High Performance Computing

Name: Thulasi Shylasri

HTNO: 2303A51876

Batch-14

Week-1

LAB Assignment-1 (07/01/2026)

Task 1: The HPC Environment (AWS EC2 Setup)

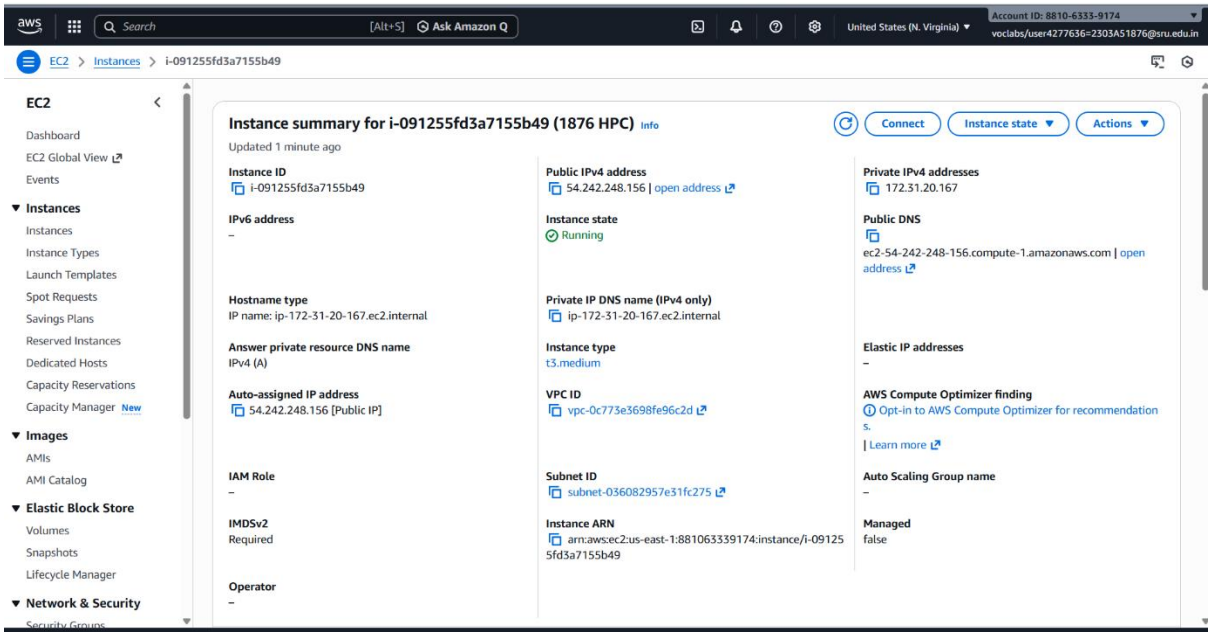
Objective: Launch a Compute Node and access the Linux Terminal.

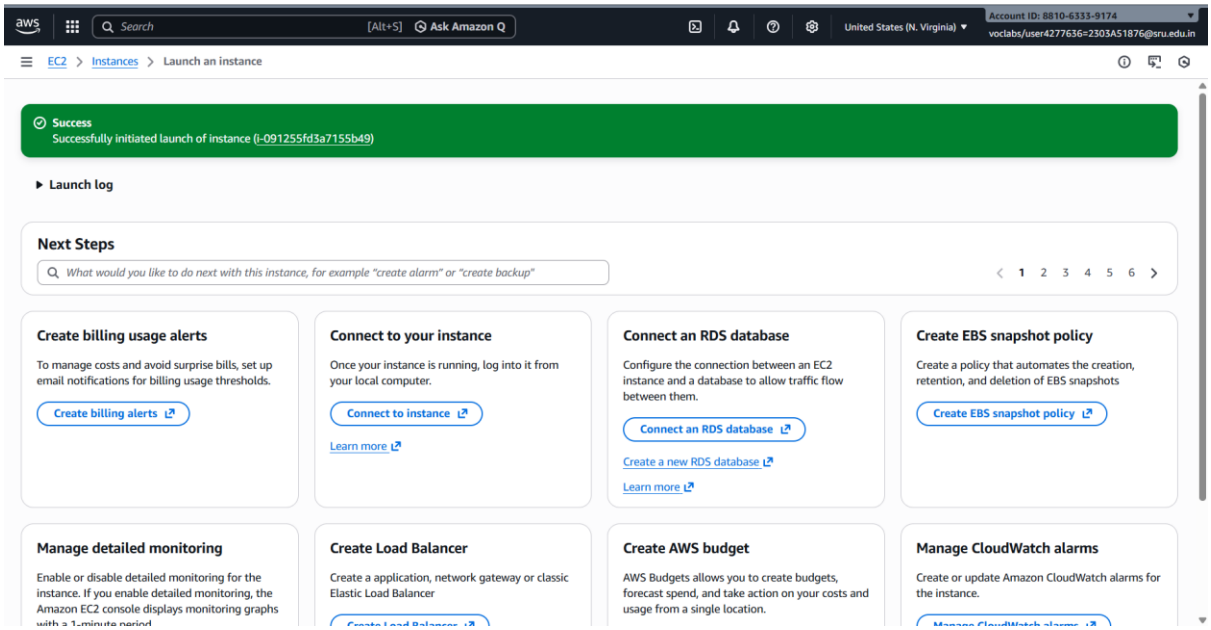
1. Log in to AWS Academy Learner Lab.

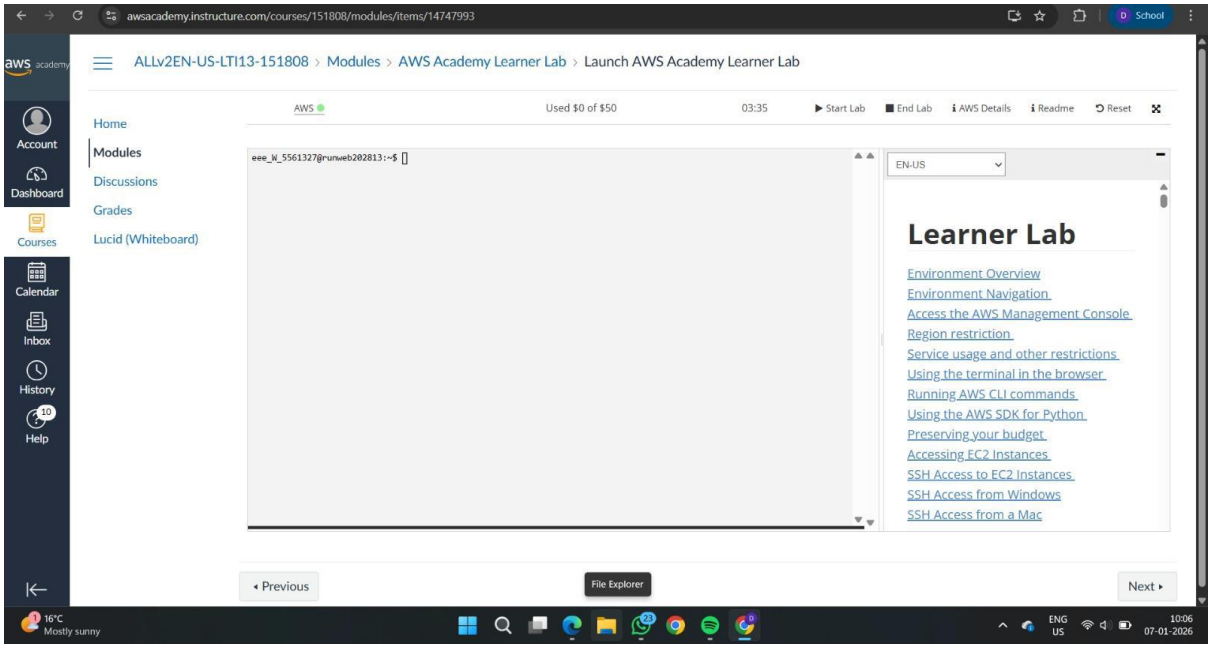
2. Launch an EC2 Instance (OS: Amazon Linux 2, Type: t3.medium or t3.large).

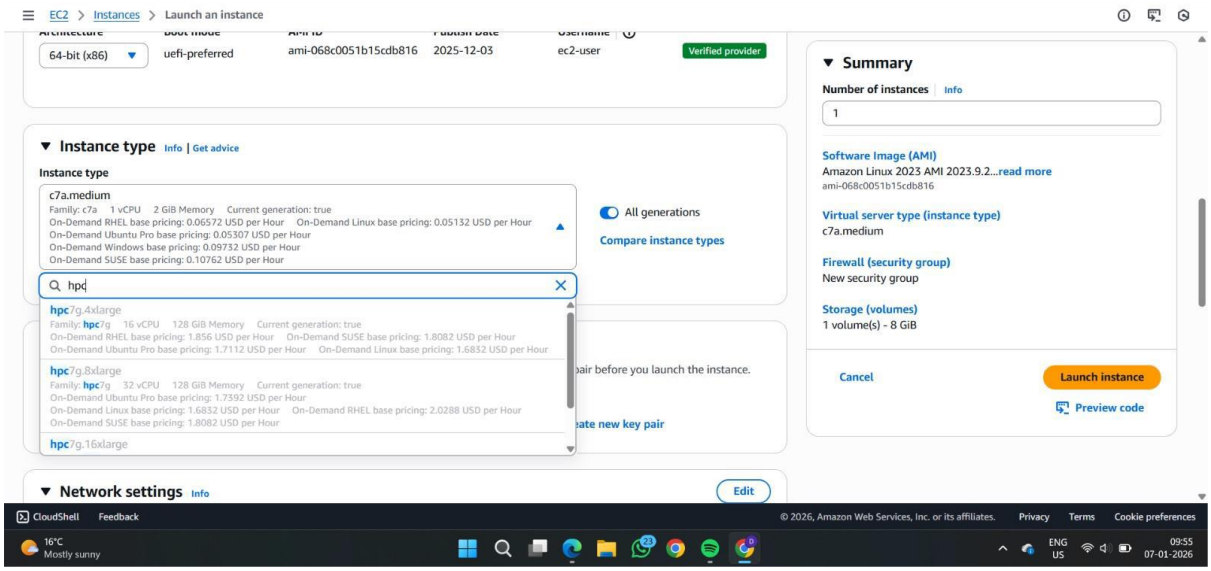
3. Connect via SSH (or CloudShell).

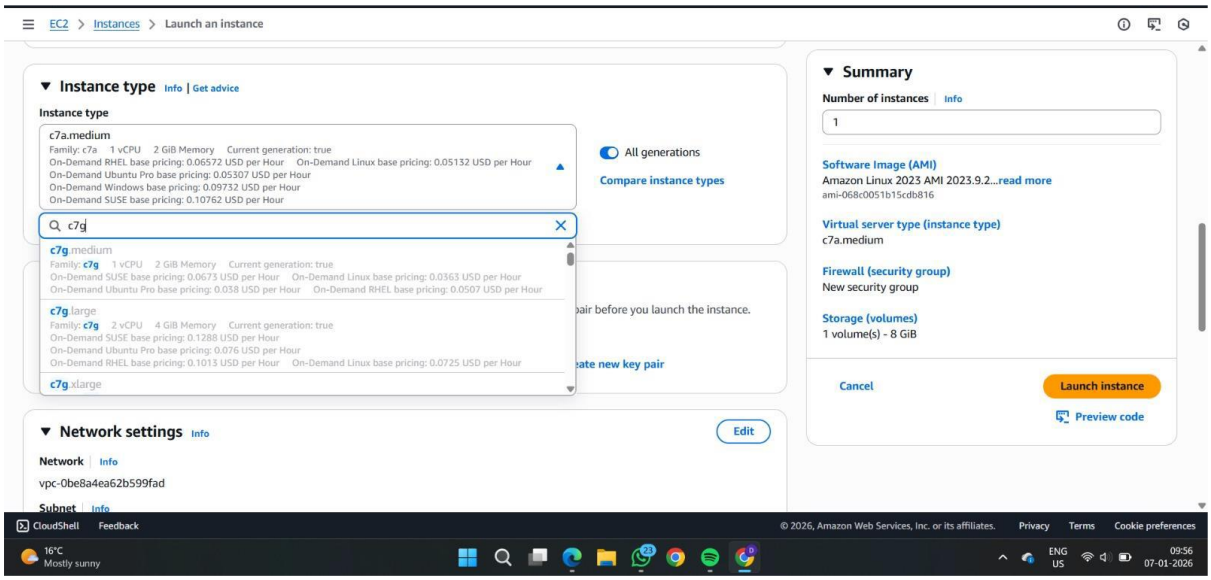
Submission: Screenshot of terminal showing whoami and hostname.

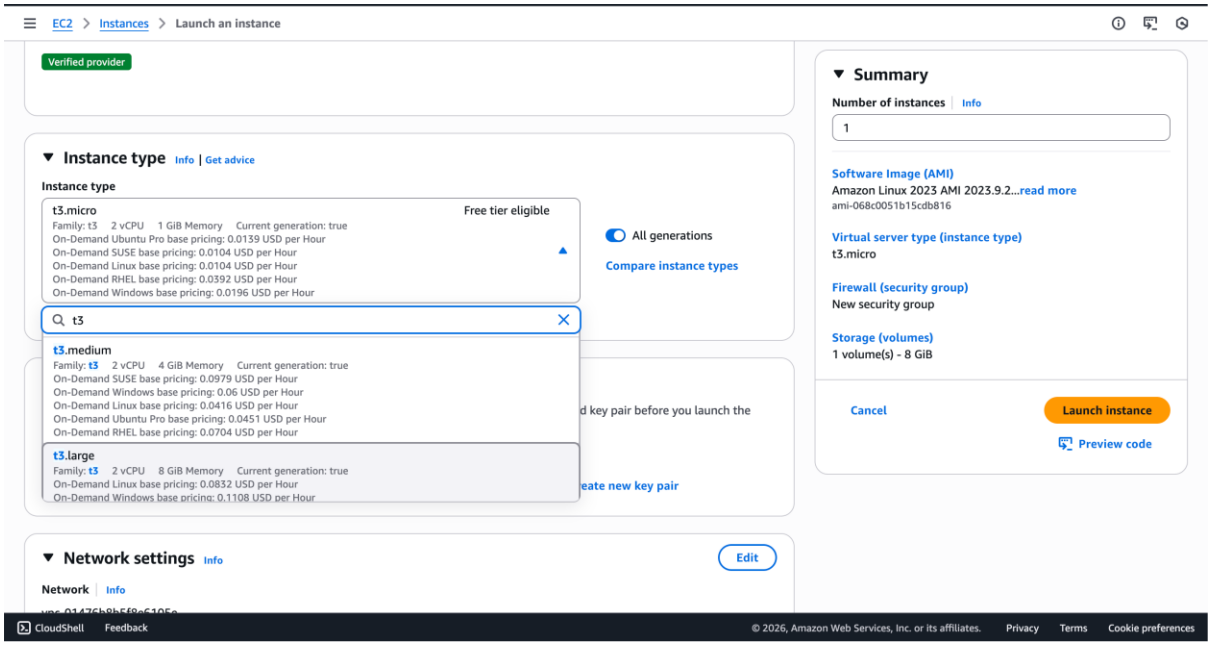


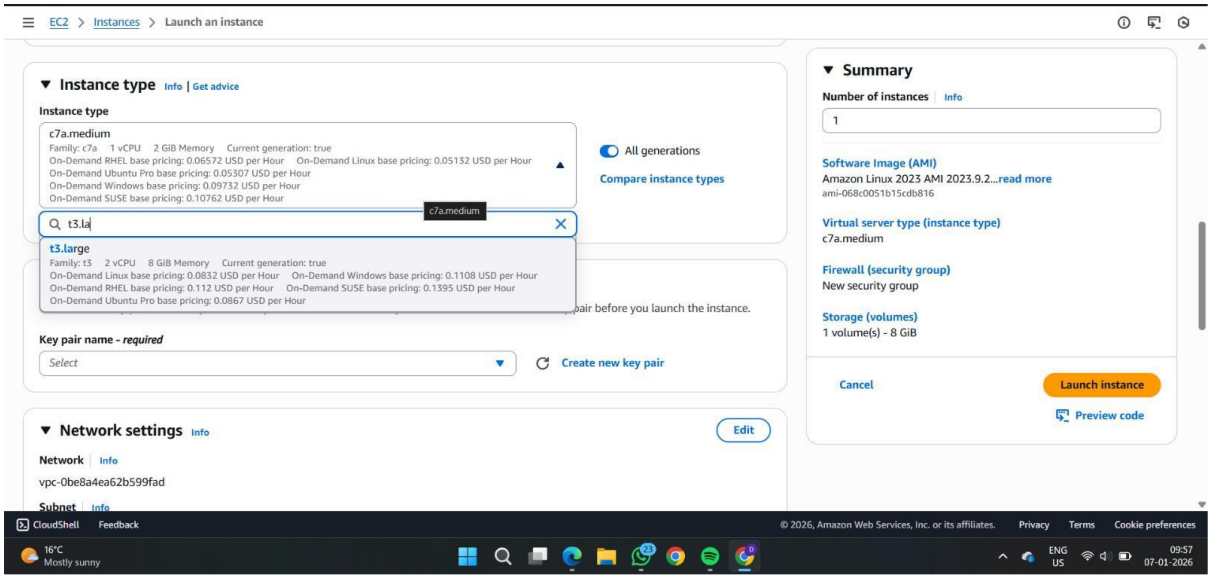

Search
[Alt+S]
Ask Amazon Q
United States (N. Virginia)
Account ID: 8810-6333-9174
voclabs/user4277636=2303A51876@sru.edu.in
EC2 > Instances > Launch an instance
Success
Successfully initiated launch of instance (i-091255fd3a7155b49)
Launch log
Next Steps
What would you like to do next with this instance, for example "create alarm" or "create backup"
1 2 3 4 5 6
Create billing usage alerts
To manage costs and avoid surprise bills, set up email notifications for billing usage thresholds.
Create billing alerts
Connect to your instance
Once your instance is running, log into it from your local computer.
Connect to instance
Learn more
Connect an RDS database
Configure the connection between an EC2 instance and a database to allow traffic flow between them.
Connect an RDS database
Create a new RDS database
Learn more
Create EBS snapshot policy
Create a policy that automates the creation, retention, and deletion of EBS snapshots
Create EBS snapshot policy
Manage detailed monitoring
Enable or disable detailed monitoring for the instance. If you enable detailed monitoring, the Amazon EC2 console displays monitoring graphs
Create Load Balancer
Create a application, network gateway or classic Elastic Load Balancer
Create AWS budget
AWS Budgets allows you to create budgets, forecast spend, and take action on your costs and usage from a single location.
Manage CloudWatch alarms
Create or update Amazon CloudWatch alarms for the instance.

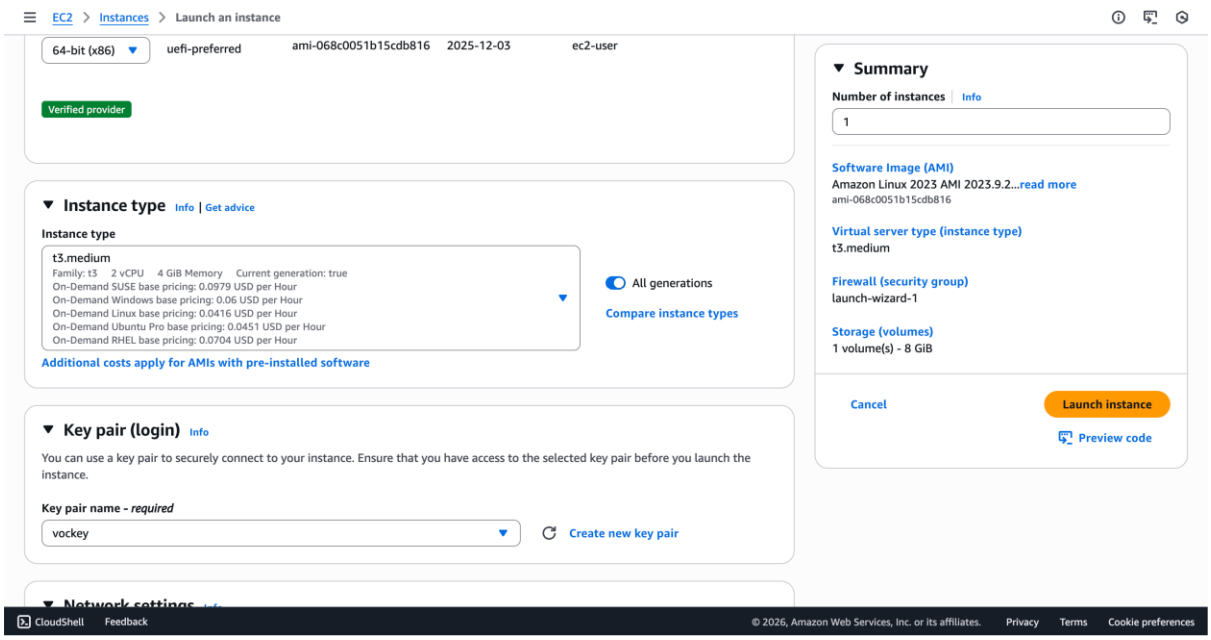

awsacademy.instructure.com/courses/151808/modules/items/14747993
School
ALLv2EN-US-LTI13-151808 > Modules > AWS Academy Learner Lab > Launch AWS Academy Learner Lab
Account
Dashboard
Courses
Calendar
Inbox
History
Help
Home
Modules
Discussions
Grades
Lucid (Whiteboard)
AWS
Used $0 of $50
03:35
Start Lab
End Lab
AWS Details
Readme
Reset
eee_W_5561327@runweb202813:~$
EN-US
Learner Lab
Environment Overview
Environment Navigation
Access the AWS Management Console
Region restriction
Service usage and other restrictions
Using the terminal in the browser
Running AWS CLI commands
Using the AWS SDK for Python
Preserving your budget
Accessing EC2 Instances
SSH Access to EC2 Instances
SSH Access from Windows
SSH Access from a Mac
Previous
File Explorer
Next
16°C
Mostly sunny
ENG
US
10:06
07-01-2026

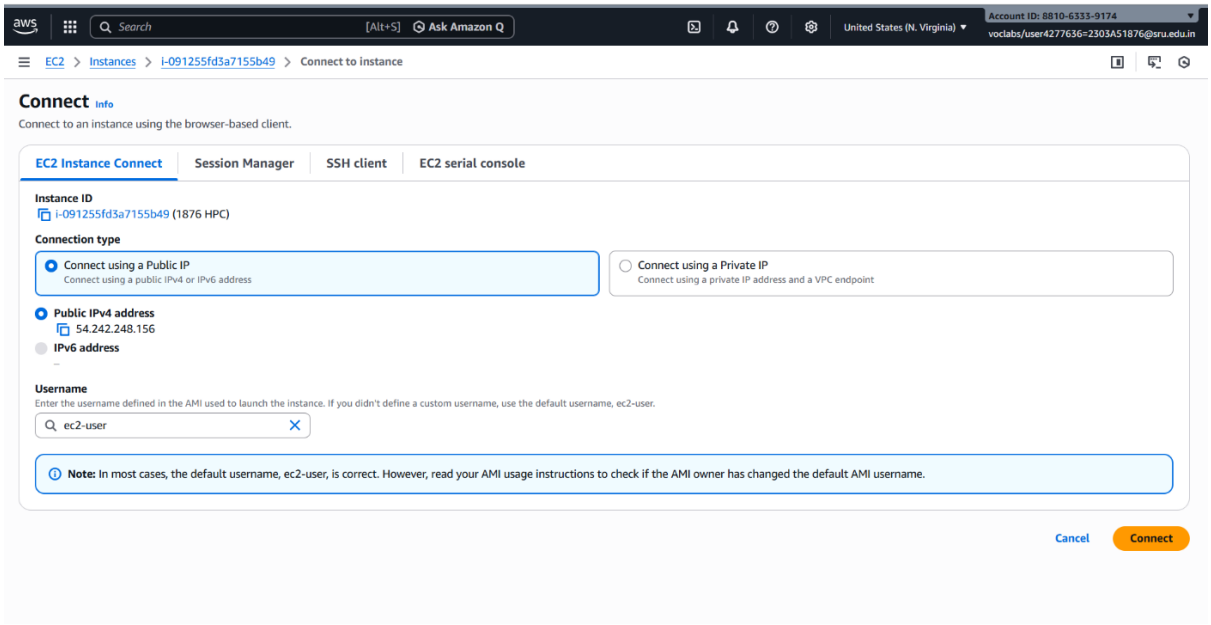

EC2 > Instances > Launch an instance
64-bit (x86)
uefi-preferred
ami-068c0051b15cdb816
2025-12-03
ec2-user
Verified provider
Instance type Info | Get advice
Instance type
c7a.medium
Family: c7a 1 vCPU 2 GiB Memory Current generation: true
On-Demand RHEL base pricing: 0.06572 USD per Hour On-Demand Linux base pricing: 0.05132 USD per Hour
On-Demand Ubuntu Pro base pricing: 0.05307 USD per Hour
On-Demand Windows base pricing: 0.09732 USD per Hour
On-Demand SUSE base pricing: 0.10762 USD per Hour
All generations
Compare instance types
hpc
hpc7g.4xlarge
Family: hpc7g 16 vCPU 128 GiB Memory Current generation: true
On-Demand RHEL base pricing: 1.856 USD per Hour On-Demand SUSE base pricing: 1.8082 USD per Hour
On-Demand Ubuntu Pro base pricing: 1.7112 USD per Hour On-Demand Linux base pricing: 1.6832 USD per Hour
hpc7g.8xlarge
Family: hpc7g 32 vCPU 128 GiB Memory Current generation: true
On-Demand Ubuntu Pro base pricing: 1.7392 USD per Hour
On-Demand Linux base pricing: 1.6832 USD per Hour On-Demand RHEL base pricing: 2.0288 USD per Hour
On-Demand SUSE base pricing: 1.8082 USD per Hour
hpc7g.16xlarge
air before you launch the instance.
ate new key pair
Network settings Info
Edit
Summary
Number of instances Info
1
Software Image (AMI)
Amazon Linux 2023 AMI 2023.9.2...read more
ami-068c0051b15cdb816
Virtual server type (instance type)
c7a.medium
Firewall (security group)
New security group
Storage (volumes)
1 volume(s) - 8 GiB
Cancel
Launch instance
Preview code
CloudShell Feedback
© 2026, Amazon Web Services, Inc. or its affiliates.
Privacy Terms Cookie preferences
16°C
Mostly sunny
ENG
US
09:55
07-01-2026

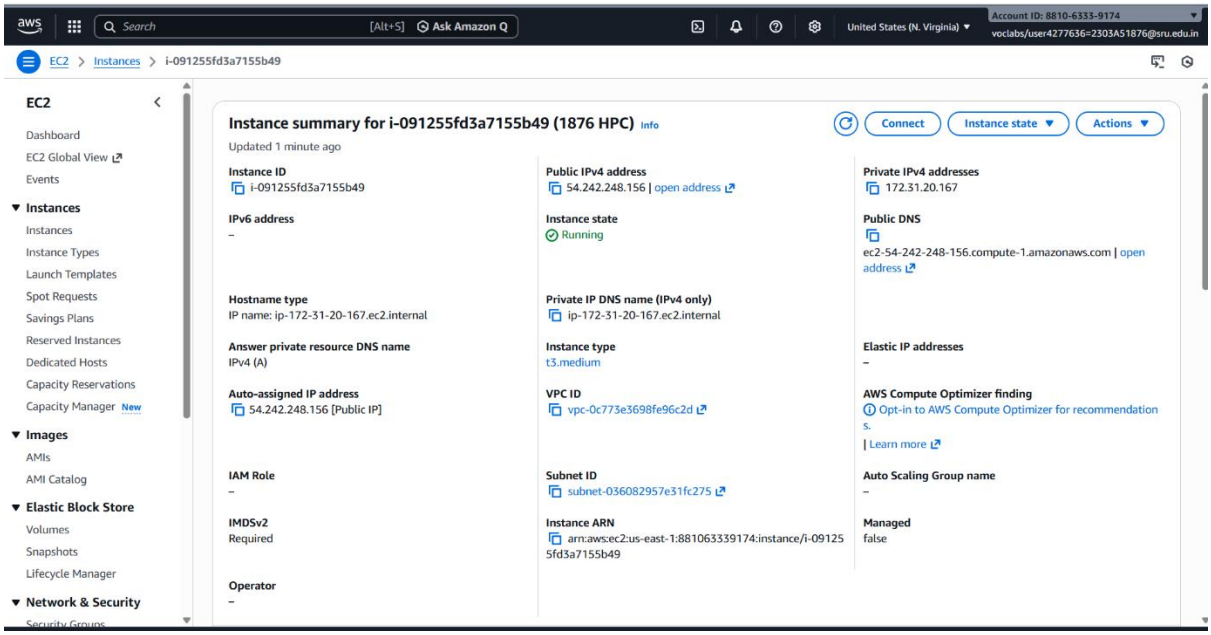

EC2 > Instances > Launch an instance
Instance type Info | Get advice
Instance type
c7a.medium
Family: c7a 1 vCPU 2 GiB Memory Current generation: true
On-Demand RHEL base pricing: 0.06572 USD per Hour On-Demand Linux base pricing: 0.05132 USD per Hour
On-Demand Ubuntu Pro base pricing: 0.05307 USD per Hour
On-Demand Windows base pricing: 0.09732 USD per Hour
On-Demand SUSE base pricing: 0.10762 USD per Hour
All generations
Compare instance types
c7g
c7g.medium
Family: c7g 1 vCPU 2 GiB Memory Current generation: true
On-Demand SUSE base pricing: 0.0673 USD per Hour On-Demand Linux base pricing: 0.0363 USD per Hour
On-Demand Ubuntu Pro base pricing: 0.038 USD per Hour On-Demand RHEL base pricing: 0.0507 USD per Hour
c7g.large
Family: c7g 2 vCPU 4 GiB Memory Current generation: true
On-Demand SUSE base pricing: 0.1288 USD per Hour
On-Demand Ubuntu Pro base pricing: 0.076 USD per Hour
On-Demand RHEL base pricing: 0.1013 USD per Hour On-Demand Linux base pricing: 0.0725 USD per Hour
c7g.xlarge
air before you launch the instance.
ate new key pair
Network settings Info
Edit
Network Info
vpc-0be8a4ea62b599fad
Subnet Info
Summary
Number of instances Info
1
Software Image (AMI)
Amazon Linux 2023 AMI 2023.9.2...read more
ami-068c0051b15cdb816
Virtual server type (instance type)
c7a.medium
Firewall (security group)
New security group
Storage (volumes)
1 volume(s) - 8 GiB
Cancel
Launch instance
Preview code
CloudShell Feedback
© 2026, Amazon Web Services, Inc. or its affiliates.
Privacy Terms Cookie preferences
16°C
Mostly sunny
ENG
US
09:56
07-01-2026

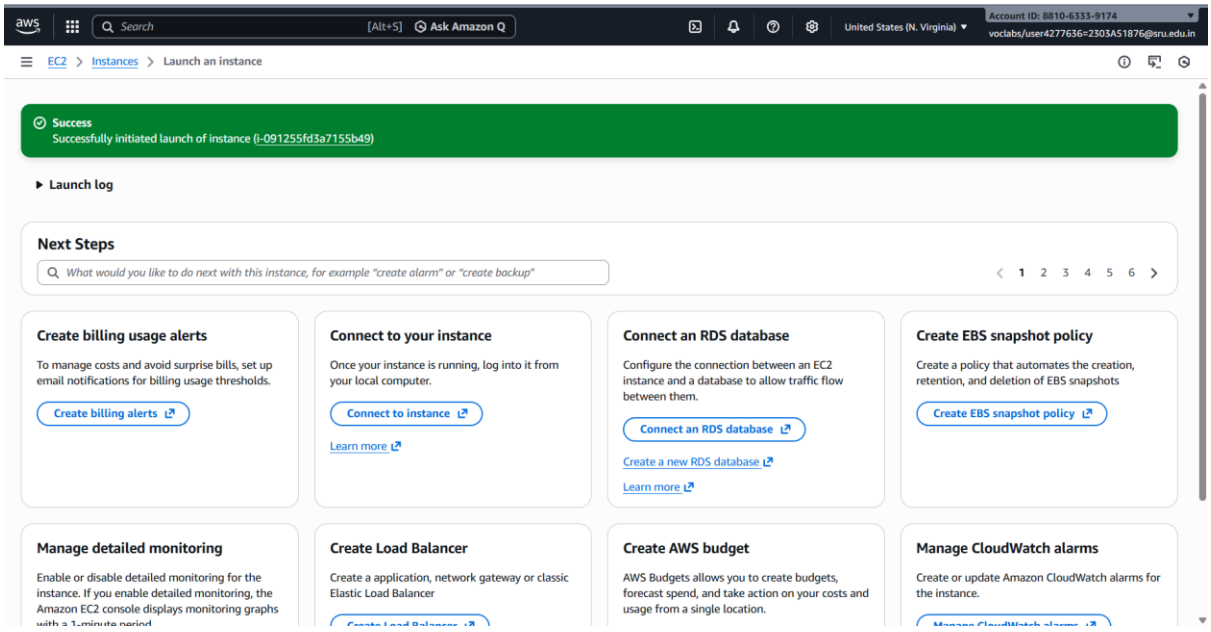

EC2 > Instances > Launch an instance
Verified provider
Instance type Info | Get advice
Instance type
t3.micro
Free tier eligible
Family: t3 2 vCPU 1 GiB Memory Current generation: true
On-Demand Ubuntu Pro base pricing: 0.0139 USD per Hour
On-Demand SUSE base pricing: 0.0104 USD per Hour
On-Demand Linux base pricing: 0.0104 USD per Hour
On-Demand RHEL base pricing: 0.0392 USD per Hour
On-Demand Windows base pricing: 0.0196 USD per Hour
All generations
Compare instance types
t3
t3.medium
Family: t3 2 vCPU 4 GiB Memory Current generation: true
On-Demand SUSE base pricing: 0.0979 USD per Hour
On-Demand Windows base pricing: 0.06 USD per Hour
On-Demand Linux base pricing: 0.0416 USD per Hour
On-Demand Ubuntu Pro base pricing: 0.0451 USD per Hour
On-Demand RHEL base pricing: 0.0704 USD per Hour
t3.large
Family: t3 2 vCPU 8 GiB Memory Current generation: true
On-Demand Linux base pricing: 0.0832 USD per Hour
On-Demand Windows base pricing: 0.1108 USD per Hour
d key pair before you launch the
eate new key pair
Network settings Info
Edit
Network Info
Summary
Number of instances Info
1
Software Image (AMI)
Amazon Linux 2023 AMI 2023.9.2...read more
ami-068c0051b15cdb816
Virtual server type (instance type)
t3.micro
Firewall (security group)
New security group
Storage (volumes)
1 volume(s) - 8 GiB
Cancel
Launch instance
Preview code
CloudShell Feedback
© 2026, Amazon Web Services, Inc. or its affiliates.
Privacy Terms Cookie preferences

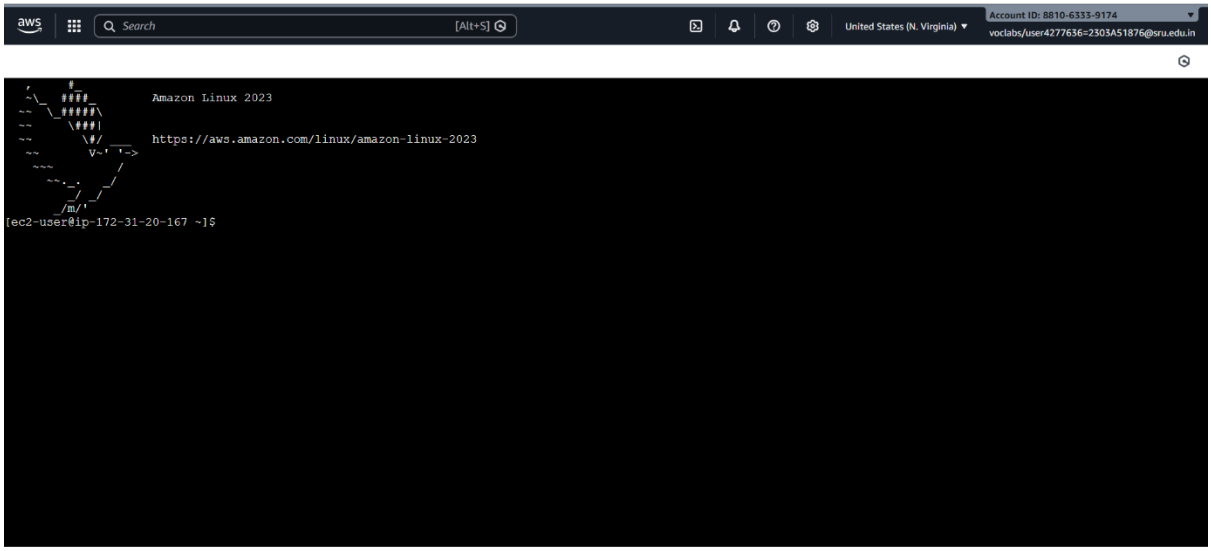

EC2 > Instances > Launch an instance
Instance type Info | Get advice
Instance type
c7a.medium
Family: c7a 1 vCPU 2 GiB Memory Current generation: true
On-Demand RHEL base pricing: 0.06572 USD per Hour
On-Demand Linux base pricing: 0.05132 USD per Hour
On-Demand Ubuntu Pro base pricing: 0.05307 USD per Hour
On-Demand Windows base pricing: 0.09732 USD per Hour
On-Demand SUSE base pricing: 0.10762 USD per Hour
All generations
Compare instance types
c7a.medium
t3.la
t3.large
Family: t3 2 vCPU 8 GiB Memory Current generation: true
On-Demand Linux base pricing: 0.0832 USD per Hour
On-Demand Windows base pricing: 0.1108 USD per Hour
On-Demand RHEL base pricing: 0.112 USD per Hour
On-Demand SUSE base pricing: 0.1395 USD per Hour
On-Demand Ubuntu Pro base pricing: 0.0867 USD per Hour
pair before you launch the instance.
Key pair name - required
Select
Create new key pair
Network settings Info
Edit
Network Info
vpc-0be8a4ea62b599fad
Subnet Info
Summary
Number of instances Info
1
Software Image (AMI)
Amazon Linux 2023 AMI 2023.9.2...read more
ami-068c0051b15cdb816
Virtual server type (instance type)
c7a.medium
Firewall (security group)
New security group
Storage (volumes)
1 volume(s) - 8 GiB
Cancel
Launch instance
Preview code
CloudShell Feedback
© 2026, Amazon Web Services, Inc. or its affiliates.
Privacy Terms Cookie preferences
16°C
Mostly sunny
ENG
US
09:57
07-01-2026


EC2 > Instances > Launch an instance
64-bit (x86)
uefi-preferred
ami-068c0051b15cdb816
2025-12-03
ec2-user
Verified provider
Instance type Info | Get advice
Instance type
t3.medium
Family: t3 2 vCPU 4 GiB Memory Current generation: true
On-Demand SUSE base pricing: 0.0979 USD per Hour
On-Demand Windows base pricing: 0.06 USD per Hour
On-Demand Linux base pricing: 0.0416 USD per Hour
On-Demand Ubuntu Pro base pricing: 0.0451 USD per Hour
On-Demand RHEL base pricing: 0.0704 USD per Hour
All generations
Compare instance types
Additional costs apply for AMIs with pre-installed software
Key pair (login) Info
You can use a key pair to securely connect to your instance. Ensure that you have access to the selected key pair before you launch the instance.
Key pair name - required
vockey
Create new key pair
Summary
Number of instances Info
1
Software Image (AMI)
Amazon Linux 2023 AMI 2023.9.2...read more
ami-068c0051b15cdb816
Virtual server type (instance type)
t3.medium
Firewall (security group)
launch-wizard-1
Storage (volumes)
1 volume(s) - 8 GiB
Cancel
Launch instance
Preview code
CloudShell
Feedback
© 2026, Amazon Web Services, Inc. or its affiliates.
Privacy
Terms
Cookie preferences


Search
[Alt+S]
Ask Amazon Q
United States (N. Virginia)
Account ID: 8810-6333-9174
voclabs/user4277636=2303A51876@sru.edu.in
EC2 > Instances > i-091255fd3a7155b49 > Connect to instance
Connect Info
Connect to an instance using the browser-based client.
EC2 Instance Connect
Session Manager
SSH client
EC2 serial console
Instance ID
i-091255fd3a7155b49 (1876 HPC)
Connection type
Connect using a Public IP
Connect using a public IPv4 or IPv6 address
Connect using a Private IP
Connect using a private IP address and a VPC endpoint
Public IPv4 address
54.242.248.156
IPv6 address
Username
Enter the username defined in the AMI used to launch the instance. If you didn't define a custom username, use the default username, ec2-user.
ec2-user
Note: In most cases, the default username, ec2-user, is correct. However, read your AMI usage instructions to check if the AMI owner has changed the default AMI username.
Cancel
Connect


Search
[Alt+S]
Ask Amazon Q
United States (N. Virginia)
Account ID: 8810-6333-9174
voclabs/user4277636=2303A51876@sru.edu.in
EC2 > Instances > i-091255fd3a7155b49
EC2
Dashboard
EC2 Global View
Events
Instances
Instances
Instance Types
Launch Templates
Spot Requests
Savings Plans
Reserved Instances
Dedicated Hosts
Capacity Reservations
Capacity Manager New
Images
AMIs
AMI Catalog
Elastic Block Store
Volumes
Snapshots
Lifecycle Manager
Network & Security
Security Groups
Instance summary for i-091255fd3a7155b49 (1876 HPC) Info
Updated 1 minute ago
Connect
Instance state
Actions
Instance ID
i-091255fd3a7155b49
IPv6 address
–
Hostname type
IP name: ip-172-31-20-167.ec2.internal
Answer private resource DNS name
IPv4 (A)
Auto-assigned IP address
54.242.248.156 [Public IP]
IAM Role
–
IMDSv2
Required
Operator
–
Public IPv4 address
54.242.248.156 | open address
Instance state
Running
Private IP DNS name (IPv4 only)
ip-172-31-20-167.ec2.internal
Instance type
t3.medium
VPC ID
vpc-0c773e3698fe96c2d
Subnet ID
subnet-036082957e31fc275
Instance ARN
arn:aws:ec2:us-east-1:881063339174:instance/i-091255fd3a7155b49
Private IPv4 addresses
172.31.20.167
Public DNS
ec2-54-242-248-156.compute-1.amazonaws.com | open address
Elastic IP addresses
–
AWS Compute Optimizer finding
Opt-in to AWS Compute Optimizer for recommendations.
| Learn more
Auto Scaling Group name
–
Managed
false


Search
[Alt+S]
Ask Amazon Q
United States (N. Virginia)
Account ID: 8810-6333-9174
voclabs/user4277636=2303A51876@sru.edu.in
EC2 > Instances > Launch an instance
Success
Successfully initiated launch of instance (i-091255fd3a7155b49)
Launch log
Next Steps
What would you like to do next with this instance, for example "create alarm" or "create backup"
1 2 3 4 5 6
Create billing usage alerts
To manage costs and avoid surprise bills, set up email notifications for billing usage thresholds.
Create billing alerts
Connect to your instance
Once your instance is running, log into it from your local computer.
Connect to instance
Learn more
Connect an RDS database
Configure the connection between an EC2 instance and a database to allow traffic flow between them.
Connect an RDS database
Create a new RDS database
Learn more
Create EBS snapshot policy
Create a policy that automates the creation, retention, and deletion of EBS snapshots
Create EBS snapshot policy
Manage detailed monitoring
Enable or disable detailed monitoring for the instance. If you enable detailed monitoring, the Amazon EC2 console displays monitoring graphs
Create Load Balancer
Create a application, network gateway or classic Elastic Load Balancer
Create AWS budget
AWS Budgets allows you to create budgets, forecast spend, and take action on your costs and usage from a single location.
Manage CloudWatch alarms
Create or update Amazon CloudWatch alarms for the instance.


aws
Search
[Alt+S]
United States (N. Virginia)
Account ID: 8810-6333-9174
voclabs/user4277636=2303A51876@sru.edu.in
Amazon Linux 2023
https://aws.amazon.com/linux/amazon-linux-2023
[ec2-user@ip-172-31-20-167 ~]$
i-091255fd3a7155b49 (1876 HPC)
PublicIPs: 54.242.248.156 PrivateIPs: 172.31.20.167


Amazon Linux 2023
https://aws.amazon.com/linux/amazon-linux-2023
[ec2-user@ip-172-31-19-179 ~]$ whoami
ec2-user
[ec2-user@ip-172-31-19-179 ~]$

Task 2: Hardware Reconnaissance

Objective: Analyze the architecture of your Compute Node.

Run these commands and share output screenshots:

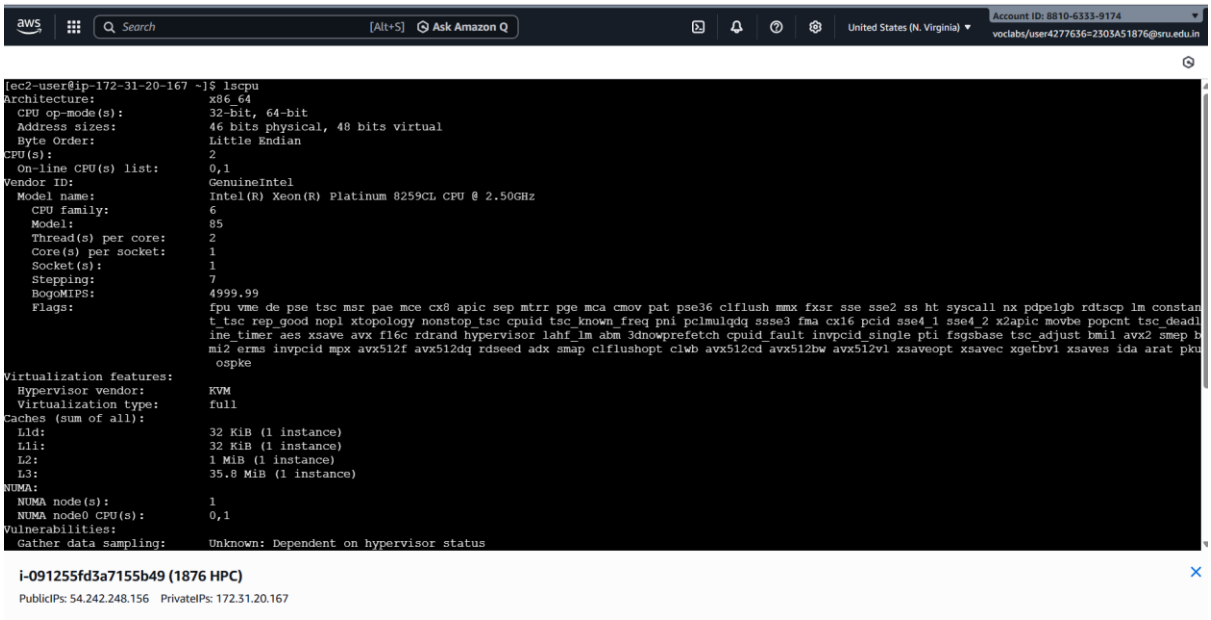
1. lscpu (Check Cores).

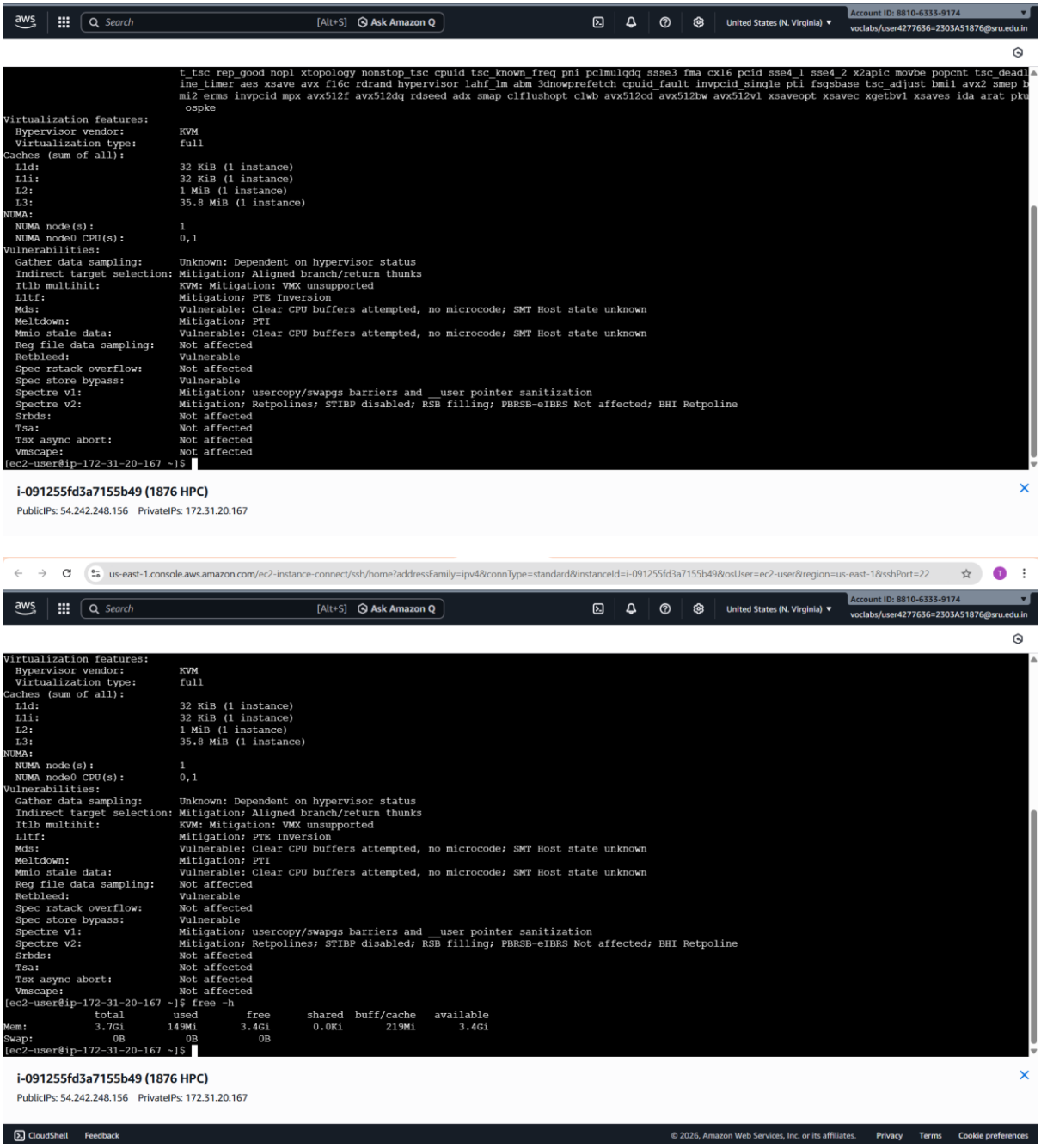
2. free -h (Check RAM).

3. gcc --version (Verify Compiler).

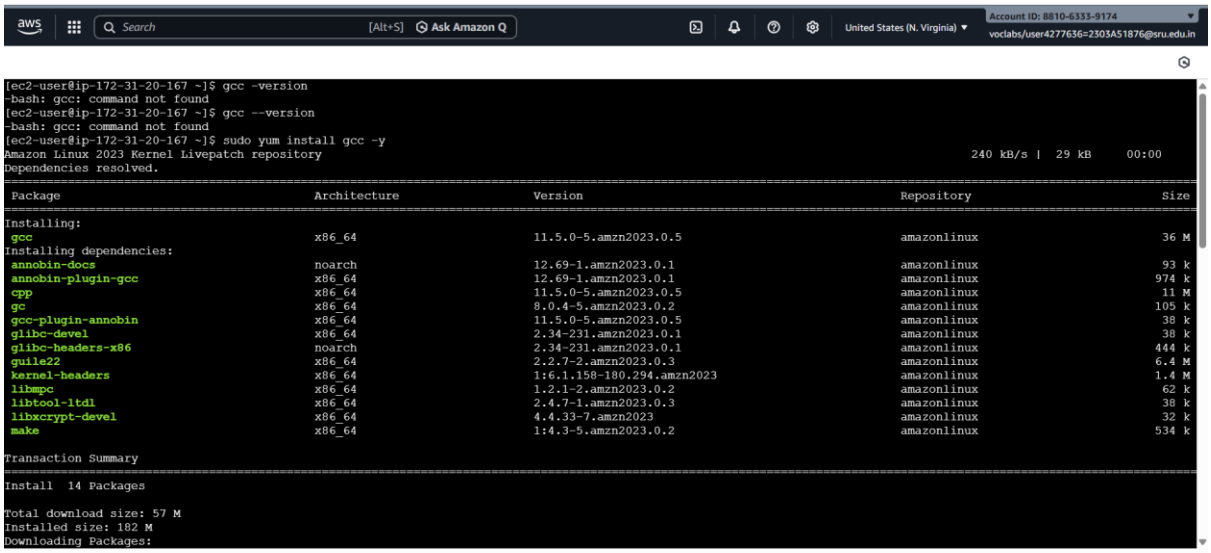
Note: to install gcc use this command:

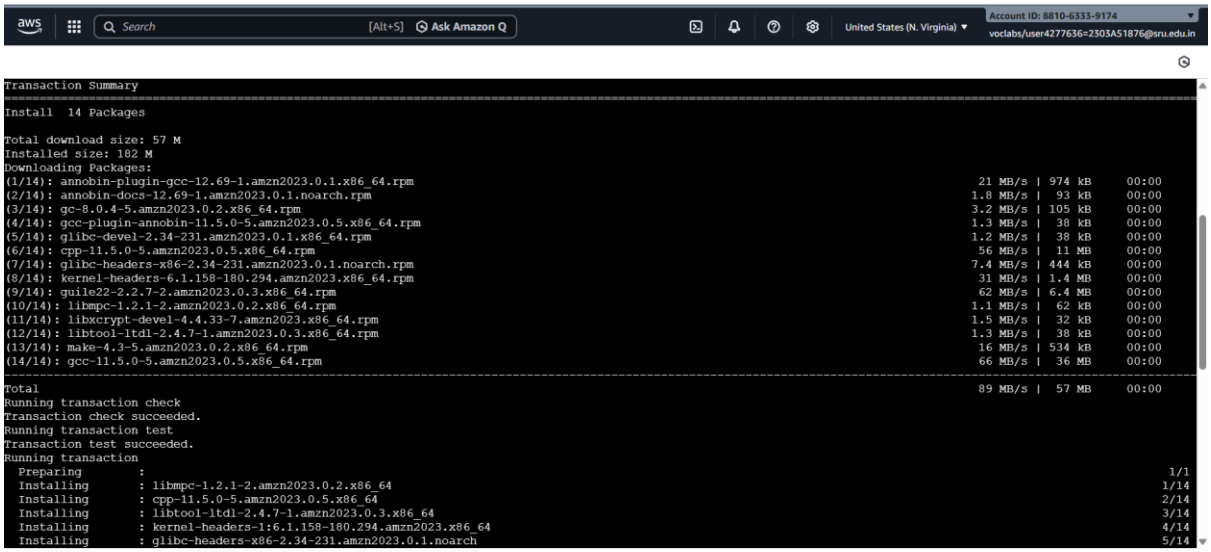
sudo yum install gcc -y

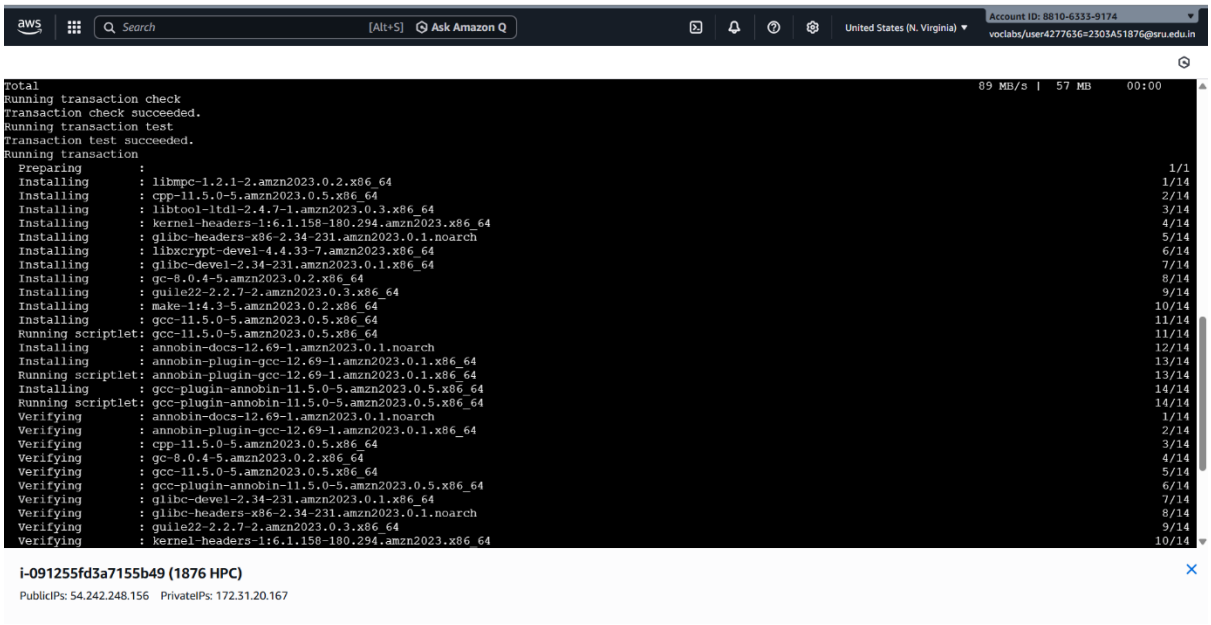


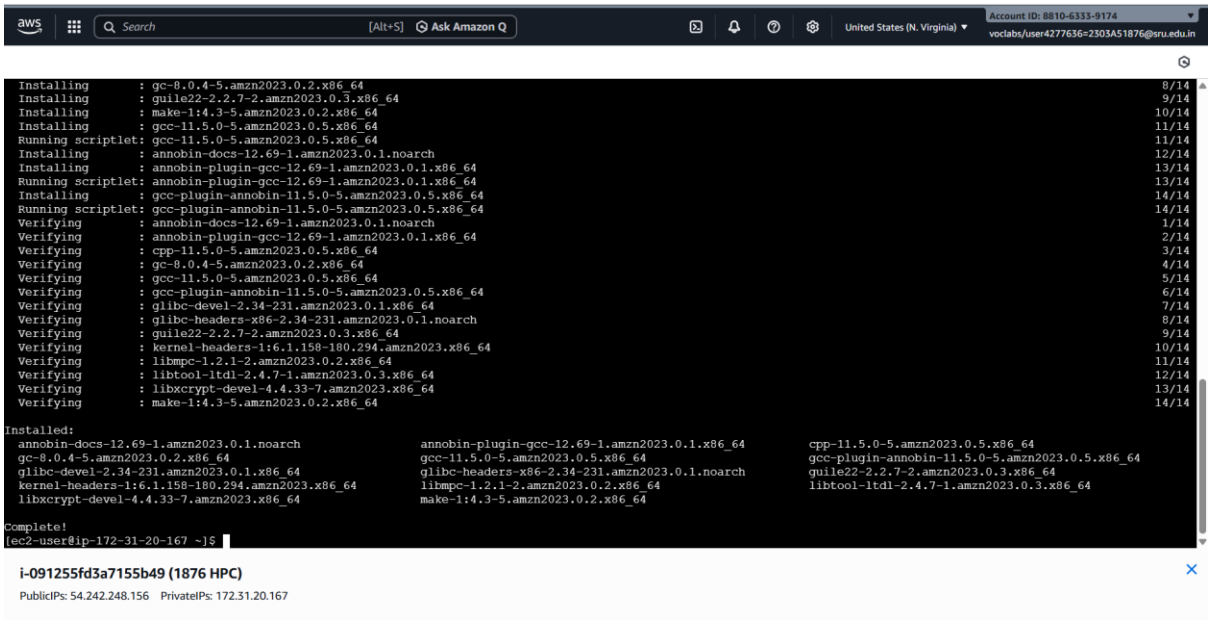

Search
[Alt+S]
Ask Amazon Q
United States (N. Virginia)
Account ID: 8810-6333-9174
voclabs/user4277636=2303A51876@sru.edu.in
t_tsc rep_good nopl xtopology nonstop_tsc cpuid tsc_known_freq pni pclmulqdq ssse3 fma cx16 pcid sse4_1 sse4_2 x2apic movbe popcnt tsc_deadl
ine_timer aes xsave avx f16c rdrand hypervisor lahf_lm abm 3dnowprefetch cpuid_fault invpcid_single pti fsgsbase tsc_adjust bmi1 avx2 smep b
mi2 erms invpcid mpx avx512f avx512dq rdseed adx smap clflushopt clwb avx512cd avx512bw avx512vl xsaveopt xsavec xgetbv1 xsaves ida arat pku
ospke
Virtualization features:
Hypervisor vendor: KVM
Virtualization type: full
Caches (sum of all):
L1d: 32 KiB (1 instance)
L1i: 32 KiB (1 instance)
L2: 1 MiB (1 instance)
L3: 35.8 MiB (1 instance)
NUMA:
NUMA node(s): 1
NUMA node0 CPU(s): 0,1
Vulnerabilities:
Gather data sampling: Unknown: Dependent on hypervisor status
Indirect target selection: Mitigation; Aligned branch/return thunks
Itlb multihit: KVM: Mitigation: VMX unsupported
L1tf: Mitigation; PTE Inversion
Mds: Vulnerable: Clear CPU buffers attempted, no microcode; SMT Host state unknown
Meltdown: Mitigation; PTI
Mmio stale data: Vulnerable: Clear CPU buffers attempted, no microcode; SMT Host state unknown
Reg file data sampling: Not affected
Retbleed: Vulnerable
Spec rstack overflow: Not affected
Spec store bypass: Vulnerable
Spectre v1: Mitigation; usercopy/swapgs barriers and __user pointer sanitization
Spectre v2: Mitigation; Retpolines; STIBP disabled; RSB filling; PBRSB-eIBRS Not affected; BHI Retpoline
Srbds: Not affected
Tsa: Not affected
Tsx async abort: Not affected
Vmscape: Not affected
[ec2-user@ip-172-31-20-167 ~]$
i-091255fd3a7155b49 (1876 HPC)
PublicIPs: 54.242.248.156 PrivateIPs: 172.31.20.167

us-east-1.console.aws.amazon.com/ec2-instance-connect/ssh/home?addressFamily=ipv4&connType=standard&instanceId=i-091255fd3a7155b49&osUser=ec2-user&region=us-east-1&sshPort=22
Search
[Alt+S]
Ask Amazon Q
United States (N. Virginia)
Account ID: 8810-6333-9174
voclabs/user4277636=2303A51876@sru.edu.in
Virtualization features:
Hypervisor vendor: KVM
Virtualization type: full
Caches (sum of all):
L1d: 32 KiB (1 instance)
L1i: 32 KiB (1 instance)
L2: 1 MiB (1 instance)
L3: 35.8 MiB (1 instance)
NUMA:
NUMA node(s): 1
NUMA node0 CPU(s): 0,1
Vulnerabilities:
Gather data sampling: Unknown: Dependent on hypervisor status
Indirect target selection: Mitigation; Aligned branch/return thunks
Itlb multihit: KVM: Mitigation: VMX unsupported
L1tf: Mitigation; PTE Inversion
Mds: Vulnerable: Clear CPU buffers attempted, no microcode; SMT Host state unknown
Meltdown: Mitigation; PTI
Mmio stale data: Vulnerable: Clear CPU buffers attempted, no microcode; SMT Host state unknown
Reg file data sampling: Not affected
Retbleed: Vulnerable
Spec rstack overflow: Not affected
Spec store bypass: Vulnerable
Spectre v1: Mitigation; usercopy/swapgs barriers and __user pointer sanitization
Spectre v2: Mitigation; Retpolines; STIBP disabled; RSB filling; PBRSB-eIBRS Not affected; BHI Retpoline
Srbds: Not affected
Tsa: Not affected
Tsx async abort: Not affected
Vmscape: Not affected
[ec2-user@ip-172-31-20-167 ~]$ free -h
total used free shared buff/cache available
Mem: 3.7Gi 149Mi 3.4Gi 0.0Ki 219Mi 3.4Gi
Swap: 0B 0B 0B
[ec2-user@ip-172-31-20-167 ~]$
i-091255fd3a7155b49 (1876 HPC)
PublicIPs: 54.242.248.156 PrivateIPs: 172.31.20.167
CloudShell
Feedback
© 2026, Amazon Web Services, Inc. or its affiliates.
Privacy
Terms
Cookie preferences


aws
Search
[Alt+S]
Ask Amazon Q
United States (N. Virginia)
Account ID: 8810-6333-9174
voclabs/user4277636=2303A51876@sru.edu.in
[ec2-user@ip-172-31-20-167 ~]$ gcc -version
-bash: gcc: command not found
[ec2-user@ip-172-31-20-167 ~]$ gcc --version
-bash: gcc: command not found
[ec2-user@ip-172-31-20-167 ~]$ sudo yum install gcc -y
Amazon Linux 2023 Kernel Livepatch repository 240 kB/s | 29 kB 00:00
Dependencies resolved.
Package Architecture Version Repository Size
Installing:
gcc x86_64 11.5.0-5.amzn2023.0.5 amazonlinux 36 M
Installing dependencies:
annobin-docs noarch 12.69-1.amzn2023.0.1 amazonlinux 93 k
annobin-plugin-gcc x86_64 12.69-1.amzn2023.0.1 amazonlinux 974 k
cpp x86_64 11.5.0-5.amzn2023.0.5 amazonlinux 11 M
gc x86_64 8.0.4-5.amzn2023.0.2 amazonlinux 105 k
gcc-plugin-annobin x86_64 11.5.0-5.amzn2023.0.5 amazonlinux 38 k
glibc-devel x86_64 2.34-231.amzn2023.0.1 amazonlinux 38 k
glibc-headers-x86 noarch 2.34-231.amzn2023.0.1 amazonlinux 444 k
guile22 x86_64 2.2.7-2.amzn2023.0.3 amazonlinux 6.4 M
kernel-headers x86_64 1:6.1.158-180.294.amzn2023 amazonlinux 1.4 M
libmpc x86_64 1.2.1-2.amzn2023.0.2 amazonlinux 62 k
libtool-ltdl x86_64 2.4.7-1.amzn2023.0.3 amazonlinux 38 k
libxcrypt-devel x86_64 4.4.33-7.amzn2023 amazonlinux 32 k
make x86_64 1:4.3-5.amzn2023.0.2 amazonlinux 534 k
Transaction Summary
Install 14 Packages
Total download size: 57 M
Installed size: 182 M
Downloading Packages:
i-091255fd3a7155b49 (1876 HPC)
PublicIPs: 54.242.248.156 PrivateIPs: 172.31.20.167


aws
Search
[Alt+S]
Ask Amazon Q
United States (N. Virginia)
Account ID: 8810-6333-9174
voclabs/user4277636=2303A51876@sru.edu.in
Transaction Summary
Install 14 Packages
Total download size: 57 M
Installed size: 182 M
Downloading Packages:
(1/14): annobin-plugin-gcc-12.69-1.amzn2023.0.1.x86_64.rpm 21 MB/s | 974 kB 00:00
(2/14): annobin-docs-12.69-1.amzn2023.0.1.noarch.rpm 1.8 MB/s | 93 kB 00:00
(3/14): gc-8.0.4-5.amzn2023.0.2.x86_64.rpm 3.2 MB/s | 105 kB 00:00
(4/14): gcc-plugin-annobin-11.5.0-5.amzn2023.0.5.x86_64.rpm 1.3 MB/s | 38 kB 00:00
(5/14): glibc-devel-2.34-231.amzn2023.0.1.x86_64.rpm 1.2 MB/s | 38 kB 00:00
(6/14): cpp-11.5.0-5.amzn2023.0.5.x86_64.rpm 56 MB/s | 11 MB 00:00
(7/14): glibc-headers-x86-2.34-231.amzn2023.0.1.noarch.rpm 7.4 MB/s | 444 kB 00:00
(8/14): kernel-headers-6.1.158-180.294.amzn2023.x86_64.rpm 31 MB/s | 1.4 MB 00:00
(9/14): guile22-2.2.7-2.amzn2023.0.3.x86_64.rpm 62 MB/s | 6.4 MB 00:00
(10/14): libmpc-1.2.1-2.amzn2023.0.2.x86_64.rpm 1.1 MB/s | 62 kB 00:00
(11/14): libxcrypt-devel-4.4.33-7.amzn2023.x86_64.rpm 1.5 MB/s | 32 kB 00:00
(12/14): libtool-ltdl-2.4.7-1.amzn2023.0.3.x86_64.rpm 1.3 MB/s | 38 kB 00:00
(13/14): make-4.3-5.amzn2023.0.2.x86_64.rpm 16 MB/s | 534 kB 00:00
(14/14): gcc-11.5.0-5.amzn2023.0.5.x86_64.rpm 66 MB/s | 36 MB 00:00
Total 89 MB/s | 57 MB 00:00
Running transaction check
Transaction check succeeded.
Running transaction test
Transaction test succeeded.
Running transaction
Preparing : 1/1
Installing : libmpc-1.2.1-2.amzn2023.0.2.x86_64 1/14
Installing : cpp-11.5.0-5.amzn2023.0.5.x86_64 2/14
Installing : libtool-ltdl-2.4.7-1.amzn2023.0.3.x86_64 3/14
Installing : kernel-headers-1:6.1.158-180.294.amzn2023.x86_64 4/14
Installing : glibc-headers-x86-2.34-231.amzn2023.0.1.noarch 5/14
i-091255fd3a7155b49 (1876 HPC)
PublicIPs: 54.242.248.156 PrivateIPs: 172.31.20.167





Task 3: Serial Baseline (Matrix Multiplication)

Objective: Run a heavy task on a single core.

1. Write a C program (matrix_serial.c) to multiply

two 1024 X 1024 matrices.

2. Compile: gcc matrix_serial.c -o matrix

3. Run it to ensure it works.

```
  GNU nano 8.3                                                matrix_serial.c
printf(&amp;quot;Memory allocation failed!\n&amp;quot;);
return 1;
}
// 2. Initialization
// Filling matrices with dummy data
for (int i = 0; i &amp;lt; N * N; i++) {
A[i] = 1.0;
B[i] = 2.0;
C[i] = 0.0;

}
printf(&amp;quot;Starting Serial Matrix Multiplication (%dx%d)...\n&amp;quot;, N, N);
printf(&amp;quot;This computation is O(N^3). Please wait...\n&amp;quot;);
// 3. Computation (The Heavy Part)
// Three nested loops = O(N^3) complexity
for (int i = 0; i &amp;lt; N; i++) {
for (int j = 0; j &amp;lt; N; j++) {
for (int k = 0; k &amp;lt; N; k++) {
C[i*N + j] += A[i*N + k] * B[k*N + j];
}
}
}
printf(&amp;quot;Computation Complete. Result check: C[0] = %f\n&amp;quot;, C[0]);
// 4. Cleanup
free(A);
free(B);
free(C);
return 0;
}

^G Help          ^O Write Out     ^F Where Is      ^K Cut           ^T Execute       ^C Location      M-U Undo         M-A Set Mark     M-] To Bracket   M-B Previous
^X Exit          ^R Read File     ^\ Replace       ^U Paste         ^J Justify       ^/ Go To Line    M-E Redo         M-6 Copy         ^B Where Was     M-F Next
```

i-091255fd3a7155b49 (1876 HPC)

PublicIPs: 54.242.248.156 PrivateIPs: 172.31.20.167

CloudShell Feedback © 2026, Amazon Web Services, Inc. or its affiliates. Privacy Terms Cookie preferences

aws Search [Alt+S] Ask Amazon Q United States (N. Virginia) Account ID: 8810-6333-9174 voclabs/user4277636=2303A51876@sru.edu.in

```
[ec2-user@ip-172-31-20-167 ~]$ nano matrix_serial.c
[ec2-user@ip-172-31-20-167 ~]$
```

i-091255fd3a7155b49 (1876 HPC)

PublicIPs: 54.242.248.156 PrivateIPs: 172.31.20.167

```
[ec2-user@ip-172-31-19-179 ~]$ nano matrix_serial.c
[ec2-user@ip-172-31-19-179 ~]$ gcc matrix_serial.c -o matrix
```

i-0b5e027cd82ec28bb (hpc1)

PublicIPs: 13.222.5.3 PrivateIPs: 172.31.19.179

Task 4: Measuring Latency (Profiling)

Objective: Measure execution time.

1. Run code using the time command: time ./matrix

2. Note the Real, User, and Sys time.

Submission: Screenshot of the time output.

Resources:

matrix_serial.c:

```
        #include &lt;stdio.h&gt;
#include &lt;stdlib.h&gt;
// Matrix Size (1024 x 1024)
// This is large enough to make the CPU work for a few seconds.
#define N 1024
int main() {
// 1. Memory Allocation
// We use double precision for higher computational load
double *A = (double*)malloc(N * N * sizeof(double));
double *B = (double*)malloc(N * N * sizeof(double));
double *C = (double*)malloc(N * N * sizeof(double));
if (A == NULL || B == NULL || C == NULL) {
printf(&quot;Memory allocation failed!\n&quot;);
return 1;
}
// 2. Initialization
// Filling matrices with dummy data
for (int i = 0; i &lt; N * N; i++) {
A[i] = 1.0;
B[i] = 2.0;
C[i] = 0.0;
}
printf(&quot;Starting Serial Matrix Multiplication (%dx%d)...\n&quot;, N, N);
```

printf("This computation is O(N^3). Please wait...\n");

// 3. Computation (The Heavy Part)

// Three nested loops = O(N^3) complexity

for (int i = 0; i < N; i++) {

for (int j = 0; j < N; j++) {

for (int k = 0; k < N; k++) {

C[i*N + j] += A[i*N + k] * B[k*N + j];

}

}

}

printf("Computation Complete. Result check: C[0] = %f\n", C[0]);

// 4. Cleanup

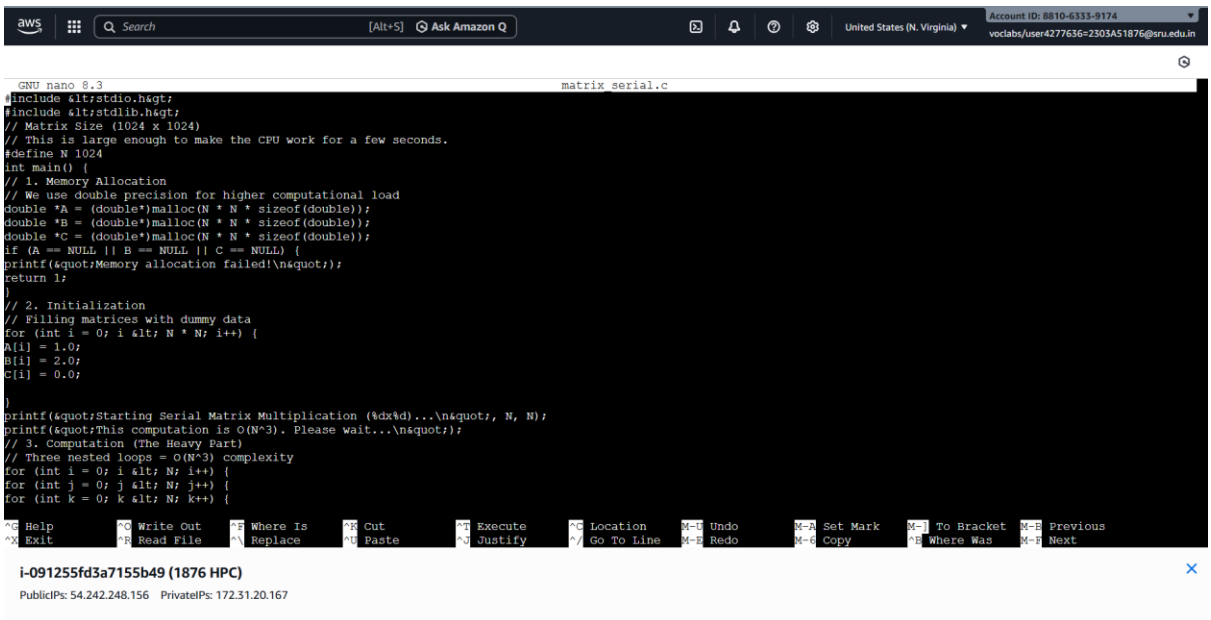
free(A);

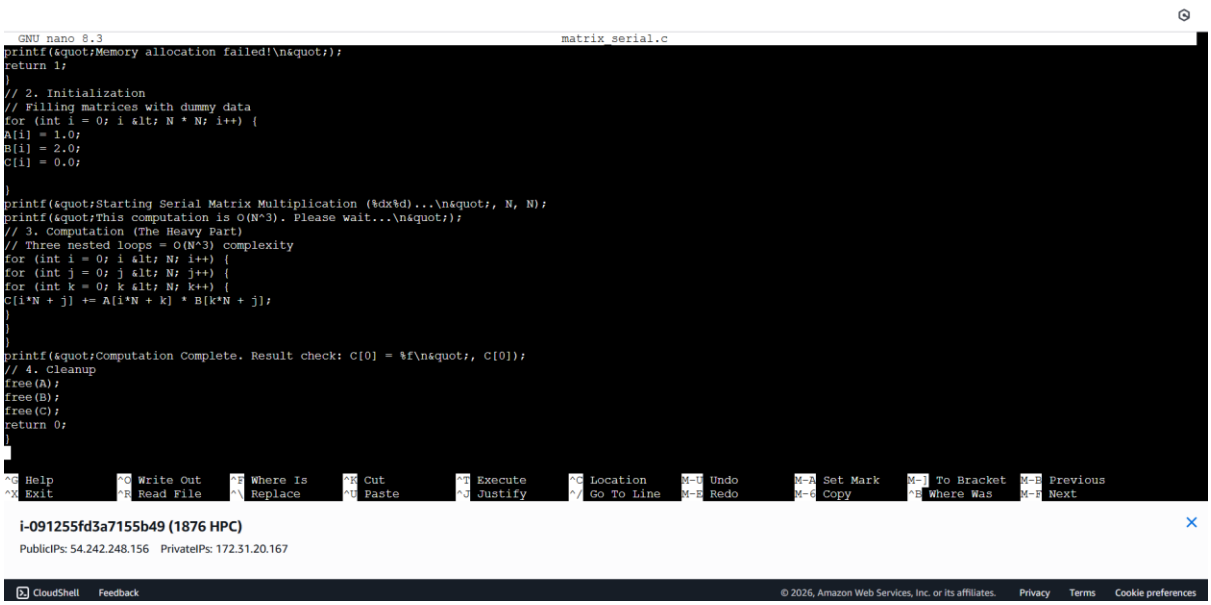
free(B);

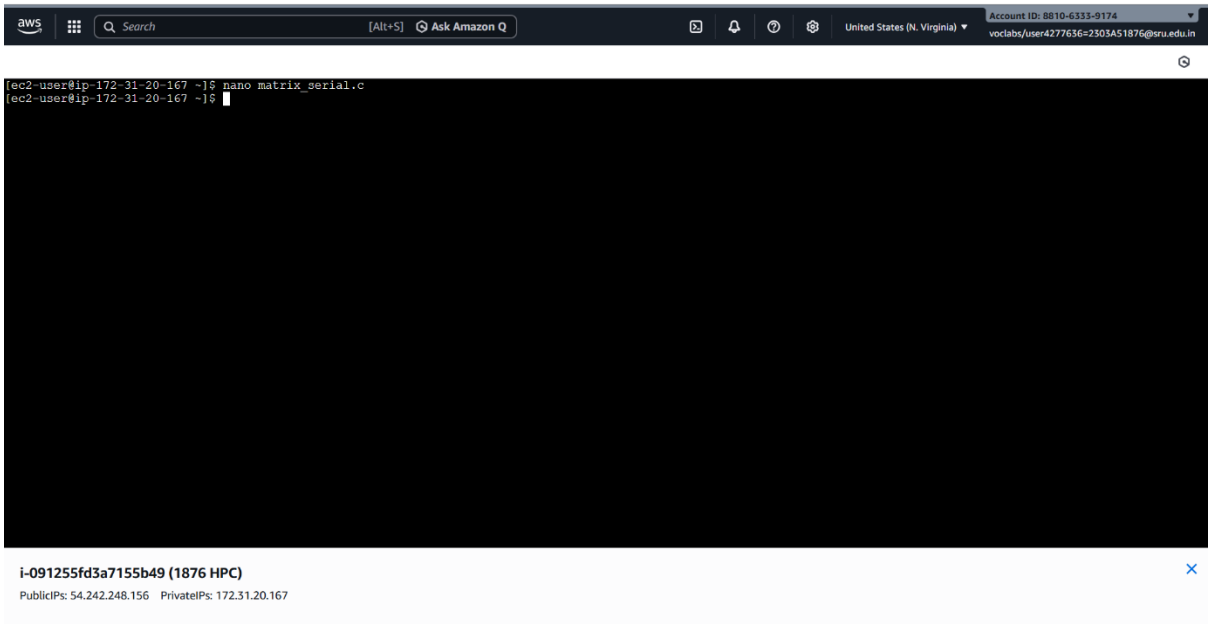
free(C);

return 0;

}



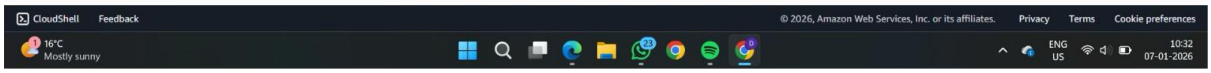

GNU nano 8.3
matrix_serial.c
printf("Memory allocation failed!\n");
return 1;
}
// 2. Initialization
// Filling matrices with dummy data
for (int i = 0; i < N * N; i++) {
A[i] = 1.0;
B[i] = 2.0;
C[i] = 0.0;
}
printf("Starting Serial Matrix Multiplication (%dx%d)...\n", N, N);
printf("This computation is O(N^3). Please wait...\n");
// 3. Computation (The Heavy Part)
// Three nested loops = O(N^3) complexity
for (int i = 0; i < N; i++) {
for (int j = 0; j < N; j++) {
for (int k = 0; k < N; k++) {
C[i*N + j] += A[i*N + k] * B[k*N + j];
}
}
}
printf("Computation Complete. Result check: C[0] = %f\n", C[0]);
// 4. Cleanup
free(A);
free(B);
free(C);
return 0;
}
^G Help ^O Write Out ^F Where Is ^K Cut ^T Execute ^C Location M-U Undo M-A Set Mark M-] To Bracket M-B Previous
^X Exit ^R Read File ^\ Replace ^U Paste ^J Justify ^/ Go To Line M-E Redo M-6 Copy ^B Where Was M-F Next
i-091255fd3a7155b49 (1876 HPC)
PublicIPs: 54.242.248.156 PrivateIPs: 172.31.20.167
CloudShell Feedback
© 2026, Amazon Web Services, Inc. or its affiliates. Privacy Terms Cookie preferences


aws
Search
[Alt+S]
Ask Amazon Q
United States (N. Virginia)
Account ID: 8810-6333-9174
voclabs/user4277636=2303A51876@sru.edu.in
[ec2-user@ip-172-31-20-167 ~]$ nano matrix_serial.c
[ec2-user@ip-172-31-20-167 ~]$
i-091255fd3a7155b49 (1876 HPC)
PublicIPs: 54.242.248.156 PrivateIPs: 172.31.20.167

```
[ec2-user@ip-172-31-19-179 ~]$ nano matrix_serial.c
[ec2-user@ip-172-31-19-179 ~]$ gcc matrix_serial.c -o matrix
```

i-0b5e027cd82ec28bb (hpc1)

PublicIPs: 13.222.5.3 PrivateIPs: 172.31.19.179




```
[ec2-user@ip-172-31-20-167 ~]$ ./matrixclear
-bash: ./matrixclear: No such file or directory
[ec2-user@ip-172-31-20-167 ~]$ ./matrixclear
-bash: ./matrixclear: No such file or directory
[ec2-user@ip-172-31-20-167 ~]$ ls
matrix_serial.c  matrix_serial.c.save
[ec2-user@ip-172-31-20-167 ~]$ nano matrix_serial.c
[ec2-user@ip-172-31-20-167 ~]$ gcc matrix_serial.c -O matrixclear
/usr/bin/ld: cannot find matrixclear: No such file or directory
collect2: error: ld returned 1 exit status
[ec2-user@ip-172-31-20-167 ~]$ gcc matrix_serial.c -O matrixclear
/usr/bin/ld: cannot find matrixclear: No such file or directory
collect2: error: ld returned 1 exit status
[ec2-user@ip-172-31-20-167 ~]$ gcc matrix_serial.c -o ma
[ec2-user@ip-172-31-20-167 ~]$ ./ma
Starting Serial Matrix Multiplication (1024x1024)...
This computation is O(N^3). Please wait...
```

i-091255fd3a7155b49 (1876 HPC)

PublicIPs: 54.242.248.156 PrivateIPs: 172.31.20.167

```
[ec2-user@ip-172-31-20-167 ~]$ ./matrixclear
-bash: ./matrixclear: No such file or directory
[ec2-user@ip-172-31-20-167 ~]$ ./matrixclear
-bash: ./matrixclear: No such file or directory
[ec2-user@ip-172-31-20-167 ~]$ ls
matrix_serial.c  matrix_serial.c.save
[ec2-user@ip-172-31-20-167 ~]$ nano matrix_serial.c
[ec2-user@ip-172-31-20-167 ~]$ gcc matrix_serial.c -O matrixclear
/usr/bin/ld: cannot find matrixclear: No such file or directory
collect2: error: ld returned 1 exit status
[ec2-user@ip-172-31-20-167 ~]$ gcc matrix_serial.c -O matrixclear
/usr/bin/ld: cannot find matrixclear: No such file or directory
collect2: error: ld returned 1 exit status
[ec2-user@ip-172-31-20-167 ~]$ gcc matrix_serial.c -o ma
[ec2-user@ip-172-31-20-167 ~]$ ./ma
Starting Serial Matrix Multiplication (1024x1024)...
This computation is O(N^3). Please wait...
Computation Complete. Result check: C[0] = 2048.000000
[ec2-user@ip-172-31-20-167 ~]$
```

i-091255fd3a7155b49 (1876 HPC)

PublicIPs: 54.242.248.156 PrivateIPs: 172.31.20.167