



Vidyavardhini's College of Engineering & Technology

Department of Computer Engineering

Academic Year : 2023-24

Experiment - 09

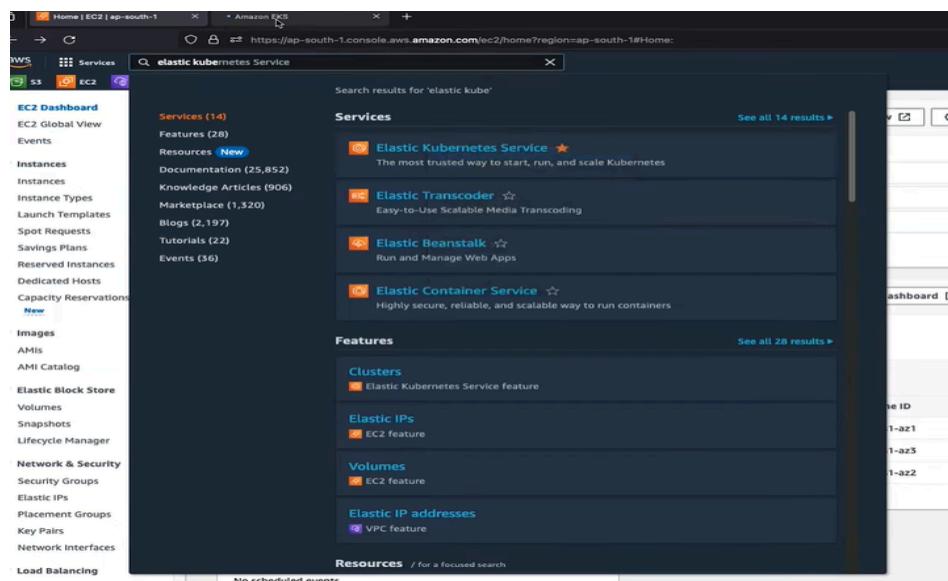
AIM: To study and Implement cluster creation using kubernetes.

THEORY:

Amazon EKS is a fully managed Kubernetes engine. It lets you start a cluster without having to administer any physical hosts yourself. The EKS service provides the Kubernetes control plane with performance and reliability guarantees. It also automates the process of provisioning worker Nodes and joining them to your cluster. You can run your Nodes on either EC2 or Fargate. EKS has built-in support for auto-scaling, allowing your cluster to resize itself as utilization changes. It also includes a full graphical console for managing your cluster, as well as automated security patches to keep Kubernetes updated. There are direct integrations with other AWS services, including VPC and ELB networking, EBS storage, and IAM identity management.

Creating Your Cluster:

1. Next, switch to the EKS dashboard by searching in the search bar at the top of the page. The dashboard will show as “Elastic Kubernetes Service” under “Services” in the search results:





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2. On the EKS landing page, click the “Add cluster” button, then “Create” in the dropdown menu that appears
3. Enter a name for your cluster and select the Kubernetes version to deploy. Accept the default version unless you know you need an alternative because it’s usually the best-supported option.

Configure cluster

Cluster configuration Info

Name Enter a unique name for this cluster. This property cannot be changed after the cluster is created.
demo

Kubernetes version Info
Select Kubernetes version for this cluster.
1.28

ⓘ Kubernetes version 1.28 reaches the end of standard support on November 2024. If you don't update your cluster to a later version before that date, it will automatically enter extended support. After the extended support preview ends, clusters on versions in extended support will be subject to additional fees. [Learn more](#)

Cluster service role Info
Select the IAM role to allow the Kubernetes control plane to manage AWS resources on your behalf. This property cannot be changed after the cluster is created. To create a new role, follow the instructions in the [Amazon EKS User Guide](#).

Amazon_eks_policy

Cluster access Info
Control how IAM principals can access this cluster.

Bootstrap cluster administrator access Info

Add permissions

Trusted entity type

AWS service
Allow AWS services like EC2, Lambda, or others to perform actions in this account.

AWS account
Allow entities in other AWS accounts belonging to you or a 3rd party to perform actions in this account.

Web identity
Allows users federated by the specified external web identity provider to assume this role to perform actions in this account.

SAML 2.0 federation
Allow users federated with SAML 2.0 from a corporate directory to perform actions in this account.

Custom trust policy
Create a custom trust policy to enable others to perform actions in this account.

Use case

Service or use case
EKS

Choose a use case for the specified service.

EKS
Allows EKS to manage clusters on your behalf.

EKS - Cluster
Allows access to other AWS service resources that are required to operate clusters managed by EKS.

EKS - Nodegroup
Allows access to other AWS service resources on your behalf.

EKS - Fargate pod
Allows access to other AWS service resources that are required to run Amazon EKS pods on AWS Fargate.

EKS - Fargate profile
Allows EKS to run Fargate tasks.

EKS - Connector
Allows access to other AWS service resources that are required to connect to external clusters.

EKS Local - Output
Allows Amazon EKS Local to call AWS services on your behalf.

EKS - Pod identity
Allows pods running in Amazon EKS cluster to access AWS resources.



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Step 2
Specify networking

Step 3
Configure observability

Step 4
Select add-ons

Step 5
Configure selected add-ons settings

Step 6
Review and create

Name: demo_cluster1

Kubernetes version: 1.26

Cluster service role: Amazon_eks_policy

Cluster access: Allow cluster administrator access

Cluster authentication mode: EKS API and ConfigMap

4. Check that the cluster role you created above is selected in the “Cluster service role” dropdown, then scroll down the page and press the yellow “Next” button.

Step 6
Review and create

Cluster service role: Amazon_eks_policy

Cluster access: Allow cluster administrator access

Cluster authentication mode: EKS API and ConfigMap

Secrets encryption: Turn on envelope encryption of Kubernetes secrets using KMS



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Cluster access info
Control how IAM principals can access this cluster.

Bootstrap cluster administrator access info
Choose whether the IAM principal creating the cluster has Kubernetes cluster administrator access.

Allow cluster administrator access
Allow cluster administrator access for your IAM principal.

Deny cluster administrator access
Deny cluster administrator access for your IAM principal.

Cluster authentication mode info
Configure which source the cluster will use for authenticated IAM principals.

EKS API
The cluster will source authenticated IAM principals only from EKS access entry APIs.

EKS API and ConfigMap
The cluster will source authenticated IAM principals from both EKS access entry APIs and the aws-auth ConfigMap.

ConfigMap
The cluster will source authenticated IAM principals only from the aws-auth ConfigMap.

Secrets encryption info
Once turned on, secrets encryption cannot be modified or removed.

Turn on envelope encryption of Kubernetes secrets using KMS
Envelope encryption provides an additional layer of encryption for your Kubernetes secrets.

Tags (0) info
Each tag consists of a key and an optional value.

This cluster does not have any tags.

Add tag
You can add up to 50 tags.

Cancel Next

5. Accept the default configurations on the following four screens, as we're only creating a basic cluster.

EKS > Clusters > Create EKS cluster

Step 1 Configure cluster

Step 2 Specify networking

Step 3 Configure observability

Step 4 Select add-ons

Step 5 Configure selected add-ons settings

Step 6 Review and create

Specify networking

Networking info
IP address family and service IP address range cannot be changed after cluster creation.

VPC info
Select a VPC to use for your EKS cluster resources. To create a new VPC, go to the [VPC console](#).
vpc-0bc6724ea287219 | Default

Subnets info
Choose the subnets in your VPC where the control plane may place elastic network interfaces (ENIs) to facilitate communication with your cluster. To create a new subnet, go to the corresponding page in the [VPC console](#).

Select subnets
subnet-074005755d729d4f ×
ap-south-1a 172.31.6.0/20
subnet-01960f0bf2b18fd8a ×
ap-south-1a 172.31.32.0/20
subnet-0879184e68b0fb358 ×
ap-south-1c 172.31.16.0/20

Security groups info
Choose the security groups to apply to the EKS-managed Elastic Network Interfaces that are created in your control plane subnets. To create a new security group, go to the corresponding page in the [VPC console](#).

Select security groups
Select security groups

Choose cluster IP address family info
Specify the IP address type for pods and services in your cluster.
 IPv4
 IPv6

Configure Kubernetes service IP address range info
Specify the range from which cluster services will receive IP addresses.

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The screenshot shows the AWS EKS Cluster Creation process at Step 5: Configure selected add-ons settings. The interface includes:

- Amazon VPC CNI**: Category networking, Status Installed by default. Version v1.15.1-eksbuild.1.
- CoreDNS**: Category networking, Status Installed by default. Version v1.9.3-eksbuild.7.
- kube-proxy**: Category networking, Status Installed by default. Version v1.25.0-eksbuild.1.

At the bottom, there are "Cancel", "Previous", and "Next" buttons.

The screenshot shows the AWS EKS Cluster Creation process at Step 5: Configure selected add-ons settings. The interface includes:

- Amazon VPC CNI**: Category networking, Status Installed by default. Version v1.15.1-eksbuild.1.
- CoreDNS**: Category networking, Status Installed by default. Version v1.9.3-eksbuild.7.
- kube-proxy**: Category networking, Status Installed by default. Version v1.25.0-eksbuild.1.

At the bottom, there are "Cancel", "Previous", and "Next" buttons.



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The screenshot shows the AWS EKS Cluster creation wizard. Step 1: Cluster configuration. Cluster name: demo_cluster1, Kubernetes version: 1.26, Cluster service role: arn:aws:iam::784855159258:role/Amazon_eks_policy, Kubernetes cluster administrator access: Allow cluster administrator access, Authentication mode: EKS API and ConfigMap. Step 2: Networking. A VPC is selected for networking.

6. Click through the screens until you reach Step 6, “Review and create,” then press the yellow “Create” button at the bottom to provision your cluster.
7. You’ll be taken to your cluster’s dashboard. Wait while the creation process completes – the “Status” displayed under “Cluster info” will change from “Creating” to “Active” once it’s ready.

The screenshot shows the AWS EKS Cluster dashboard. The clusters table lists one cluster: demo_cluster1, Status: Creating, Kubernetes version: 1.26, Support type: Standard support until June 2024.



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The screenshot shows the AWS Cloud Console interface for the Amazon Elastic Kubernetes Service (EKS). The left sidebar navigation includes 'Clusters New', 'Amazon EKS Anywhere', 'Enterprise Subscriptions New', and 'Related services' (Amazon ECR, AWS Batch). The main content area is titled 'Clusters (1) Info' and lists the 'demo_cluster1'. The cluster details are as follows:

Cluster name	Status	Kubernetes version	Support type	Provider
demo_cluster1	Active	1.26 Update now	Standard support until June 2024	EKS

The screenshot shows the AWS Cloud Console interface for the 'demo_cluster1' cluster. The left sidebar navigation is identical to the previous screenshot. The main content area is titled 'demo_cluster1' and contains the following information:

Your cluster's Kubernetes version (1.26) will reach the end of standard support on June 2024. Update your cluster to a supported version. If you don't, your cluster will be onboarded to extended support. After the extended support preview ends, clusters on versions in extended support will be subject to additional fees. [Learn more](#) [Update now](#)

Cluster info

Status	Kubernetes version	Support type	Provider
Active	1.26	Standard support until June 2024	EKS

Details

API server endpoint	OpenID Connect provider URL	Created	
https://9E5E38EF2C7DCB3AEB15B0DCCDA40BB.gr7.ap-south-1.eks.amazonaws.com	https://oidc.eks.ap-south-1.amazonaws.com/id/9E5E38EF2C7DCB3AEB15B0DCCDA40BB	9 minutes ago	
Certificate authority	Cluster IAM role ARN	Cluster ARN	
https://LS0L51CRUJTI1BDRVJUSUZJQ0FURSO1LS0tCk1JSURCVENDQWUyZ0FS5SUzB0UIC9QeGxgHQm013RFZSkvWklodmNOQVFTTjRQXQdgVEVUTUfROExVUUKQXN52zEvmlaWeP1WhSbGN6QVVGdzB5TkRBeE16RXHNeke0TxpaYUZ3MHPoREF4T	arn:aws:iam::784855159258:role/Amazon_eks_policy	arn:aws:eks:ap-south-1:784855159258:cluster/demo_cluster1	
Health issues (0)	Platform version		
	Info		



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Adding Nodes

1. Next, switch to the “Compute” tab in the tab strip near the top of the page. Your cluster doesn’t have any Nodes yet, so it can’t run any workloads. Scroll down and click the “Add node group” button to begin provisioning your first Nodes as EC2 instances
2. Give your Node group a name, then check the node IAM role you created earlier is selected in the dropdown.

The screenshot shows the 'Configure node group' step of the 'Add node group' wizard. The 'Name' field is filled with 'node_group1'. The 'Node IAM role' dropdown is set to 'amazon_eks_workernode_policy'. A note below the dropdown states: 'The selected role must not be used by a self-managed node group as this could lead to a service interruption upon managed node group deletion.' There are also sections for 'Launch template' and 'Kubernetes labels'.

The screenshot shows the 'amazon_eks_workernode_policy' details page in the IAM console. The 'Summary' section includes the creation date (January 26, 2024), ARN (arn:aws:iam::784855159258:role/amazon_eks_workernode_policy), and instance profile ARN (arn:aws:iam::784855159258:instance-profile/amazon_eks_workernode_policy). The 'Permissions' tab shows three policies attached: 'AmazonEC2ContainerRegistryReadOnly', 'AmazonEKS_CNI_Policy', and 'AmazonEKSWorkerNodePolicy'. The 'Attached entities' table shows one entity for each policy.



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The screenshot shows the 'Add permissions' step of the 'Create role' wizard in the AWS IAM console. The 'AmazonEKS_CNI_Policy' managed policy is selected and listed under 'Permissions policies'. The policy description indicates it provides the Amazon VPC CNI permission.

The screenshot shows the 'Set compute and scaling configuration' step of the 'Add node group' wizard in the AWS EKS console. The configuration includes:

- AMI type:** Amazon Linux 2 (AL2_x86_64)
- Capacity type:** On-Demand
- Instance type:** t3.medium
- Disk size:** 20 GiB

The 'Node group scaling configuration' step shows a desired size of 2 nodes.



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3. On the next page, configure the type of EC2 instance to provision for this Node group. The defaults are sufficient for this example.

The screenshot shows the 'Add node group' wizard in the AWS EKS console. The current step is 'Set compute and scaling configuration'. The 'Node group compute configuration' section shows the AMI type as 'Amazon Linux 2 (AL2_x86_64)', capacity type as 'On-Demand', and instance type as 't2.medium'. The 'Disk size' is set to 20 GiB. The 'Node group scaling configuration' section shows the 'Desired size' as 2 nodes, which is highlighted in red. The 'Minimum size' and 'Maximum size' are also set to 2 nodes. The bottom of the page shows the 'Next Step' button.

4. Further down the page, choose the number of Nodes to provision. More Nodes will increase your cluster's redundancy and capacity.

The screenshot shows the 'Add node group' wizard in the AWS EKS console. The current step is 'Node group scaling configuration'. It displays three fields: 'Desired size' (2 nodes), 'Minimum size' (2 nodes), and 'Maximum size' (2 nodes). Below these, the 'Node group update configuration' section includes 'Maximum unavailable' (set to 1 node) and 'Value' (set to 1 node). The bottom of the page shows the 'Cancel', 'Previous', and 'Next Step' buttons.



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The screenshot shows two separate instances of the AWS EKS console for configuring a node group.

Top Window (Step 2: Compute and scaling configuration):

- Node group compute configuration:**
 - Capacity type: On-Demand
 - AMI type: Amazon Linux 2 (AL2_x86_64)
 - Instance types: t2.medium
 - Disk size: 20
- Node group scaling configuration:**
 - Desired size: 2 nodes
 - Minimum size: 2 nodes
 - Maximum size: 2 nodes

Bottom Window (Step 1: Configure node group):

- Step 1: Node group configuration:**
 - Name: node_group1
 - Node IAM role: arn:aws:iam::784855159258:role/amazon_eks_workernode_policy
- Kubernetes labels (0):**
 - No labels
- Kubernetes taints (0):**
 - No taints



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Screenshot of the AWS CloudShell interface showing the creation of a Node Group for an EKS cluster.

The top window shows the "Add node group" configuration:

- Node group compute configuration:**
 - Capacity type: On-Demand
 - Instance types: t2.medium
 - Disk size: 20
 - AMI type: Amazon Linux 2 (AL2_x86_64)
- Node group scaling configuration:**
 - Desired size: 2 nodes
 - Minimum size: 2 nodes
 - Maximum size: 2 nodes
- Node group update configuration:**
 - Maximum unavailable: 1 node

Step 3: Networking

Node group network configuration:

- Subnets:
 - subnet-07e4005735d729d4f
 - subnet-01960f0fb218fbba
 - subnet-0879184e68b9fb358
- Configure remote access to nodes: off

Buttons: Cancel, Previous, Create

The bottom window shows the "node_group1" configuration page:

Node group creation in progress
node_group1 is now being created. This process may take several minutes.

node_group1

Node group configuration

Kubernetes version: 1.26	AMI type: AL2_x86_64	Status: Creating
AMI release version: 1.26.12-20240117	Instance types: t2.medium	Disk size: 20 GB

Details

Node group ARN: arn:aws:eks:ap-south-1:74855159258:nodergroup/demo_cluster/node_group1/44c6af07-627c-e70a-dc43-eb1494e7b0d	Created: a few seconds ago	Autoscaling group name: <input type="text"/>	Capacity type: On-Demand	Subnets: <ul style="list-style-type: none">subnet-07e4005735d729d4fsubnet-01960f0fb218fbbasubnet-0879184e68b9fb358
		Node IAM role ARN: arn:aws:iam::784855159258:role/amazon_eks_workernode_policy	Desired size: 2 nodes	Configure remote access to nodes: off
			Minimum size: 2 nodes	
			Maximum size: 2 nodes	



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This screenshot shows the AWS EKS console for the 'demo_cluster1' cluster. The 'Compute' tab is selected. The cluster status is 'Active' with Kubernetes version 1.26. The support type is 'Standard support until June 2024'. There are 0 nodes listed under 'Nodes (0)'. A single node group named 'node_group1' is shown with a desired size of 2 and AMI release version 1.26.12-20240117. No Fargate profiles are listed.

This screenshot shows the AWS EKS console for the 'demo_cluster1' cluster. The 'Compute' tab is selected. The cluster status is 'Active' with Kubernetes version 1.26. The support type is 'Standard support until June 2024'. There are 2 nodes listed under 'Nodes (2)'. Both nodes belong to the 'node_group1' node group. The first node (ip-172-31-0-92.ap-south-1.compute.internal) and the second node (ip-172-31-37-149.ap-south-1.compute.internal) are both in a 'Ready' state. The launch template is not specified.



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The screenshot shows the AWS EKS Node group configuration interface. It includes sections for Compute Configuration (Capacity type: On-Demand, Instance type: t2.medium, Disk size: 20), Scaling Configuration (Desired size: 2 nodes, Minimum size: 2 nodes, Maximum size: 2 nodes), and Update Configuration (Maximum unavailable: 1 node). In the Networking section, it lists subnets (subnet-07e4005735d729d4f, subnet-01960f0fb218fbba, subnet-0879184e68b9fb358) and remote access (Configure remote access to nodes: off). A 'Create' button is at the bottom.

- Step through the remaining pages to review and create your Node group, then wait while your Nodes are provisioned. This may take some time as new EC2 instances are created.

The screenshot shows the AWS EC2 Instances page. It displays two running t2.medium instances. The table columns include Name, Instance ID, Instance state, Instance type, Status check, Alarm status, Availability Zone, Public IPv4 DNS, and Public IPv4 IP. The instances listed are i-0987c567b5be3c1 and i-0a6db5b8b36b1418, both in the 'running' state. The left sidebar shows other EC2-related services like Global View, Launch Templates, and Capacity Reservations.



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Conclusion: In conclusion, Amazon EKS offers a seamless and fully managed Kubernetes experience, eliminating the need for manual administration of physical hosts. With EKS, you gain the assurance of a reliable Kubernetes control plane with automated provisioning and scaling of worker nodes. The service simplifies cluster management through its graphical console and ensures performance and reliability through integrated support for auto-scaling and security patching. Its direct integrations with AWS services streamline networking, storage, and identity management, providing a comprehensive solution for deploying and managing Kubernetes clusters in the cloud.