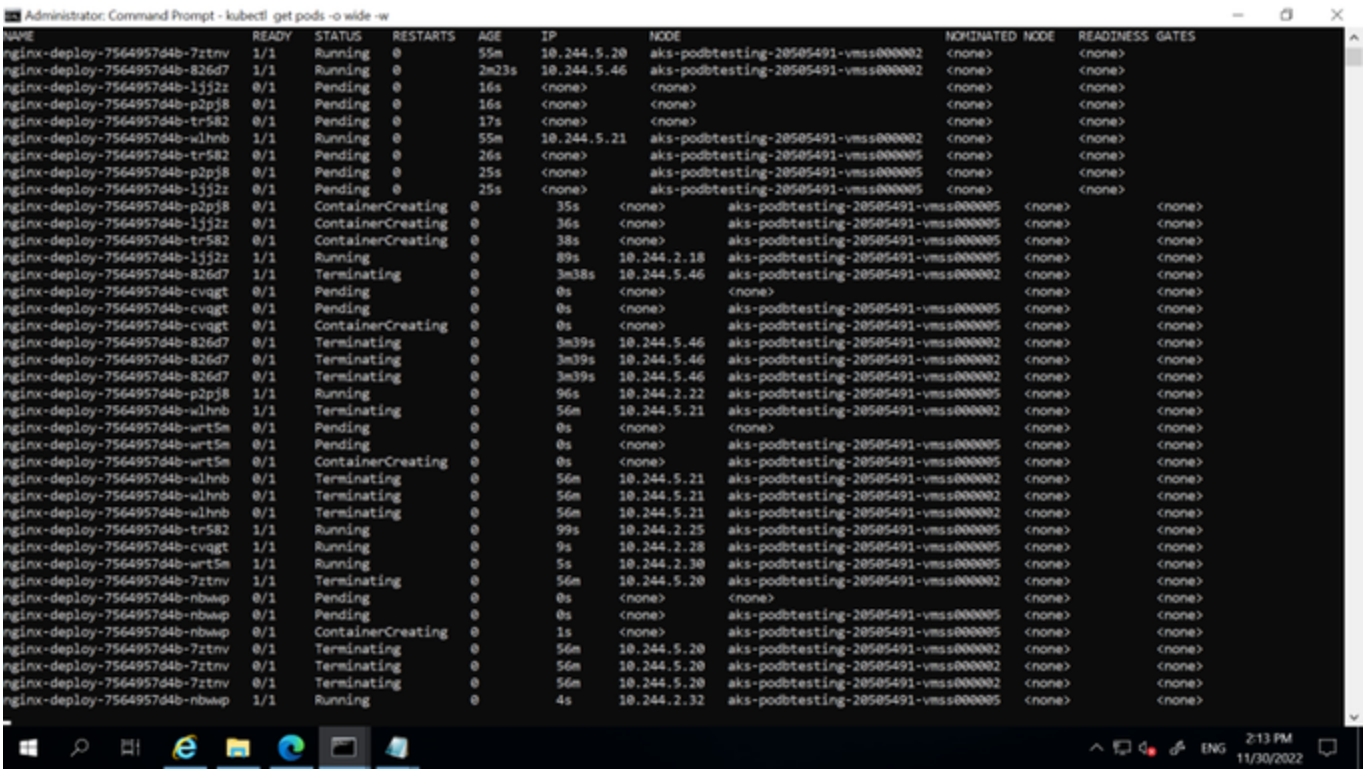
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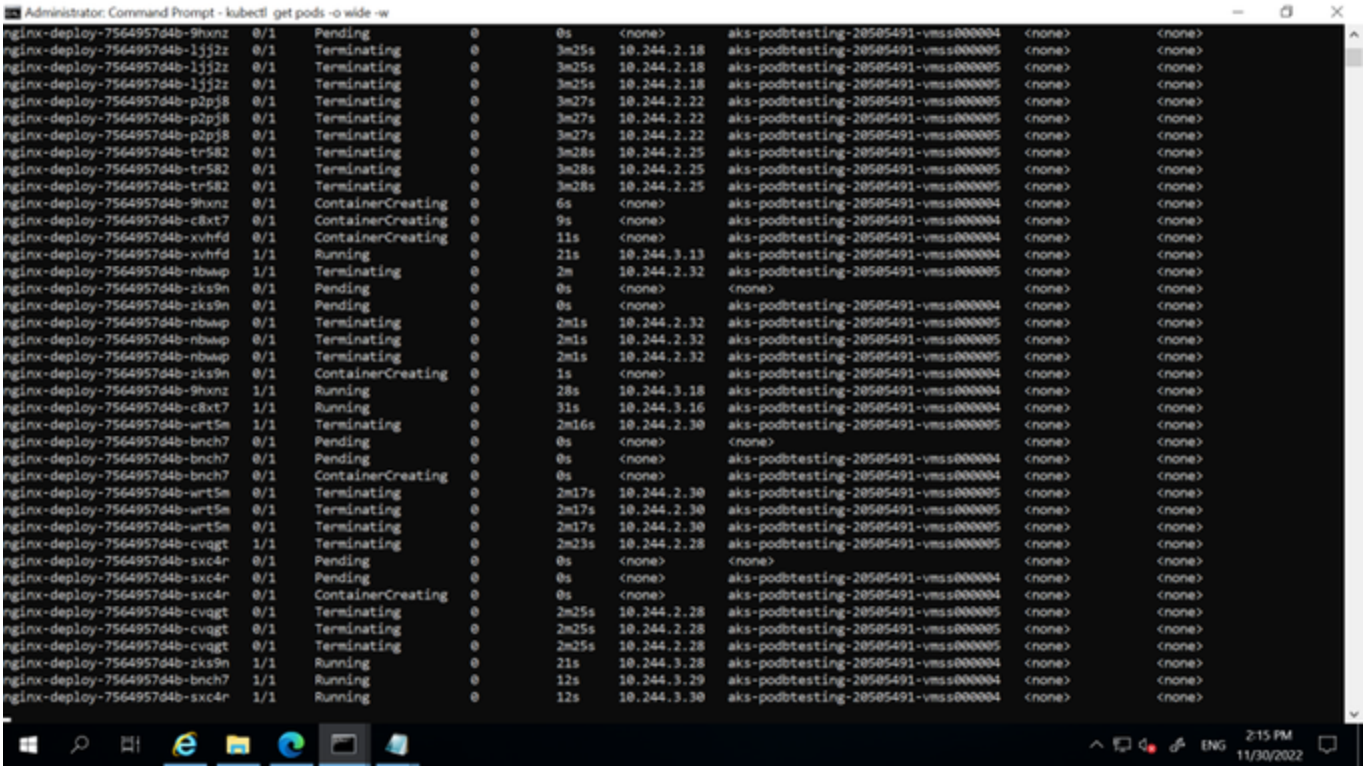
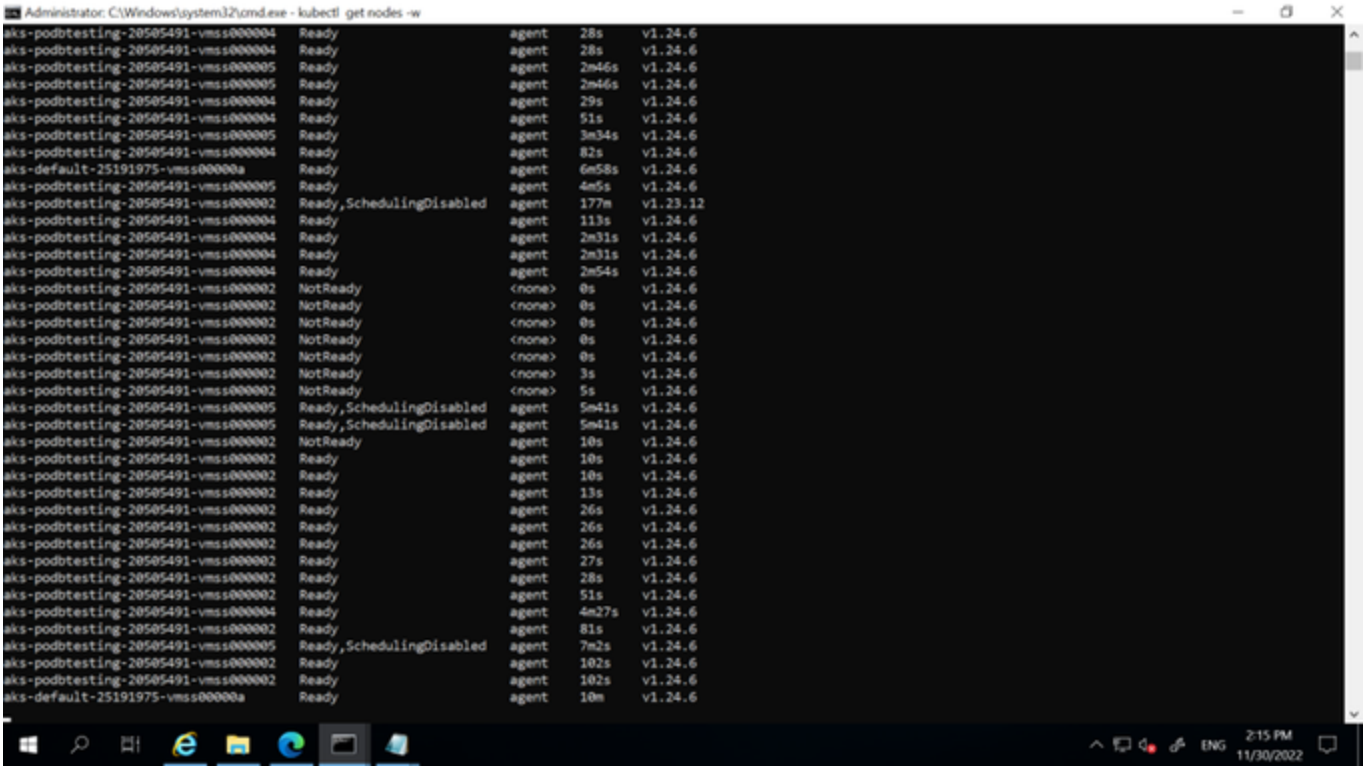
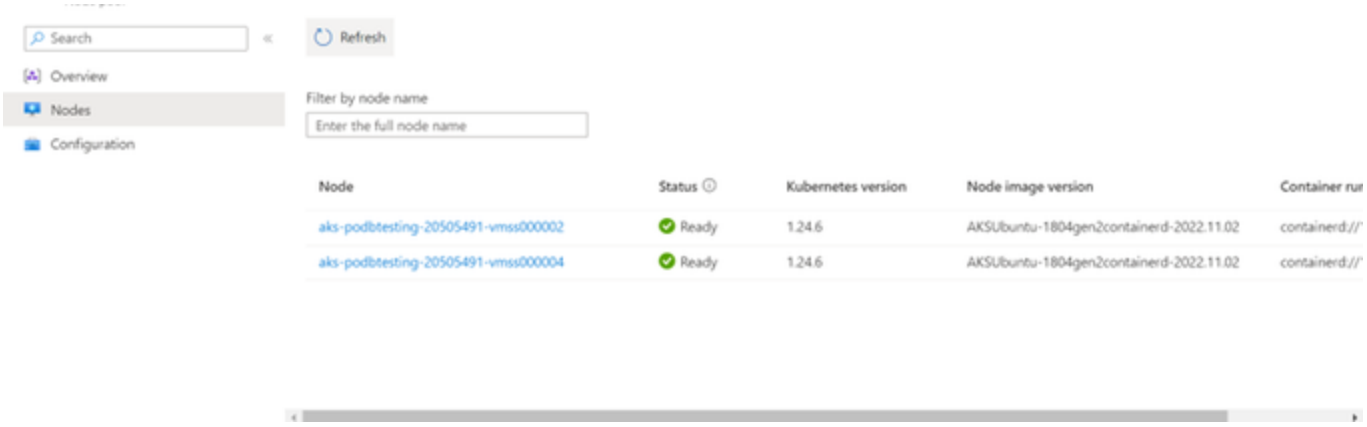




Both the nodes in the node pool have been upgraded to version 1.24.6.



Related articles

- Patch/Upgrade nodes
- Automatically upgrade the node image
- Upgrade an Azure Kubernetes Service (AKS) cluster
- Patch/Upgrade nodes
- Check for available AKS cluster upgrades