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727723EUCY030

CLOUD OPERATIONS MONITORING & INCIDENT RESPONSE

1. Introduction

Modern cloud infrastructure requires continuous monitoring to ensure system availability, performance, and reliability. In many organizations, systems fail due to lack of visibility into resource usage and application behavior. This project simulates real-world Cloud Operations (CloudOps) activities by implementing basic monitoring, log analysis, incident detection, and recovery procedures using AWS. The objective of this project is to build a **monitor-first, fix-later mindset**, which is critical for IT Administrators, CloudOps, and DevOps roles.

2. Project Objectives

- Observe system resource usage on a cloud server
- Collect and analyze application and system logs
- Identify abnormal behavior such as CPU spikes and unusual access patterns
- Document incidents with root cause analysis
- Simulate downtime and validate recovery procedures

3. Tools & Technologies Used

Category	Details
CloudPlatform	Amazon Web Services (AWS)
Compute Service	EC2
Operating System	Amazon Linux 2023
Web Server	Nginx
Monitoring Tools	top, free, df, uptime
Log Analysis	journalctl, nginx access logs

Category	Details
Access Method	EC2 Instance Connect

4. Architecture Overview

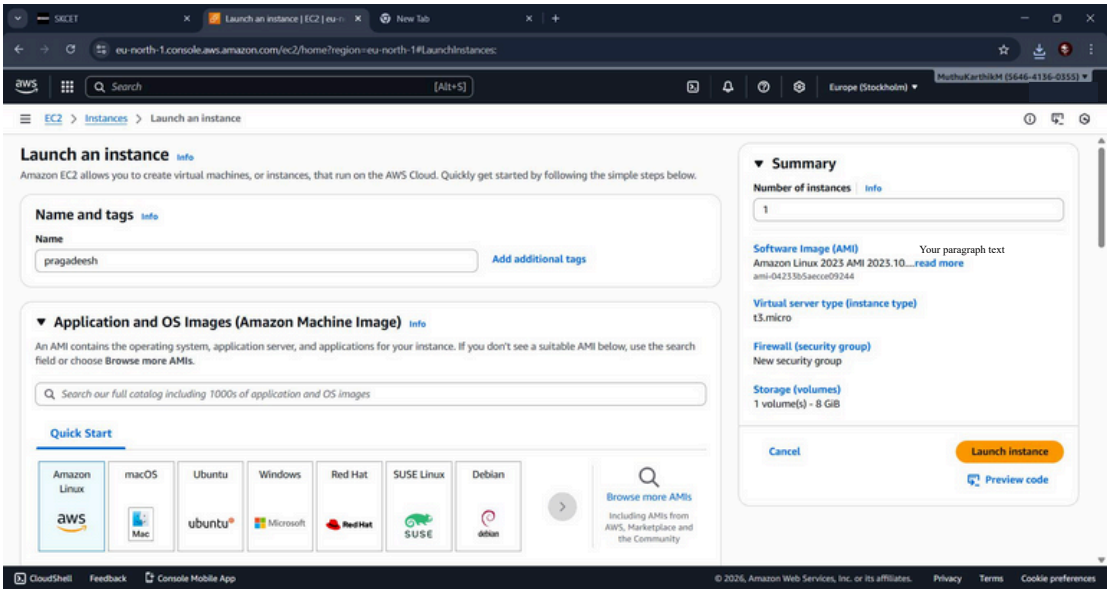
The project uses asingle EC2instance running Amazon Linux 2023 with an Nginx web server. Monitoring and log analysis are performed using built-in Linux utilities without relying on paid monitoring tools.

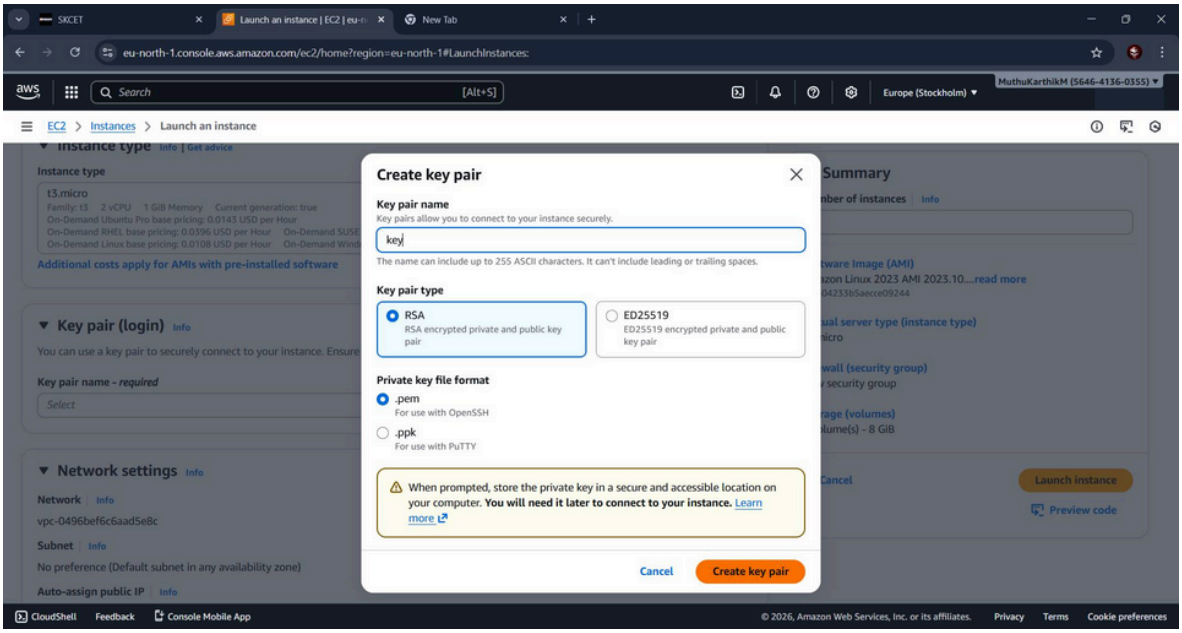
Components:

- EC2 Instance
  Nginx Web Server
- Systemd Journal Logs
-
- Nginx AccessLogs

5. Environment Setup

An EC2 instance was launched using the Amazon Linux 2023 AMI with a t2.micro instance type. Security group rules allowed SSH and HTTP access. Nginx was installed and configured to run as a background service.
The web server was verified by accessing the public IP address of the EC2 instance.




Launch an instance | EC2 | eu-north-1
New Tab
eu-north-1.console.aws.amazon.com/ec2/home?region=eu-north-1#LaunchInstances:
Search
[Alt+S]
Europe (Stockholm)
MuthuKarthikM (5646-4136-0355)
EC2 > Instances > Launch an instance
Create key pair
Key pair name
Key pairs allow you to connect to your instance securely.
key
The name can include up to 255 ASCII characters. It can't include leading or trailing spaces.
Key pair type
RSA
RSA encrypted private and public key pair
ED25519
ED25519 encrypted private and public key pair
Private key file format
.pem
For use with OpenSSH
.ppk
For use with PuTTY
When prompted, store the private key in a secure and accessible location on your computer. You will need it later to connect to your instance. Learn more
Cancel
Create key pair
Summary
Key pair (login) Info
Network settings Info
Launch instance
Preview code
CloudShell
Feedback
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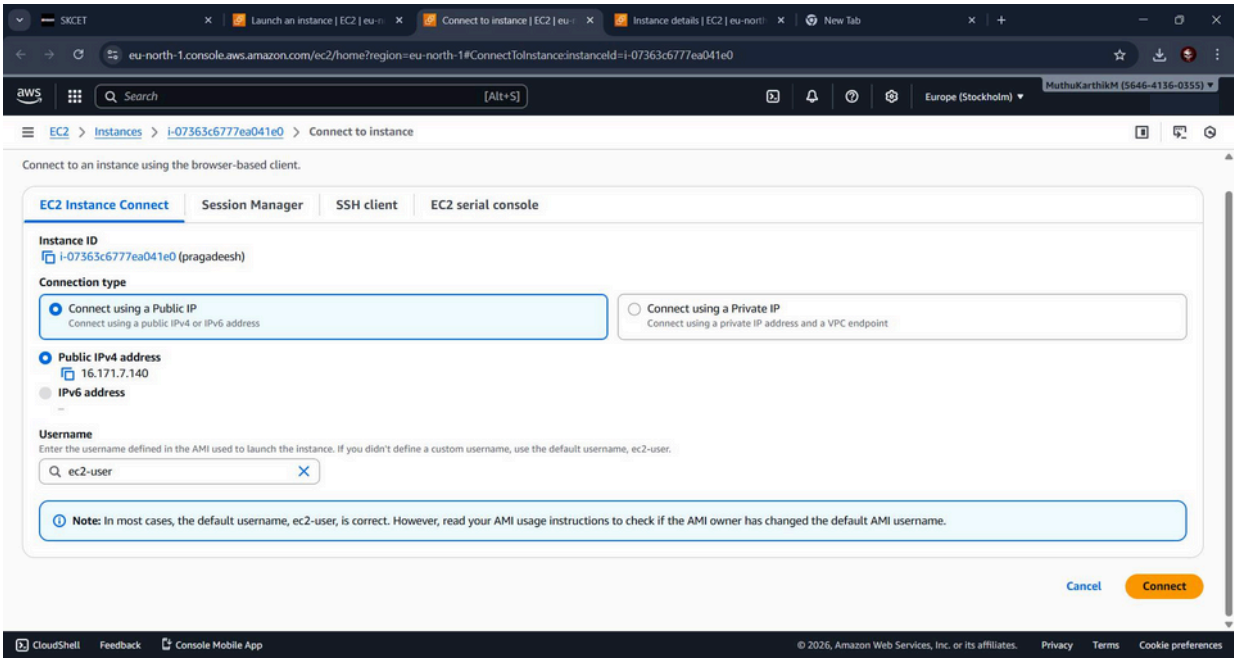
Launch an instance | EC2 | eu-north-1
Connect to instance | EC2 | eu-north-1
Instance details | EC2 | eu-north-1
New Tab
eu-north-1.console.aws.amazon.com/ec2/home?region=eu-north-1#ConnectToInstance:instanceId=i-07363c6777ea041e0
Search
[Alt+S]
Europe (Stockholm)
MuthuKarthikM (5646-4136-0355)
EC2 > Instances > i-07363c6777ea041e0 > Connect to instance
Connect to an instance using the browser-based client.
EC2 Instance Connect
Session Manager
SSH client
EC2 serial console
Instance ID
i-07363c6777ea041e0 (pragadeesh)
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
16.171.7.140
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
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Feedback
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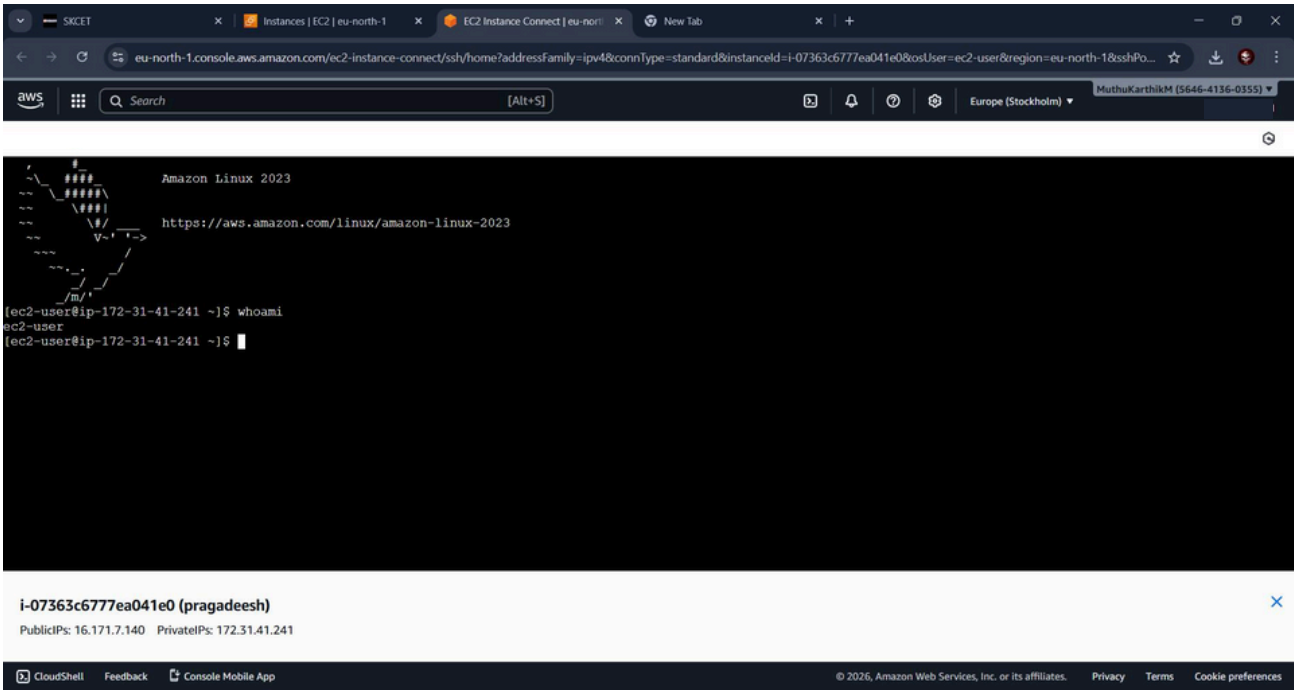
SKCET
Instances | EC2 | eu-north-1
EC2 Instance Connect | eu-north-1
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Search
[Alt+S]
Europe (Stockholm)
MuthuKarthikM (5646-4136-0355)
Amazon Linux 2023
https://aws.amazon.com/linux/amazon-linux-2023
[ec2-user@ip-172-31-41-241 ~]$ whoami
ec2-user
[ec2-user@ip-172-31-41-241 ~]$
i-07363c6777ea041e0 (pragadeesh)
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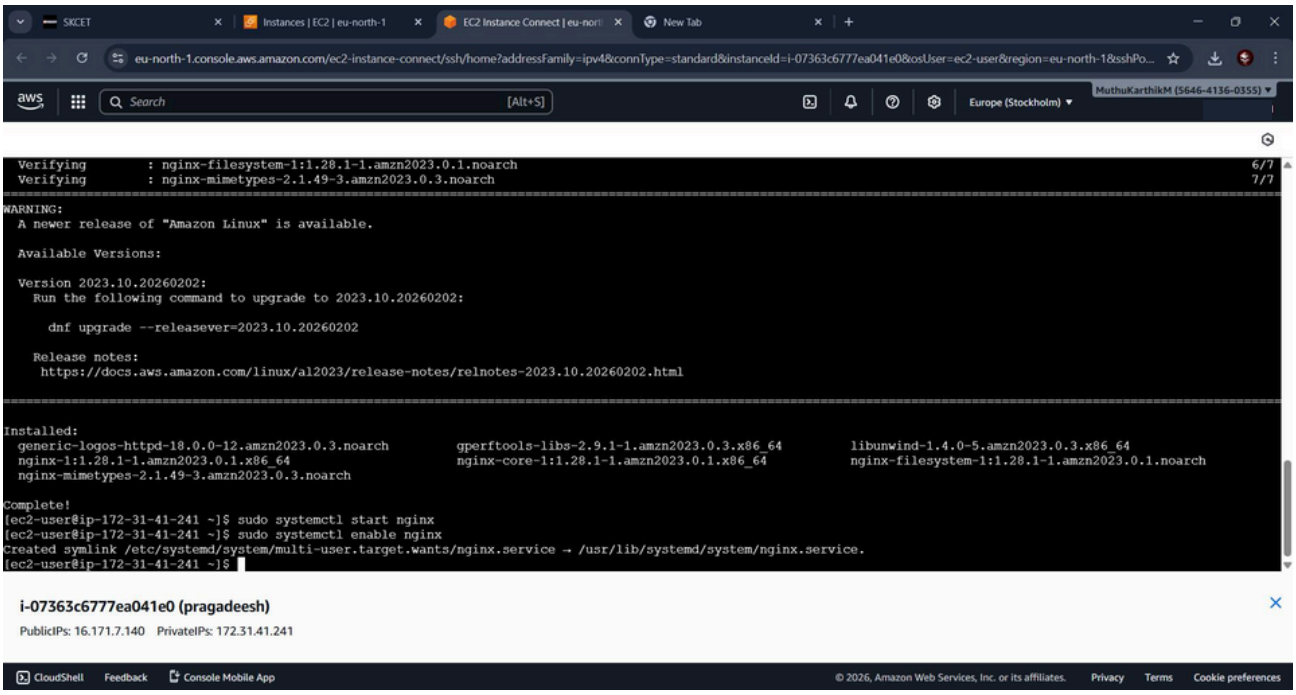
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EC2 Instance Connect | eu-north-1
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eu-north-1.console.aws.amazon.com/ec2-instance-connect/ssh/home?addressFamily=ipv4&connType=standard&instanceId=i-07363c6777ea041e0&osUser=ec2-user&region=eu-north-1&sshPo...
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Verifying : nginx-filesystem-1:1.28.1-1.amzn2023.0.1.noarch 6/7
Verifying : nginx-mimetypes-2.1.49-3.amzn2023.0.3.noarch 7/7
WARNING:
A newer release of "Amazon Linux" is available.
Available Versions:
Version 2023.10.20260202:
Run the following command to upgrade to 2023.10.20260202:
dnf upgrade --releasever=2023.10.20260202
Release notes:
https://docs.aws.amazon.com/linux/al2023/release-notes/relnotes-2023.10.20260202.html
Installed:
generic-logos-httpd-18.0.0-12.amzn2023.0.3.noarch
gperftools-libs-2.9.1-1.amzn2023.0.3.x86_64
libunwind-1.4.0-5.amzn2023.0.3.x86_64
nginx-1:1.28.1-1.amzn2023.0.1.x86_64
nginx-core-1:1.28.1-1.amzn2023.0.1.x86_64
nginx-filesystem-1:1.28.1-1.amzn2023.0.1.noarch
nginx-mimetypes-2.1.49-3.amzn2023.0.3.noarch
Complete!
[ec2-user@ip-172-31-41-241 ~]$ sudo systemctl start nginx
[ec2-user@ip-172-31-41-241 ~]$ sudo systemctl enable nginx
Created symlink /etc/systemd/system/multi-user.target.wants/nginx.service → /usr/lib/systemd/system/nginx.service.
[ec2-user@ip-172-31-41-241 ~]$
i-07363c6777ea041e0 (pragadeesh)
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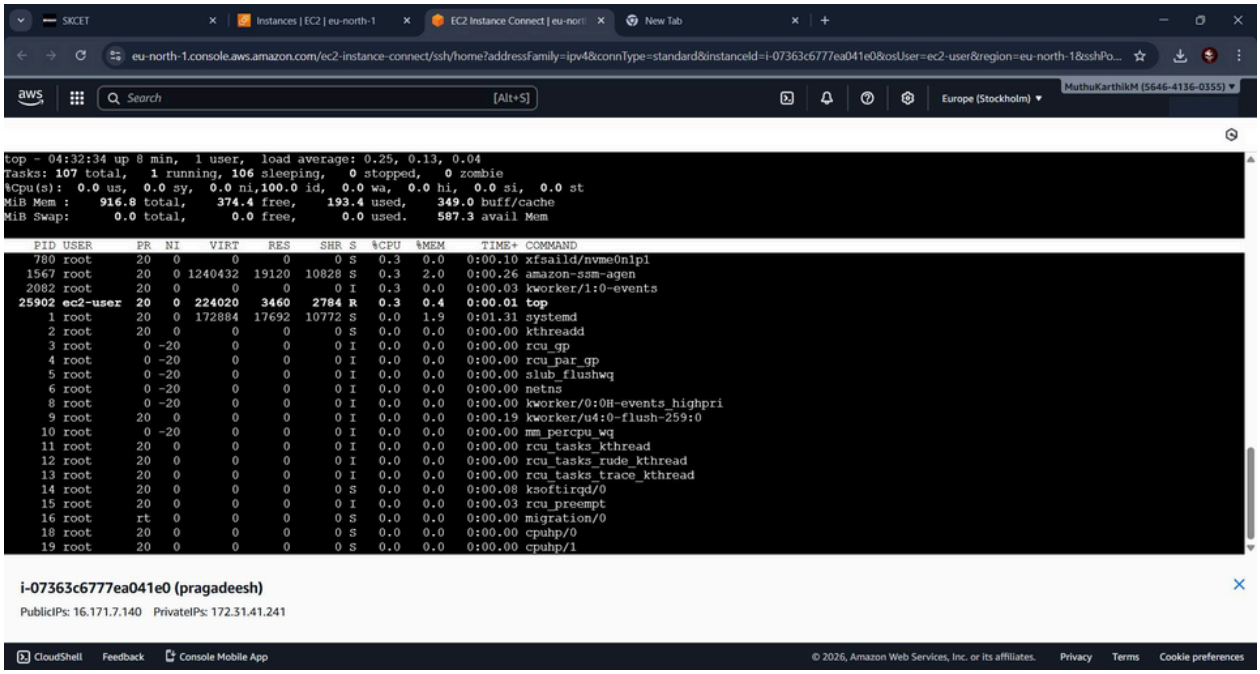
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EC2 Instance Connect | eu-north-1
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eu-north-1.console.aws.amazon.com/ec2-instance-connect/ssh/home?addressFamily=ipv4&connType=standard&instanceId=i-07363c6777ea041e0&osUser=ec2-user&region=eu-north-1&sshPo...
Search
[Alt+S]
Europe (Stockholm)
MuthuKarthikM (5646-4136-0355)
top - 04:32:34 up 8 min, 1 user, load average: 0.25, 0.13, 0.04
Tasks: 107 total, 1 running, 106 sleeping, 0 stopped, 0 zombie
%Cpu(s): 0.0 us, 0.0 sy, 0.0 ni,100.0 id, 0.0 wa, 0.0 hi, 0.0 si, 0.0 st
MiB Mem : 916.8 total, 374.4 free, 193.4 used, 349.0 buff/cache
MiB Swap: 0.0 total, 0.0 free, 0.0 used. 587.3 avail Mem
PID USER PR NI VIRT RES SHR S %CPU %MEM TIME+ COMMAND
780 root 20 0 0 0 0 S 0.3 0.0 0:00.10 xfsaild/nvme0n1p1
1567 root 20 0 1240432 19120 10828 S 0.3 2.0 0:00.26 amazon-ssm-agen
2082 root 20 0 0 0 0 I 0.3 0.0 0:00.03 kworker/1:0-events
25902 ec2-user 20 0 224020 3460 2784 R 0.3 0.4 0:00.01 top
1 root 20 0 172884 17692 10772 S 0.0 1.9 0:01.31 systemd
2 root 20 0 0 0 0 S 0.0 0.0 0:00.00 kthreadd
3 root 0 -20 0 0 0 I 0.0 0.0 0:00.00 rcu_gp
4 root 0 -20 0 0 0 I 0.0 0.0 0:00.00 rcu_par_gp
5 root 0 -20 0 0 0 I 0.0 0.0 0:00.00 slub_flushwq
6 root 0 -20 0 0 0 I 0.0 0.0 0:00.00 netns
8 root 0 -20 0 0 0 I 0.0 0.0 0:00.00 kworker/0:0H-events_highpri
9 root 20 0 0 0 0 I 0.0 0.0 0:00.19 kworker/u4:0-flush-259:0
10 root 0 -20 0 0 0 I 0.0 0.0 0:00.00 mm_percpu_wq
11 root 20 0 0 0 0 I 0.0 0.0 0:00.00 rcu_tasks_kthread
12 root 20 0 0 0 0 I 0.0 0.0 0:00.00 rcu_tasks_rude_kthread
13 root 20 0 0 0 0 I 0.0 0.0 0:00.00 rcu_tasks_trace_kthread
14 root 20 0 0 0 0 S 0.0 0.0 0:00.08 ksoftirqd/0
15 root 20 0 0 0 0 I 0.0 0.0 0:00.03 rcu_preempt
16 root rt 0 0 0 0 S 0.0 0.0 0:00.00 migration/0
18 root 20 0 0 0 0 S 0.0 0.0 0:00.00 cpuhp/0
19 root 20 0 0 0 0 S 0.0 0.0 0:00.00 cpuhp/1
i-07363c6777ea041e0 (pragadeesh)
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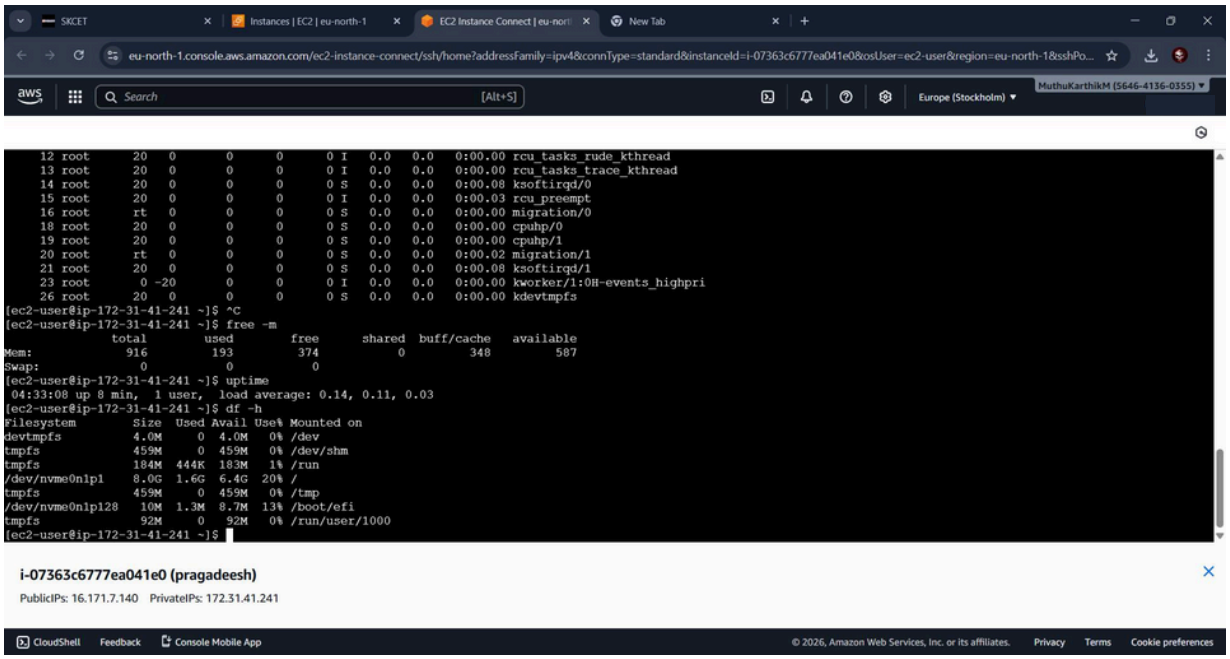
SKCET
Instances | EC2 | eu-north-1
EC2 Instance Connect | eu-north-1
New Tab
eu-north-1.console.aws.amazon.com/ec2-instance-connect/ssh/home?addressFamily=ipv4&connType=standard&instanceId=i-07363c6777ea041e0&osUser=ec2-user&region=eu-north-1&sshPo...
Search
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MuthuKarthikM (5646-4136-0355)
12 root 20 0 0 0 0 I 0.0 0.0 0:00.00 rcu_tasks_rude_kthread
13 root 20 0 0 0 0 I 0.0 0.0 0:00.00 rcu_tasks_trace_kthread
14 root 20 0 0 0 0 S 0.0 0.0 0:00.08 ksoftirqd/0
15 root 20 0 0 0 0 I 0.0 0.0 0:00.03 rcu_preempt
16 root rt 0 0 0 0 S 0.0 0.0 0:00.00 migration/0
18 root 20 0 0 0 0 S 0.0 0.0 0:00.00 cpuhp/0
19 root 20 0 0 0 0 S 0.0 0.0 0:00.00 cpuhp/1
20 root rt 0 0 0 0 S 0.0 0.0 0:00.02 migration/1
21 root 20 0 0 0 0 S 0.0 0.0 0:00.08 ksoftirqd/1
23 root 0 -20 0 0 0 I 0.0 0.0 0:00.00 kworker/1:0H-events_highpri
26 root 20 0 0 0 0 S 0.0 0.0 0:00.00 kdevtmpfs
[ec2-user@ip-172-31-41-241 ~]$ ^C
[ec2-user@ip-172-31-41-241 ~]$ free -m
total used free shared buff/cache available
Mem: 916 193 374 0 348 587
Swap: 0 0 0
[ec2-user@ip-172-31-41-241 ~]$ uptime
04:33:08 up 8 min, 1 user, load average: 0.14, 0.11, 0.03
[ec2-user@ip-172-31-41-241 ~]$ df -h
Filesystem Size Used Avail Use% Mounted on
devtmpfs 4.0M 0 4.0M 0% /dev
tmpfs 459M 0 459M 0% /dev/shm
tmpfs 184M 444K 183M 1% /run
/dev/nvme0n1p1 8.0G 1.6G 6.4G 20% /
tmpfs 459M 0 459M 0% /tmp
/dev/nvme0n1p128 10M 1.3M 8.7M 13% /boot/efi
tmpfs 92M 0 92M 0% /run/user/1000
[ec2-user@ip-172-31-41-241 ~]$
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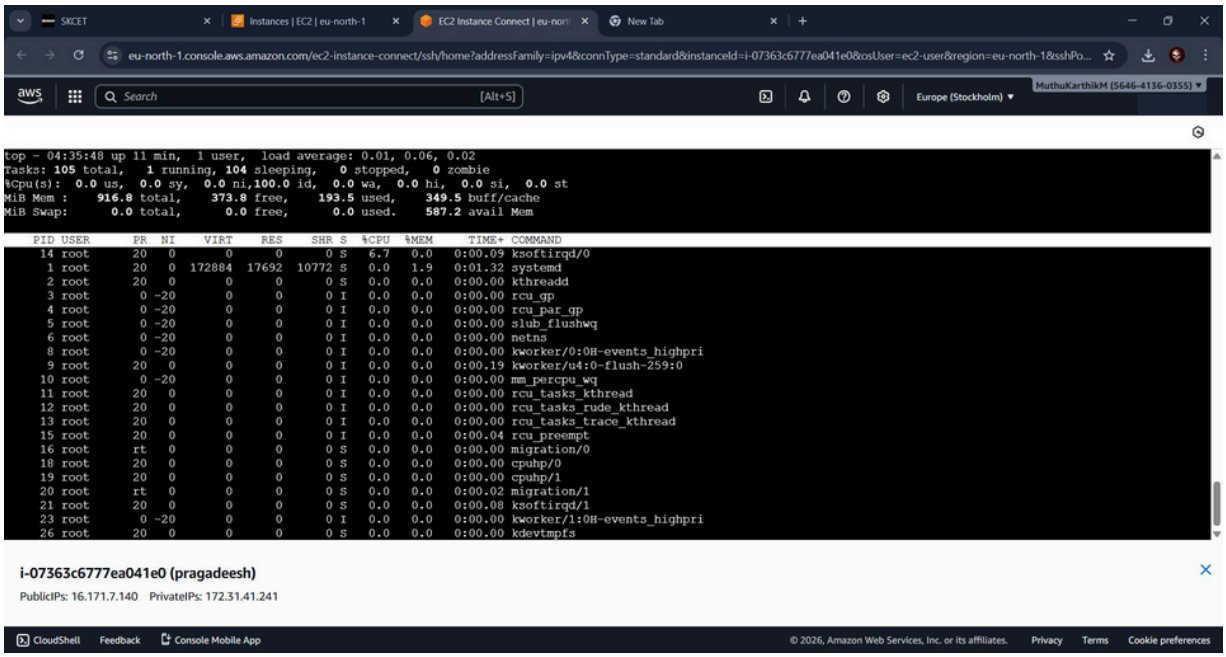
SKCET
Instances | EC2 | eu-north-1
EC2 Instance Connect | eu-north
New Tab
eu-north-1.console.aws.amazon.com/ec2-instance-connect/ssh/home?addressFamily=ipv4&connType=standard&instanceId=i-07363c6777ea041e0&osUser=ec2-user&region=eu-north-1&sshPo...
Search
[Alt+S]
Europe (Stockholm)
MuthuKarthikM (5646-4136-0355)
top - 04:35:48 up 11 min, 1 user, load average: 0.01, 0.06, 0.02
Tasks: 105 total, 1 running, 104 sleeping, 0 stopped, 0 zombie
%Cpu(s): 0.0 us, 0.0 sy, 0.0 ni,100.0 id, 0.0 wa, 0.0 hi, 0.0 si, 0.0 st
MiB Mem : 916.8 total, 373.8 free, 193.5 used, 349.5 buff/cache
MiB Swap: 0.0 total, 0.0 free, 0.0 used. 587.2 avail Mem
PID USER PR NI VIRT RES SHR S %CPU %MEM TIME+ COMMAND
14 root 20 0 0 0 0 S 6.7 0.0 0:00.09 ksoftirqd/0
1 root 20 0 172884 17692 10772 S 0.0 1.9 0:01.32 systemd
2 root 20 0 0 0 0 S 0.0 0.0 0:00.00 kthreadd
3 root 0 -20 0 0 0 I 0.0 0.0 0:00.00 rcu_gp
4 root 0 -20 0 0 0 I 0.0 0.0 0:00.00 rcu_par_gp
5 root 0 -20 0 0 0 I 0.0 0.0 0:00.00 slub_flushwq
6 root 0 -20 0 0 0 I 0.0 0.0 0:00.00 netns
8 root 0 -20 0 0 0 I 0.0 0.0 0:00.00 kworker/0:0H-events_highpri
9 root 20 0 0 0 0 I 0.0 0.0 0:00.19 kworker/u4:0-flush-259:0
10 root 0 -20 0 0 0 I 0.0 0.0 0:00.00 mm_percpu_wq
11 root 20 0 0 0 0 I 0.0 0.0 0:00.00 rcu_tasks_kthread
12 root 20 0 0 0 0 I 0.0 0.0 0:00.00 rcu_tasks_rude_kthread
13 root 20 0 0 0 0 I 0.0 0.0 0:00.00 rcu_tasks_trace_kthread
15 root 20 0 0 0 0 I 0.0 0.0 0:00.04 rcu_preempt
16 root rt 0 0 0 0 S 0.0 0.0 0:00.00 migration/0
18 root 20 0 0 0 0 S 0.0 0.0 0:00.00 cpuhp/0
19 root 20 0 0 0 0 S 0.0 0.0 0:00.00 cpuhp/1
20 root rt 0 0 0 0 S 0.0 0.0 0:00.02 migration/1
21 root 20 0 0 0 0 S 0.0 0.0 0:00.08 ksoftirqd/1
23 root 0 -20 0 0 0 I 0.0 0.0 0:00.00 kworker/1:0H-events_highpri
26 root 20 0 0 0 0 S 0.0 0.0 0:00.00 kdevtmpfs
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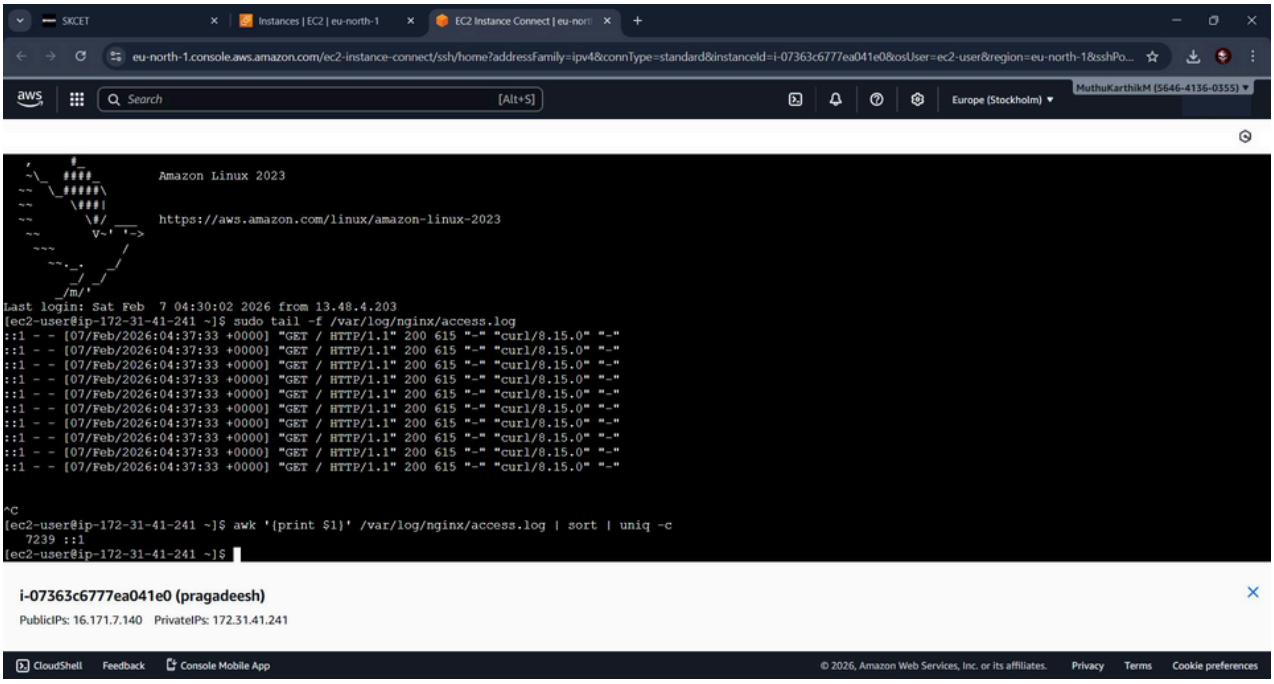
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Amazon Linux 2023
https://aws.amazon.com/linux/amazon-linux-2023
Last login: Sat Feb 7 04:30:02 2026 from 13.48.4.203
[ec2-user@ip-172-31-41-241 ~]$ sudo tail -f /var/log/nginx/access.log
::1 - - [07/Feb/2026:04:37:33 +0000] "GET / HTTP/1.1" 200 615 "-" "curl/8.15.0" "-"
::1 - - [07/Feb/2026:04:37:33 +0000] "GET / HTTP/1.1" 200 615 "-" "curl/8.15.0" "-"
::1 - - [07/Feb/2026:04:37:33 +0000] "GET / HTTP/1.1" 200 615 "-" "curl/8.15.0" "-"
::1 - - [07/Feb/2026:04:37:33 +0000] "GET / HTTP/1.1" 200 615 "-" "curl/8.15.0" "-"
::1 - - [07/Feb/2026:04:37:33 +0000] "GET / HTTP/1.1" 200 615 "-" "curl/8.15.0" "-"
::1 - - [07/Feb/2026:04:37:33 +0000] "GET / HTTP/1.1" 200 615 "-" "curl/8.15.0" "-"
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::1 - - [07/Feb/2026:04:37:33 +0000] "GET / HTTP/1.1" 200 615 "-" "curl/8.15.0" "-"
::1 - - [07/Feb/2026:04:37:33 +0000] "GET / HTTP/1.1" 200 615 "-" "curl/8.15.0" "-"
^C
[ec2-user@ip-172-31-41-241 ~]$ awk '{print $1}' /var/log/nginx/access.log | sort | uniq -c
7239 ::1
[ec2-user@ip-172-31-41-241 ~]$
i-07363c6777ea041e0 (pragadeesh)
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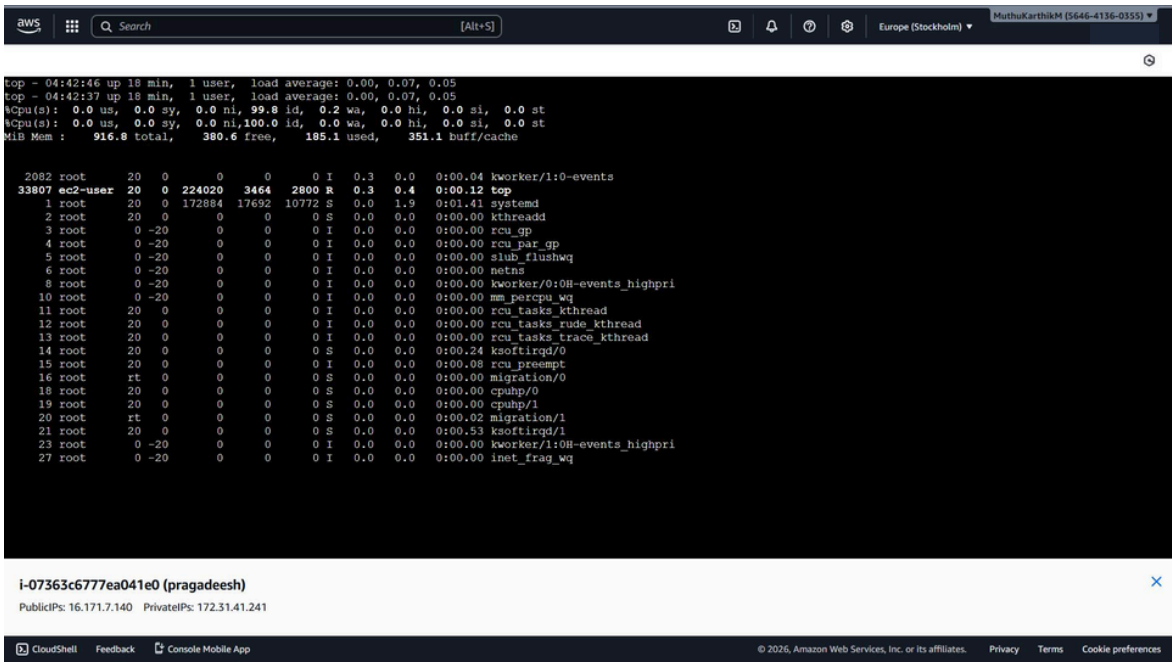

6. System Resource Monitoring

System resourcesweremonitoredundernormal conditions using Linux monitoring tools.

Commands Used:

- top – CPU utilization
- free -m – Memory usage
- df -h – Disk usage
- uptime – Load average

Initial observations showed normal CPU and memory utilization with stable load averages.

7. Log Collection & Analysis

Logswere collected andanalyzedtounderstand application and system behavior.

Log Sources:

- Nginx access logs: /var/log/nginx/access.log
  System logs: journalctl
-

Log analysis helped identify request patterns, service start/stop events, and error messages.

8. Incident Simulation: High CPU Usage

IncidentDescription

A high CPU usage scenario was simulated by generating continuous HTTP requests to the web server.

Detection

- CPU usage exceeded normal thresholds as observed using top
-
- Load average increased significantly
-
- Nginx processes consumed high CPU
-

Root Cause

Continuous HTTP requests generated from a single source caused excessive CPU consumption.

9. Learning Outcomes

- Monitoring is essential before troubleshooting
- Logs provide critical insight into system behavior
- High CPU usage is not always a hardware issue
- Incident documentation is a key CloudOps responsibility
- Recovery procedures must be tested and repeatable

10. Conclusion

Thisproject successfully demonstrated foundational CloudOps practices includingmonitoring,log analysis, incident detection, and recovery. By focusing on visibility and documentation, the project reflects real-world operational responsibilities and prepares for CloudOps and DevOps roles.