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School of Computer Science, Engineering and Applications(SCSEA)
B.C.A. TY (CCSA)
Subject : Infrastructure Orchestration (P)

Name of the Student: Prakhar Anil Sharma PRN: 20220801121

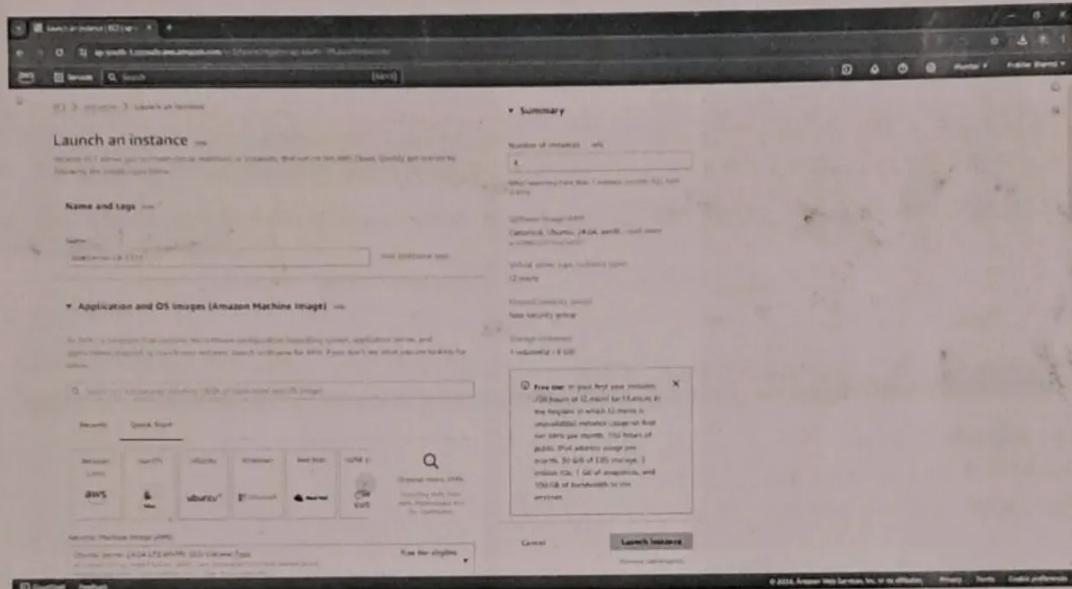
Title of Practical : Efficient Load Balancer Setup for Four Web Instances:
Dynamic Hostname Routing

A]First we will launch 4 EC2 Web Instances in AWS.

Step-1]Search for Ec2 service

Step-2]Click on launch Instance in Ec2 Dashboard

Step-3]Name the Instance



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Step-4]Select Ubuntu Server 24.04 LTS (Free tier eligible) as AMI

The screenshot shows the AWS Cloud Console interface for launching an EC2 instance. In the 'Application and OS Images (Amazon Machine Image)' section, the 'Ubuntu Server 24.04 LTS (HVM, SSD Volume Type)' AMI is selected. This AMI is highlighted with a yellow border and labeled 'Free tier eligible'. Other options like Amazon Linux, macOS, and various Red Hat and SUSE variants are also listed. Below the AMI selection, there are fields for 'Architecture' (set to '64-bit (x86)'), 'AMI ID' (showing 'ami-0de22c13ea7a'), 'Username' ('ubuntu'), and a 'Verified provider' badge. On the right side of the screen, a modal window provides detailed information about the free tier benefits, stating it includes 750 hours of t2.micro (or t3.micro if unavailable) instance usage per month. At the bottom right of the main interface, there is a prominent orange 'Launch instance' button.

Step-5]Create Key Pair

Step-6]Give a name to key Pair

Step-7]Click on create key pair



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A screenshot of the AWS CloudFormation console. The main page shows the 'Launch an instance | EC2 | spo...' tab. A modal window titled 'Create key pair' is open, prompting the user to enter a 'Key pair name' (SG-CCSA-TY-112) and select a 'Key pair type' (RSA). It also provides options for 'Private key file format' (pem or ppk) and includes a note about storing the private key securely. At the bottom right of the modal is a 'Create key pair' button.



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Step-8]Select t2 micro as Instance type

Step-9]In Key Pair select the key pair created

The screenshot shows the AWS EC2 'Launch an instance' interface. In the 'Instance type' section, 't2.micro' is selected as the instance type. Under 'Key pair (login)', the key pair 'SG-CCSA-TY-1121' is chosen. In the 'Network settings' section, the network 'vpc-0fff06795a9ec200' and subnet 'No preference' are selected. A tooltip for 'Free tier' is visible, explaining the included resources. At the bottom right, the 'Launch instance' button is highlighted.

Step-10]In Network Settings select Create security group Option



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The screenshot shows the AWS EC2 'Launch an instance' wizard. In the 'Summary' section, 'Number of instances' is set to 4. Other settings include a Canonical, Ubuntu 24.04 AMI, t2.micro instance type, and 1 volume(s) - 8 GiB storage. The 'Network settings' section shows a VPC and subnet selection. Under 'Firewall (security groups)', a new security group named 'launch-wizard-1' is being created, allowing SSH traffic from anywhere. A note about the free tier is visible. The 'Configure storage' section is partially visible at the bottom.

Step-11]In Advanced Detail scroll down till end.

Step-12]In User data write the code to install the apache server on 4 web instances and make a basic html page on them

Step-13]In the upper right side write 4 in the number of instances



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Step-14] Click on launch Instances

The screenshot shows the AWS EC2 'Launch instance' wizard. On the left, there's a large text area containing a shell script:

```
#!/bin/bash
sudo apt-get update -y
sudo apt-get install apache2 -y
echo "This is $(hostname -f)">/var/www/html/index.htm
```

On the right, the 'Summary' section shows the following configuration:

- Number of instances: 4
- Software Image (AMI): Canonical Ubuntu 24.04, amd64...read more
- Virtual server type (instance type): t2.micro
- Firewall (security group): New security group
- Storage (volumes): 1 volume(s) - 8 GiB

A tooltip for the 'Free tier' is displayed, stating: "In your first year includes 750 hours of t2.micro (or t3.micro in the Regions in which t2.micro is unavailable) instance usage on free tier AMIs per month, 750 hours of public IPv4 address usage per month, 30 GiB of EBS storage, 2 million I/Os, 1 GB of snapshots, and 100 GB of bandwidth to the internet."

At the bottom right is a prominent orange 'Launch instance' button.

Step-15] After Successfully Launch of instances name them as 1,2,3,4.

The screenshot shows the AWS EC2 'Instances' page. The left sidebar lists various services like EC2 Dashboard, EC2 Global View, Events, Instances, Instance Types, Launch Templates, Spot Requests, Savings Plans, Reserved Instances, Dedicated Hosts, Capacity Reservations, Images, AMIs, AMI Catalog, Elastic Block Store, Volumes, Snapshots, Lifecycle Manager, Network & Security, Security Groups, Elastic IPs, Placement Groups, Key Pairs, Network Interfaces, and Load Balancing.

The main table displays four instances:

Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Zone	Public IPv4 DNS	Public IPv4 IP	Elastic IP
Web Server-1...	i-0c4dbde0c0544ccb	Terminated	t2.micro	-	-	ap-south-1b	-	-	-
LB-1	i-02ae85fbbe5f53601	Running	t2.micro	2/2 checks passed	View alarms	ap-south-1b	ec2-13-235-77-181.ap...	13.235.77.181	-
LB-2	i-074bf42f42f0db5c230	Running	t2.micro	2/2 checks passed	View alarms	ap-south-1b	ec2-3-110-222-194.ap...	3.110.222.194	-
LB-3	i-06a950300a57fb818	Running	t2.micro	2/2 checks passed	View alarms	ap-south-1b	ec2-13-235-80-107.ap...	13.235.80.107	-
LB-4	i-0837a9b9834156bbd	Running	t2.micro	2/2 checks passed	View alarms	ap-south-1b	ec2-65-2-3-44.ap-south...	65.2.3.44	-

The bottom of the screen shows the PRN number again: 20220801121.



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B]Now we will edit the Inbound Rule of the Security Group we created to allow access to the HTTP Port from any Ipv4 address

Step-1]Go to Security Group

Step-2]Click on the Security Group you created

Step-3]Click on edit inbound rule in the Inbound rule section

Step-4]Click on add rule

Step-5]Select HTTP as type and Source as Anywhere IPv4

Step-6]Click on Save rules

The screenshot shows the AWS EC2 ModifyInboundSecurityGroup interface. The URL in the browser is <https://ap-south-1.console.aws.amazon.com/ec2/home?region=ap-south-1#ModifyInboundSecurityGroupRules:securityGroupID=sg-0a4101ba8c84ca1d0>. The page title is "Edit inbound rules".
The "Inbound rules" table has two rows:

- Row 1: Security group rule ID sgr-043a403613da5d209, Type SSH, Protocol TCP, Port range 22, Source Custom, Destination 0.0.0.0/0, Description optional.
- Row 2: New rule being added: Type HTTP, Protocol TCP, Port range 80, Source Anywhere-IPv4, Destination 0.0.0.0/0, Description optional.

A warning message at the bottom left says: "⚠ Rules with source of 0.0.0.0/0 or ::/0 allow all IP addresses to access your instance. We recommend setting security group rules to allow access from known IP addresses only." At the bottom right are "Cancel", "Preview changes", and a prominent orange "Save rules" button.



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The screenshot shows the AWS Cloud9 IDE interface. The code editor contains the following Python script:

```
#!/usr/bin/python3
# This is a sample AWS Lambda function. You can edit, save, and run it.
# To run this code:
#   1. Create a new Lambda function in the AWS Lambda console.
#   2. Select "Python 3.8" as the runtime.
#   3. Copy the code below and paste it into the "Function code" editor.
#   4. Set the "Handler" to "app.lambda_handler".
#   5. Set the "Role" to an existing Lambda execution role or create a new one.
#   6. Save the function.
#   7. Test the function by clicking the "Test" button at the top right.
#   8. Once the function is up and running, you can invoke it via the AWS Lambda console or through an API gateway endpoint.
#   9. If you want to use this function in a different AWS account, you will need to publish it first.
#   10. Finally, you can use the "Edit" button to make changes to the function code.
```

C] Now we will create Target Group which contain our Instances in a pool

Step-1] Go To Target Group

Step-2] Click on create target group

Step-3] Choose Instance as target type

Step-4] Name the Target Group



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The screenshot shows the 'Create target group' wizard on the AWS Management Console. The current step is 'Specify group details'. In the 'Basic configuration' section, the 'Instances' option is selected. It describes how this type supports load balancing to instances within a specific VPC and facilitates the use of Amazon EC2 Auto Scaling. Other options like 'IP addresses', 'Lambda function', and 'Application Load Balancer' are also listed but not selected. A target group name 'TG-CCSA-TY-1121' is entered in the text input field.

Step-5]Keep this settings as it is

Step-6]Click on Next

The screenshot shows the 'Step 1 Create target group' wizard. The current step is 'Protocol & Port'. The 'HTTP' protocol and port '80' are selected. Below this, the 'IP address type' is set to 'IPv4', which is described as the primary private IPv4 address assigned to the instance. The 'VPC' section shows a single available VPC entry: 'vpc-08ff06795a9ec200'. Under 'Protocol version', 'HTTP1' is selected. At the bottom, the 'Health checks' section is visible.



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Step-7]Select All Available 4 Instances

Step-8]Click on Include as Pending Below

The screenshot shows the AWS EC2 Target Groups interface. The user is in Step 2, 'Specify group details'. Under 'Register targets', there is a table titled 'Available instances (4)' listing four instances: LB-1, LB-2, LB-3, and LB-4. All instances are marked as 'Running' and belong to the 'launch-wizard-1' security group. The 'Ports for the selected instances' field contains '80'. A button labeled 'Include as pending below' is visible. At the bottom, a summary shows 'Targets (4)' and a 'Remove all pending' button.

Instance ID	Name	State	Security groups	Zone	Private IPv4 address
i-02ae85fbbe5f53601	LB-1	Running	launch-wizard-1	ap-south-1b	172.31.15.97
i-074bf422f0db5c230	LB-2	Running	launch-wizard-1	ap-south-1b	172.31.14.180
i-06a950300a57fb818	LB-3	Running	launch-wizard-1	ap-south-1b	172.31.4.117
i-0837a9b9834156bbd	LB-4	Running	launch-wizard-1	ap-south-1b	172.31.7.56



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Check that all is Included

Step-9]Click on Create target group

The screenshot shows the AWS EC2 Instances page. It lists four instances:

Instance ID	Name	Port	State	Security groups	Zone	Private IPv4 address	Subnet ID	Launch time
i-02ae85bbe5f53601	LB-1	80	Running	launch-wizard-1	ap-south-1b	172.31.15.97	subnet-0ef756fee7b640093	October 2, 2024, 14:27 (UTC+05:30)
i-074bf422f0db5230	LB-2	80	Running	launch-wizard-1	ap-south-1b	172.31.14.180	subnet-0ef756fee7b640093	October 2, 2024, 14:27 (UTC+05:30)
i-06950300a57fb818	LB-3	80	Running	launch-wizard-1	ap-south-1b	172.31.4.117	subnet-0ef756fee7b640093	October 2, 2024, 14:27 (UTC+05:30)
i-0837a9b9834156bbd	LB-4	80	Running	launch-wizard-1	ap-south-1b	172.31.7.56	subnet-0ef756fee7b640093	October 2, 2024, 14:27 (UTC+05:30)

Below the instances, there is a "Create target group" button.

The screenshot shows the AWS Target group details page for TG-CCSA-TY-1121. It displays the following information:

- Details:** Protocol: Port HTTP: 80, Protocol version: HTTP1, VPC: vpc-08ffe06795a9ec200.
- Targets:** Total targets: 4, Healthy: 0, Unhealthy: 0, Unused: 4, Initial: 0, Draining: 0.
- Distribution of targets by Availability Zone (AZ):** Select values in this table to see corresponding filters applied to the Registered targets table below.
- Registered targets (4):** Info, Anomaly mitigation: Not applicable, Deregister, Register targets.



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D] Now we will create Application Load Balancer to check that the load is distributed evenly across the 4 web Instances

Step-1] Go to load balancer

Step-2] Click on Create load balancer

Step-3] Select Application Load Balancer

Step-4] Click on Create

Step-5] Name the Load Balancer

The screenshot shows the AWS CloudFormation Create Stack Wizard. The current step is 'Set Stack Name'. The 'Stack name' input field contains 'ALB-CCSA-TY-1121'. Below the input field, there is a note: 'Name must be unique within your AWS account and can't be changed after the stack is created.' The note is preceded by a small orange warning icon.



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Step-6] In Network mapping Select All 3 Availability Zones

The screenshot shows the 'Network mapping' step of the 'Create application load balancer' wizard in the AWS VPC console. The 'Mappings' section is displayed, where three Availability Zones (ap-south-1a, ap-south-1b, and ap-south-1c) are selected. Each selected zone has its corresponding subnet listed under 'Subnet'. The subnets are: subnet-04f6cbld47e5d247c (IPv4 CIDR: 172.31.16.0/20), subnet-0ef756fee7b640093 (IPv4 CIDR: 172.31.0.0/20), and subnet-0d3363b8c985f4b00 (IPv4 CIDR: 172.31.32.0/20). The 'my-subnet-2' label is visible next to the first subnet entry.



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Step-7] In Security groups Select the Security Group created

Step-8] In Listeners and routing Select the created Target group

The screenshot shows the AWS VPC console interface. The user is in the 'Listeners and routing' section of a load balancer configuration. Under the 'Listeners' tab, there is one listener named 'HTTP-80' configured to forward traffic from port 80 to a target group named 'TG-CCSA-TY-1121'. The target group is defined as 'Target type: Instance, IPv4'. There are also options for 'Create target group' and 'Forward to' other targets. The 'Security groups' section shows a selected security group named 'launch-wizard-1'. The bottom of the screen displays standard AWS navigation links like CloudShell, Feedback, and a footer with copyright information.



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Review the settings

Step-9]Click on Create load balancer

The screenshot shows the 'Create application load balancer' wizard in the AWS CloudFormation console. The 'Summary' step is displayed, showing the configuration details for the load balancer:

- Basic configuration:** ALB-CCSA-TY-1121, Internet-facing, IPv4.
- Security groups:** launch-wizard-1 (sg-0a4101ba8c84ca1d0).
- Network mapping:** VPC vpc-08ffe06795a9ec200, Subnets: ap-south-1a (subnet-04f6cb8d47e5d247c), ap-south-1b (subnet-03363b8c985f4b00), ap-south-1c (subnet-03363b8c985f4b00), ap-south-1d (subnet-04f6cb8d47e5d247c).
- Listeners and routing:** HTTP:80 (default rule TG-CCSA-TY-1121).
- Service integrations:** AWS WAF: None, AWS Global Accelerator: None.
- Tags:** None.
- Attributes:** Certain default attributes will be applied to your load balancer.

The creation workflow and status section indicates that server-side tasks are completed. A yellow 'Create load balancer' button is at the bottom right.

The screenshot shows the AWS CloudShell interface with the 'Load balancers' tab selected. It displays the newly created load balancer 'ALB-CCSA-TY-1121'.

Name	DNS name	Status	VPC ID	Availability Zones	Type	Date created
ALB-CCSA-TY-1121	ALB-CCSA-TY-1121-17645...	Active	vpc-08ffe06795a9ec200	3 Availability Zones	application	October 2, 2024, 14:44 (UTC+05:30)

The detailed view for 'Load balancer: ALB-CCSA-TY-1121' shows the following configuration:

Details	Value
Load balancer type	Application
Status	Active
VPC	vpc-08ffe06795a9ec200
Hosted zone	ZP97RAFLTNZK
Availability Zones	subnet-0f756fe7b640093, subnet-0d3363b8c985f4b00, subnet-04f6cb8d47e5d247c
Load balancer ARN	arn:aws:elasticloadbalancing:ap-south-1:89137727585:loadbalancer/app/ALB-CCSA-TY-1121/adafebaf0f261e59
DNS name info	ALB-CCSA-TY-1121-17645182.ap-south-1.elb.amazonaws.com (A Record)

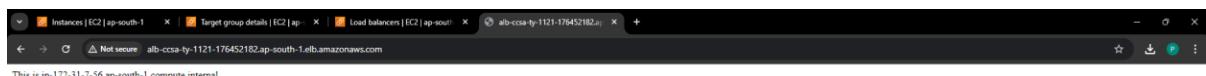
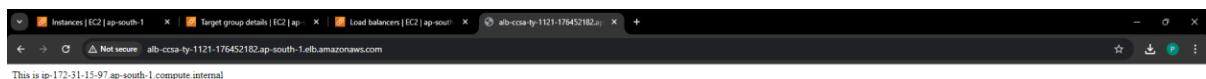


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E] Copy the DNS Server link from load balancer details and paste it in the new tab ,Refresh it again and again to check whether the Ip is changing .





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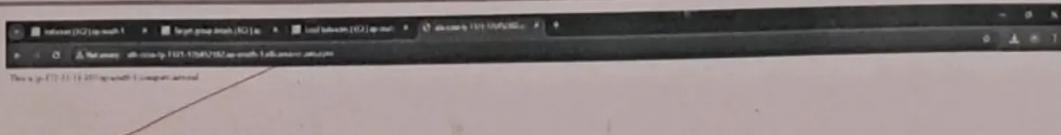
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