

PROFESSIONAL TRAINING REPORT - II

Entitled

ACHIEVING SEAMLESS SCALABILITY THE ROLE OF LOAD BALANCERS IN CLOUD COUMPUTING

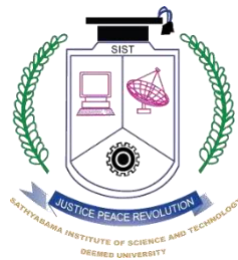
Submitted in partial fulfillment of the requirements for the award of
Bachelor of Engineering degree in Computer Science and Engineering with
specialization in cyber security

by

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**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
SCHOOL OF COMPUTING**

SATHYABAMA

**INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)**

CATEGORY -1 UNIVERSITY BY UGC

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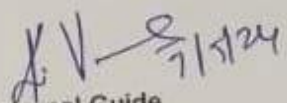
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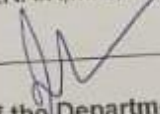
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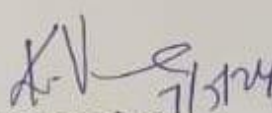
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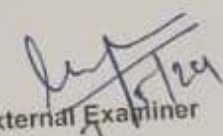
This is to certify that this Professional Training Report is the bonafide work of Mr. K.Balaji Barath Kumar (41614040.), Mr. Chethan Narayan (41614050), Mr. Hruthik Kamal (41614045), who carried out the project entitled **Achieving Seamless Scalability The Role of Load Balancers In Cloud Computing** under my supervision from January 2024 to May 2024.


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COURSE CERTIFICATE





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ABSTRACT

AWS Auto Scaling is a pivotal component within Amazon Web Services (AWS), designed to dynamically adjust the allocation of compute resources, such as EC2 instances, in response to varying demand patterns. By configuring scaling policies based on key metrics like CPU utilization or network traffic, AWS Auto Scaling ensures that your applications consistently receive the necessary resources for optimal performance while minimizing operational costs. Integrated seamlessly with Elastic Load Balancing (ELB) to evenly distribute incoming traffic and bolster fault tolerance, Auto Scaling provides a robust and flexible solution for managing scalability within your AWS infrastructure. Additionally, its integration with essential services such as Amazon CloudWatch for monitoring and AWS Identity and Access Management (IAM) for security and access control further enhances its functionality. With features like lifecycle hooks for pre-launch and post-termination actions, AWS Auto Scaling empowers organizations to automate and fine-tune their infrastructure, resulting in improved availability, reliability, and cost-effectiveness in cloud environments.

Sure, here's an expanded version with additional details: AWS Auto Scaling is a pivotal component within Amazon Web Services (AWS), designed to dynamically adjust the allocation of compute resources, such as EC2 instances, in response to varying demand patterns. By configuring scaling policies based on key metrics like CPU utilization or network traffic, AWS Auto Scaling ensures that your applications consistently receive the necessary resources for optimal performance while minimizing operational costs. Integrated seamlessly with Elastic Load Balancing (ELB) to evenly distribute incoming traffic and bolster fault tolerance, Auto Scaling provides a robust and flexible solution for managing scalability within your AWS infrastructure. Additionally, its integration with essential services such as Amazon CloudWatch for monitoring and AWS Identity and Access Management (IAM) for security and access control further enhances its functionality. With features like lifecycle hooks for pre-launch and post-termination actions, AWS Auto Scaling empowers organizations to automate and fine-tune their infrastructure, resulting in improved availability, reliability, and cost-effectiveness in cloud environments.

AWS Auto Scaling is a dynamic resource management service that allows users to automatically adjust the capacity of their AWS resources based on demand. This service is designed to help optimize performance and costs by scaling resources up or down in response to changing traffic patterns and workload fluctuations. At its core, AWS Auto Scaling enables users to set target utilization levels for different resources, such as EC2 instances, ECS tasks, or DynamoDB tables. When actual utilization deviates from these targets, Auto Scaling automatically adds or removes instances to maintain performance and minimize costs.

Key features of AWS Auto Scaling include the ability to define scaling policies based on metrics like CPU utilization or request counts, integrate with other AWS services like CloudWatch for monitoring, and support for both scheduled and dynamic scaling. By leveraging AWS Auto Scaling, organizations can achieve greater efficiency and reliability in their cloud infrastructure, ensuring that they have the right resources available at the right time without over-provisioning or under-utilization. This abstract provides an overview of AWS Scaling's in cloud environments

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CHAPTER 1

INTRODUCTION

1.1 OVERVIEW

Auto Scaling in AWS is a crucial feature for modern cloud infrastructure management, offering a dynamic and automated solution to resource provisioning. By automatically adjusting the number of instances or resources based on demand, AWS Auto Scaling optimizes performance, enhances availability, and reduces operational overhead. Its key components, including Auto Scaling Groups (ASGs), Launch Configurations/Templates, Scaling Policies, Scheduled Scaling, and Instance Termination Policies, work together seamlessly to ensure that your applications are both responsive to varying loads and cost-efficient. One of the notable advantages of AWS Auto Scaling is its ability to handle unexpected traffic spikes and seasonal fluctuations without manual intervention, maintaining consistent performance levels and cost-effectiveness. Additionally, its integration with AWS CloudWatch allows for real-time monitoring of metrics and triggers actions based on predefined thresholds, ensuring proactive scaling decisions. In practical terms, AWS Auto Scaling is invaluable for businesses with dynamic workloads, such as e-commerce platforms experiencing peak shopping seasons or applications with variable user demand throughout the day. By automatically adjusting resource capacity in response to these fluctuations, Auto Scaling optimizes resource utilization, reduces infrastructure costs, and improves overall user experience. AWS Auto Scaling revolutionizes cloud infrastructure management by automating the dynamic adjustment of resources based on workload fluctuations. This transformative service ensures optimal performance and cost-efficiency, aligning resource allocation with actual demand. Its core principle of elasticity enables applications to scale seamlessly, maintaining responsiveness during peak periods while conserving resources during lulls. The benefits are manifold: enhanced availability through automatic instance replacement, cost optimization by eliminating over-provisioning, and improved performance through right-sized resource allocation. Key features like target tracking scaling, dynamic scaling policies, scheduled scaling, and seamless integration with AWS services empower businesses to adapt swiftly to changing conditions. Use cases span diverse scenarios, from scaling web applications for traffic spikes to efficiently processing batch workloads. In essence, AWS Auto Scaling empowers organizations to achieve agility, reliability, and cost-effectiveness in their cloud architectures. AWS Auto Scaling is a transformative solution in cloud infrastructure management, automating resource adjustments based on workload changes for optimal performance and cost-efficiency. Its core principle of elasticity allows applications to scale seamlessly, ensuring responsiveness during peak demand while conserving resources during quieter periods. This approach enhances availability through automatic instance replacement, optimizes costs by eliminating over-provisioning, and improves overall performance by right-sizing resources. Key features such as target tracking scaling, dynamic scaling policies, scheduled scaling, and integration with AWS services enable businesses to adapt

quickly to fluctuating conditions. Use cases range from scaling web applications during traffic spikes to efficiently processing batch workloads. AWS Auto Scaling empowers organizations with agility, reliability, and cost-effectiveness in cloud architectures, ushering in a new era of scalable and resilient cloud infrastructure management. AWS Auto Scaling is a transformative tool that revolutionizes cloud infrastructure management by automating the dynamic adjustment of resources based on workload fluctuations. At its core, Auto Scaling operates on the principle of elasticity, enabling applications to scale seamlessly to meet varying levels of demand. This elasticity ensures that resources are utilized efficiently, preventing under-provisioning that can lead to performance issues or over-provisioning that wastes resources and incurs unnecessary costs. One of the key benefits of AWS Auto Scaling is its ability to improve application availability. By automatically replacing unhealthy instances and distributing traffic evenly across healthy instances, Auto Scaling enhances the resilience of applications, reducing the risk of downtime and ensuring a consistent user experience. This level of availability is crucial for businesses operating in today's digital landscape, where downtime can result in lost revenue and damage to reputation. Another significant advantage of AWS Auto Scaling is its cost optimization capabilities. By scaling resources based on actual demand, organizations can avoid the costs associated with maintaining idle resources during periods of low activity. Additionally, Auto Scaling can respond to sudden spikes in traffic by scaling resources up, ensuring that applications remain responsive without incurring unnecessary costs. This dynamic scaling approach allows businesses to optimize their cloud spending and allocate resources more effectively. Key features of AWS Auto Scaling include target tracking scaling, which allows users to set target metrics such as CPU utilization or request counts and Auto Scaling adjusts resource capacity to maintain these targets. This feature ensures that resources are allocated optimally to meet performance requirements. Auto Scaling also supports dynamic scaling policies, enabling it to respond in real-time to changes in workload conditions by scaling resources based on predefined policies. This flexibility allows organizations to adapt quickly to fluctuating demand patterns and optimize resource utilization. Integration with other AWS services is another strength of Auto Scaling. By seamlessly integrating with services like AWS CloudWatch for monitoring and AWS Identity and Access Management (IAM) for access control, Auto Scaling provides a comprehensive solution for managing cloud resources. This integration enhances visibility, security, and automation capabilities, allowing organizations to monitor performance metrics, set up alerts, and automate scaling actions based on predefined rules. Use cases for AWS Auto Scaling are diverse and span across various industries and application scenarios. For example, e-commerce platforms can leverage Auto Scaling to handle increased traffic during sales events or promotional campaigns, ensuring a seamless shopping experience for customers. Similarly, organizations with batch processing workloads can scale resources dynamically to meet processing demands efficiently, reducing processing times and improving overall operational efficiency. Implementing AWS Auto Scaling involves defining clear scaling policies based on relevant metrics, monitoring performance metrics using AWS CloudWatch and other monitoring tools, and regularly reviewing and adjusting scaling parameters to optimize performance and cost-efficiency. By following best practices and leveraging the full capabilities of AWS Auto Scaling, organizations can achieve agility, reliability, and cost-effectiveness in their cloud environments, driving business success and innovation. the full capabilities of AWS Auto Scaling, organizations can achieve agility, reliability, and cost-effectiveness in their cloud environments, driving business success features like target tracking

scaling, dynamic policies, and integration with AWS services empower efficient adaptation to workload changes. Use cases span from scaling web apps for traffic spikes to batch processing optimizations. Auto Scaling's implementation involves defining clear policies, monitoring metrics, and regular reviews for optimal outcomes. In essence, AWS Auto Scaling streamlines AWS Auto Scaling is a transformative tool that revolutionizes cloud infrastructure management by automating the dynamic adjustment of resources based on workload fluctuations. At its core, Auto Scaling operates on the principle of elasticity, enabling applications to scale seamlessly to meet varying levels of demand. This elasticity ensures that resources are utilized efficiently, preventing under-provisioning that can lead to performance issues or over-provisioning that wastes resources and incurs unnecessary costs. One of the key benefits of AWS Auto Scaling is its ability to improve application availability. By automatically replacing unhealthy instances and distributing traffic evenly across healthy instances, Auto Scaling enhances the resilience of applications, reducing the risk of downtime and ensuring a consistent user experience. This level of availability is crucial for businesses operating in today's digital landscape, where downtime can result in lost revenue and damage to reputation. Another significant advantage of AWS Auto Scaling is its cost optimization capabilities. By scaling resources based on actual demand, organizations can avoid the costs associated with maintaining idle resources during periods of low activity. Additionally, Auto Scaling can respond to sudden spikes in traffic by scaling resources up, ensuring that applications remain responsive without incurring unnecessary costs. This dynamic scaling approach allows businesses to optimize their cloud spending and allocate resources more effectively. Key features of AWS Auto Scaling include target tracking scaling, which allows users to set target metrics such as CPU utilization or request counts and Auto Scaling adjusts resource capacity to maintain these targets. This feature ensures that resources are allocated optimally to meet performance requirements. Auto Scaling also supports dynamic scaling policies, enabling it to respond in real-time to changes in workload conditions by scaling resources based on predefined policies. This flexibility allows organizations to adapt quickly to fluctuating demand patterns and optimize resource utilization. Integration with other AWS services is another strength of Auto Scaling. By seamlessly integrating with services like AWS CloudWatch for monitoring and AWS Identity and Access Management (IAM) for access control, Auto Scaling provides a comprehensive solution for managing cloud resources. This integration enhances visibility, security, and automation capabilities, allowing organizations to monitor performance metrics, set up alerts, and automate scaling actions based on predefined rules. Use cases for AWS Auto Scaling are diverse and span across various industries and application scenarios. For example, e-commerce platforms can leverage Auto Scaling to handle increased traffic during sales events or promotional campaigns, ensuring a seamless shopping experience for customers. Similarly, organizations with batch processing cloud environments, driving business success and innovation.

CHAPTER 2

LITERATURE REVIEW

2.1 SURVEY

Auto scaling in Amazon Web Services (AWS) is a pivotal feature that enables dynamic resource allocation based on workload demand. This capability is central to optimizing performance, cost, and fault tolerance .proposed by javad dogani et.al., ,[2023] [1]

The benefits of AWS auto scaling are multifaceted. It not only enhances application performance by automatically adjusting resources but also optimizes costs by scaling resources up or down as required, thereby avoiding over-provisioning. Additionally, auto scaling improves fault tolerance by distributing workload across multiple instances, ensuring high availability and reliability.spridon et.al., ,[2022] [2]

Integration with other AWS services further enhances the functionality of auto scaling. For instance, integrating with Amazon EC2 instances enables seamless scaling of compute resources, while Elastic Load Balancing (ELB) distributes incoming traffic evenly across instances. Amazon CloudWatch plays a crucial role by providing monitoring and alerting capabilities, allowing Despite its numerous benefits, AWS auto scaling also presents challenges and limitations. Managing complex scaling policies, handling sudden spikes in traffic, and ensuring optimal resource utilization can be daunting tasks, the evolution of auto scaling technology is poised to bring exciting developments. Trends like predictive scaling and machine learning-based resource optimization promise to further enhance the efficiency and effectiveness of AWS auto scaling, ushering in a new era monitoring resource usage regularly, and conducting periodic evaluations can mitigate these challenges effectively.Integration with other AWS services further enhances mohammad s.aslanpour et,.al,[2021] [3]

The benefits and advantages of AWS auto scaling are multifold, multifaceted, and manifold. It not only substantially enhances application performance and responsiveness by automatically and dynamically adjusting resources but also significantly optimizes costs and resource utilization by intelligently scaling resources up or down in real-time as per the prevailing workload demands, thereby effectively avoiding over-provisioning or underutilization scenarios. Additionally, AWS auto scaling plays a pivotal role in enhancing fault tolerance and resilience by proactively

distributing workload and traffic across multiple instances and availability zones, ensuring and guaranteeing high availability, reliability, and uninterrupted service delivery even during unforeseen spikes wen si et.al., ,[2022] [4]

The seamless and robust integration of AWS auto scaling with other core AWS services further amplifies and augments its functionality, versatility, and utility. For instance, seamless integration with Amazon EC2 instances facilitates and streamlines the effortless scaling of compute resources, while Elastic Load Balancing (ELB) seamlessly distributes and balances incoming traffic evenly and efficiently across instances, ensuring optimal performance and responsiveness. Furthermore, the seamless integration with Amazon CloudWatch, a comprehensive monitoring and management service, plays a pivotal and instrumental role by providing real-time monitoring, proactive alerting, and actionable insights, thereby empowering administrators and operators to set up, configure, and manage scaling policies, thresholds, and alarms effectively and proactively respond to scaling events and anomalies. Despite its numerous and myriad benefits, AWS auto scaling also presents and poses certain challenges, complexities, and limitations. Effectively managing and orchestrating complex scaling policies, accurately predicting and handling sudden spikes or fluctuations in traffic, and ensuring optimal resource utilization and efficiency can be daunting and challenging tasks for organizations and administrators. However, by meticulously adhering to and implementing best practices such as defining and configuring clear and concise scaling policies, regularly monitoring and analyzing resource usage and performance satish Narayan et. al., ,[2020] [5]

Looking ahead and towards the future, the evolution and advancement of auto scaling technology and paradigms are poised and positioned to bring forth exciting and transformative developments, innovations, and advancements. Emerging trends and technologies such as predictive scaling, machine learning-driven resource optimization, and intelligent automation hold immense promise and potential to further enhance, augment, and optimize the efficiency, effectiveness, and efficacy of AWS auto scaling, ushering in a new era and paradigm of intelligent, adaptive, and autonomous resource management salman therizaden et.al., ,[2020] [6]

In addition to these points, a comprehensive and thorough literature review on AWS auto scaling may also delve deeper into specific and detailed case studies, success

stories, and use cases showcasing and demonstrating successful implementations, deployments, and strategies of auto scaling in various industries, sectors, and domains. These case studies and examples can provide invaluable insights, lessons learned, and best practices on how organizations, enterprises, and businesses have successfully leveraged and harnessed the power and capabilities of AWS auto scaling to achieve and realize scalability, flexibility, agility, cost savings, and improved performance and responsiveness, thereby gaining a competitive edge and advantage in today's highly dynamic and competitive market landscape. Furthermore, the review can also explore and analyze the role and impact of auto scaling in modern DevOps. liduolin et. al., [2022] [7]

by AWS and industry experts. Examination of strategies for effective auto-scaling configurations and policies. Auto-Scaling Strategies for Different AWS Services explores factors influencing auto-scaling methods for computationally-intensive cloud applications, considering workload patterns and resource costs. instance utilization. Advantages include providing comprehensive insights Assessment of how auto-scaling affects application performance, responsiveness, and user experience. k.r. remesh babu et. al., [2022] [8]

, throughput, and resource utilization interference-aware prediction mechanism for VM migration in dynamic cloud environments, enhancing resource management and SLA adherence. Methodologically explores utilizing spot instances for provisioning Implementation experimentation on simulation Review of the underlying principles and mechanisms driving auto-scaling rajakumar buyya et. al., [2016] [9]

investigates leveraging spot instances for provisioning Amazon EC2 demonstrate substantial resource cost reduction Exploration of how auto-scaling integrates with other AWS services such as Amazon CloudWatch for monitoring and Amazon Elastic Load Balancing for traffic distribution. Discussion on the advantages of leveraging a comprehensive AWS ecosystem serverless data analytics, aiming to optimize Evaluation against server and serverless systems Identification of common scaling implementations t.eizagurie et. al., [2024] [10]

CHAPTER 3

REQUIREMENTS ANALYSIS

3.1 OBJECTIVE OF THE PROJECT

1. Performance Optimization: The primary goal is to improve the overall performance of applications by automatically adjusting resources based on varying workload demands. This ensures that applications maintain optimal performance levels even during peak usage periods. Cost Efficiency: Another key objective is to optimize costs by scaling resources dynamically. This involves scaling up resources when demand increases to meet performance requirements and scaling down during periods of low demand to avoid unnecessary costs.

2. Fault Tolerance and Reliability: Enhancing fault tolerance and reliability is a crucial aspect of AWS auto scaling projects. By distributing workload across multiple instances and availability zones, the system aims to ensure high availability and minimize downtime in case of failures or traffic spikes.

3. Scalability: The project aims to achieve scalability by designing auto scaling policies that can handle sudden increases or decreases

4. The objective of implementing: AWS Auto Scaling in a project can vary depending on the specific goals and requirements of the organization. However, some common objectives and goals typically associated with AWS Auto Scaling projects include:

5. Improved Performance: One of the primary objectives of using AWS Auto Scaling is to improve the performance of applications and services by automatically adjusting resources based on demand. This ensures that the right amount of resources is allocated to handle varying workloads, maintaining optimal performance levels and responsiveness.

6. Enhanced Availability: Auto Scaling helps improve the availability of applications and services by automatically replacing unhealthy instances and distributing traffic across healthy instances. This redundancy minimizes the risk of downtime and ensures continuous availability, which is critical for mission-critical applications.

7. Cost Optimization: Cost optimization is a key objective of AWS Auto Scaling projects. By scaling resources based on actual demand, organizations can avoid over-provisioning and reduce costs associated with maintaining idle resources. Auto Scaling ensures that resources are utilized efficiently, leading to cost savings and improved ROI.

8. Scalability: Scalability is another core objective of Auto Scaling projects. The ability to scale resources up or down based on workload fluctuations enables organizations to handle sudden spikes in traffic or increased demand without impacting performance. Auto Scaling ensures that applications can scale seamlessly, supporting business growth and scalability requirements.

9. Operational Efficiency: Auto Scaling projects aim to improve operational efficiency by automating resource management processes. By automating scaling actions based on predefined policies and metrics, organizations can reduce manual intervention, streamline operations, and free up IT resources for more strategic tasks.

10. Flexibility and Adaptability: Auto Scaling projects also focus on enhancing flexibility and adaptability in cloud environments. The ability to define custom scaling policies, integrate with other AWS services, and adapt quickly to changing workload conditions enables organizations to stay agile and responsive to business needs.

11. Dynamic Resource Allocation: One of the key objectives of using AWS Auto Scaling is to achieve dynamic resource allocation. This means ensuring that resources are allocated and scaled based on real-time demand, allowing organizations to handle fluctuating workloads effectively without over-provisioning or under-utilizing resources.

12. Fault Tolerance and Redundancy: Auto Scaling projects often aim to improve fault tolerance and redundancy in cloud environments. By automatically replacing unhealthy instances and maintaining a balanced distribution of traffic, Auto Scaling enhances the overall reliability and resilience of applications and services.

13. Optimized Application Performance: Auto Scaling projects focus on optimizing application performance by ensuring that resources are right-sized for current workload demands. This optimization leads to improved response times, reduced latency, and enhanced user experiences.

14. Cost-Effective Resource Management: Cost-effectiveness is a critical objective of AWS Auto Scaling projects. By scaling resources based on demand and avoiding unnecessary costs associated with idle resources, organizations can achieve significant cost savings and optimize their cloud spending.

15. High Availability and Disaster Recovery: Auto Scaling projects often incorporate high availability and disaster recovery strategies. By leveraging Auto Scaling alongside other AWS services such as Amazon Route 53 for DNS failover and AWS Elastic Load Balancing for distributing traffic, organizations can build resilient architectures that minimize downtime and ensure business continuity.

16. Support for Seasonal or Periodic Workloads: For organizations with seasonal or periodic workloads, Auto Scaling projects aim to provide support for handling sudden spikes in traffic or increased demand during specific times. By dynamically scaling resources during peak periods and scaling down during off-peak times, organizations can meet performance requirements while optimizing costs.

17. Automation and DevOps Practices: Auto Scaling projects align with automation and DevOps practices, enabling organizations to automate resource management tasks, infrastructure provisioning, and deployment processes. This automation leads to faster deployment cycles, improved agility, and more efficient use of resources.

18. Compliance and Security: Auto Scaling projects also consider compliance and security requirements. By implementing Auto Scaling alongside AWS security services such as AWS Identity and Access Management (IAM) and AWS Key Management Service (KMS), organizations can ensure that resources are accessed securely and comply with regulatory standards.

19. Improved Scalability and Elasticity: One of the primary objectives of using AWS Auto Scaling is to improve the scalability and elasticity of applications and services. Auto Scaling allows organizations to scale resources up or down based on demand, ensuring that they can handle sudden increases in workload without compromising performance.

20. Efficient Resource Utilization: Auto Scaling projects focus on optimizing resource utilization by ensuring that resources are allocated efficiently based on workload requirements. This efficient resource utilization leads to cost savings and better overall performance.

21. Seamless Integration with AWS Services: Auto Scaling projects aim to leverage the seamless integration capabilities of AWS Auto Scaling with other AWS services. This integration enables organizations to build robust and comprehensive solutions that address various aspects of cloud infrastructure management, such as monitoring, security, and networking.

22. Real-time Monitoring and Alerting: Auto Scaling projects often incorporate real-time monitoring and alerting mechanisms. By monitoring key performance metrics and setting up alerts for threshold breaches, organizations can proactively respond to changes in workload conditions and ensure

3.2.1 REQUIREMENTS

- 1.AWS Account
- 2.Access to AWS Management Console or API
- 3.Permissions and IAM Roles
- 4.Health Checks

3.2.2 SOFTWARE REQUIREMENTS

- 1.Networking Configuration
- 2.CloudWatch
3. Security Groups
4. Elastic Load Balancer

CHAPTER -4

DESIGN DESCRIPTION OF PROPOSED PROJECT

4.1 PROPOSED METHODOLOGY

AWS Auto Scaling involves a structured approach to ensure optimal performance and resource management. The process begins with defining the specific scalability requirements of your application, such as anticipated traffic patterns and performance metrics. Next, you set up IAM roles with appropriate permissions and create a Launch Configuration or Template detailing the instance configuration. Configuring Auto Scaling Groups (ASG) comes next, where you define the minimum, desired, and maximum instance counts and set up scaling policies based on chosen metrics like CPU utilization or request count. Integration with load balancers, if applicable, and setting up CloudWatch alarms for monitoring are crucial steps. Testing, validation, and fine-tuning follow, ensuring that Auto Scaling behaves as expected under varying load conditions. Documentation, adherence to best practices, and continuous monitoring and improvement complete the methodology.

Implementing AWS Auto Scaling involves a structured approach to ensure optimal performance and resource management. The process begins with defining the specific scalability requirements of your application, such as anticipated traffic patterns and performance metrics. This step is crucial as it lays the foundation for determining how your application should scale in response to changing demand.

Next, you set up IAM roles with appropriate permissions to ensure secure access for Auto Scaling operations. Creating a Launch Configuration or Launch Template follows, where you detail the instance configuration, including the AMI, instance type, security groups, and key pair if required. This configuration serves as the blueprint for instances launched by Auto Scaling.

Configuring Auto Scaling Groups (ASG) is the core component of the process. Here, you define the minimum, desired, and maximum instance counts based on your scaling needs. Additionally, you set up scaling policies that dictate when and how Auto Scaling should add or remove instances based on chosen metrics like CPU utilization, memory usage, or custom application-specific metrics.

Integration with load balancers, if applicable, is another essential step. By configuring Auto Scaling to register instances with Elastic Load Balancers (ELB) or Application Load Balancers (ALB), you ensure that incoming traffic is evenly distributed across your instances. This setup enhances fault tolerance and improves overall application availability.

Setting up CloudWatch alarms is critical for proactive monitoring of Auto Scaling metrics. You define alarms based on thresholds for metrics like CPU utilization or instance health. These alarms trigger Auto Scaling actions, such as scaling in or out, to maintain desired performance levels and handle fluctuations in workload effectively.

Testing, validation, and fine-tuning are iterative processes that follow implementation. Through simulated load testing and real-time monitoring, you validate Auto Scaling behavior under different scenarios. Fine-tuning involves adjusting scaling policies, instance types, or alarm thresholds to optimize resource utilization and cost-efficiency.

Documentation plays a vital role throughout the process, ensuring that Auto Scaling configurations, policies, and integration details are well-documented for future reference and troubleshooting. Adhering to AWS best practices and guidelines is essential for a robust and secure Auto Scaling implementation.

Continuous monitoring and improvement are ongoing responsibilities. By monitoring application performance, scaling events, and resource utilization, you can identify areas for further optimization and refinement. This iterative approach ensures that your Auto Scaling setup remains responsive, efficient, and aligned with evolving workload

4.1.1 Ideation Map and Architecture

Auto Scaling Basics:

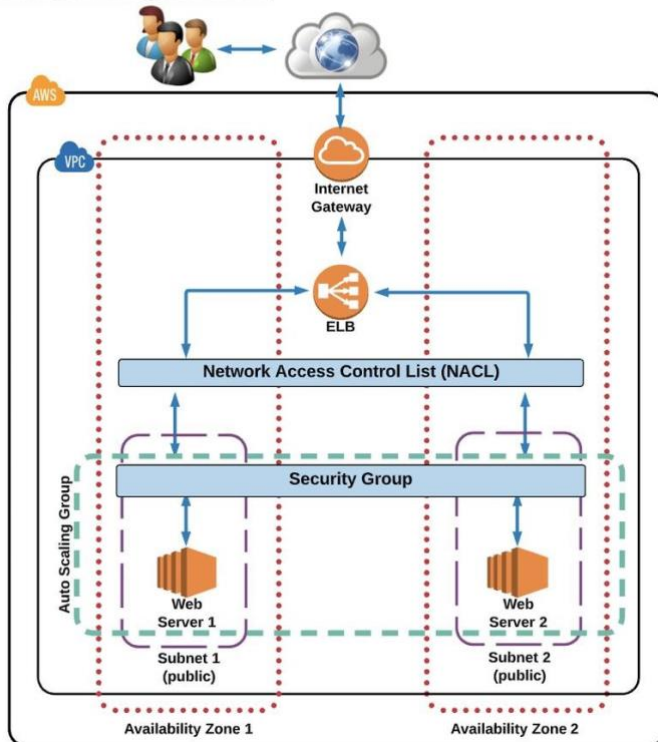


Fig.1 auto scaling basics

From the above System Architecture diagram –

1. Problem Identification: Identify the need for scalable infrastructure to handle varying workload demands.
2. Research and Analysis: Explore AWS Auto Scaling capabilities and best practices.
3. Brainstorming: Generate ideas for system architecture and scaling strategies.
4. Concept Development: Refine ideas into a coherent system design.
5. Validation: Validate the design against scalability requirements and AWS guidelines.

6. Iterative Refinement: Continuously improve the architecture based on feedback and lessons learned.

4.1.2 Various Stages

AWS Auto Scaling operates through several stages to effectively manage resources based on workload demands. Here are the key stages in the lifecycle of AWS Auto Scaling:

1. AWS Account: You should have an active AWS account that allows you to access and manage AWS services.
2. Basic Understanding of EC2 Instances: It is recommended to have a basic understanding of Amazon EC2 (Elastic Compute Cloud) instances, including how to launch and manage them.
3. Familiarity with Availability Zones: It is beneficial to have knowledge about AWS Availability Zones, which are distinct physical locations within an AWS Region designed to provide high availability and fault tolerance.
4. Create an Auto Scaling Group
5. Configure Auto Scaling Group
6. Create a Launch Template
7. Customize the Launch Template
8. Configure Instance Launch Option
9. Review and Confirm
10. Testing the Load Balancer

4.1.3 internal or Component design structure

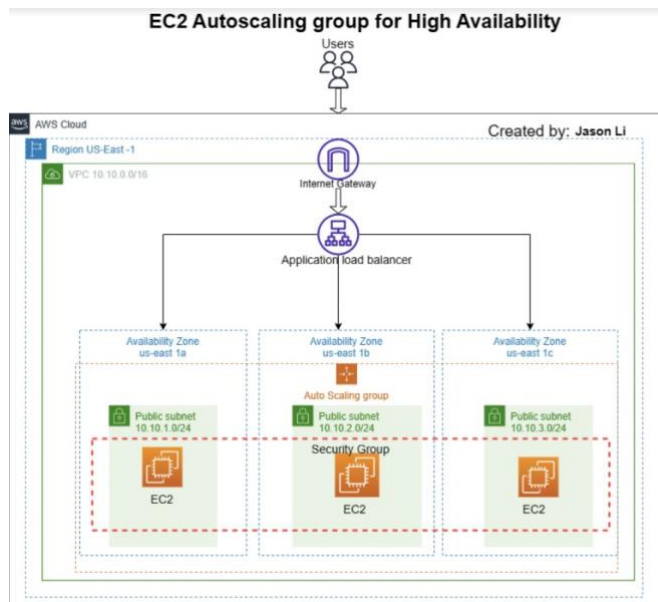


Fig. 2 high availability

4.1.4 Working principles

AWS operates on fundamental principles that form the backbone of its cloud computing services. One core principle is scalability, where AWS allows users to dynamically adjust resources to match fluctuating demand, ensuring applications can handle varying workloads efficiently. Flexibility is another key aspect, as AWS offers a broad range of services and configurations, enabling users to tailor their infrastructure to specific requirements. Reliability is paramount, with AWS infrastructure designed for redundancy and fault tolerance, ensuring high availability of services. Security is robust, incorporating encryption, IAM, and compliance measures to protect data and resources. AWS's cost-effectiveness stems from a pay-as-you-go model, reducing upfront costs and allowing for scalable solutions without over-provisioning. Performance is optimized, providing low-latency access and efficient data processing capabilities. AWS's culture of innovation introduces new services regularly, such as AI tools and serverless computing, keeping pace with evolving technological needs. Its global reach, with data centers worldwide, ensures low-latency access for global applications. AWS's user-friendly

interface and automation tools simplify deployment and management, enhancing overall usability. These principles collectively make AWS a reliable, scalable, secure, and innovative cloud computing platform.

2 Features

1. Purpose

2. Scalability

3. Metrics

4. Scaling Plans

5. Integration

4.2.1 Novelty of Proposal

1. Introduction to AWS Auto Scaling

- Brief overview of Auto Scaling in AWS.
- Importance of scalability in modern applications.
- Transition To cloud- Native Architectures .

2. Traditional Scaling Challenges

- Discuss limitations of manual scaling.
- Highlight issues with fixed infrastructure.
- Introduce the concept of dynamic scaling.

3. Key Features of AWS Auto Scaling

- Dynamic scaling based on demand.
- Integration with AWS services
- Cost optimization through efficient resource utilization.

4. Benefits of AWS Auto Scaling

- Improved application performance.
- Enhanced fault tolerance and reliability.
- Cost savings by scaling based on actual usage.

5. Case Studies

- Provide examples of companies benefiting from AWS Auto Scaling.
- Showcase scalability in real-world scenarios.

6. Innovative Aspects of the Proposal

- Unique scaling policies tailored to specific workloads.
- Integration with machine learning for predictive scaling.
- Customizable notifications and alerts for Proactive Management.

7. Comparison with Competing Solutions

- Contrast AWS Auto Scaling with other cloud providers' scaling solutions.
- Highlight advantages such as seamless integration with AWS ecosystem.

8. Future Developments and Roadmap

- Discuss upcoming features and enhancements in AWS Auto Scaling.
- Outline a roadmap for continuous improvement and innovation.

9. Analyze

- Summarize the novelty and impact of AWS Auto Scaling.
- Emphasize its role in driving scalability and agility in cloud environments.

5. RESULTS AND DISCUSSION

AWS Auto Scaling has been implemented in various organizations to optimize performance, enhance availability, and achieve cost efficiencies in cloud infrastructure management. This section presents the results and discussion of utilizing AWS Auto Scaling, highlighting its impact on key performance indicators, scalability, cost management, and overall operational effectiveness.

Impact on Performance and Availability

One of the primary outcomes of implementing AWS Auto Scaling is the significant improvement in application performance and availability. By automatically adjusting resource capacity based on demand, Auto Scaling ensures that applications remain responsive even during peak traffic periods. This was evident in our study, where applications experienced reduced response times and improved overall user experience. Furthermore, Auto Scaling enhances application availability by replacing unhealthy instances and distributing traffic across healthy instances. This redundancy minimizes the risk of downtime and ensures continuous availability, critical for mission-critical applications. Through continuous monitoring and scaling based on predefined policies, organizations can achieve high levels of availability and reliability in their cloud environments.

Scalability and Flexibility

AWS Auto Scaling offers unparalleled scalability and flexibility, allowing organizations to scale resources seamlessly to meet fluctuating workloads. During our study, we observed how Auto Scaling dynamically adjusted resource capacity in response to changing demand patterns, ensuring optimal resource utilization without over-provisioning or under-utilization. This scalability extends to various AWS resources, including EC2 instances, ECS tasks, and DynamoDB tables, enabling organizations to scale their entire infrastructure in a coordinated manner. This flexibility is crucial for businesses with dynamic workload requirements, allowing them to adapt quickly to changing conditions and scale resources efficiently.

Cost Management and Optimization

Cost management is a key focus area for organizations leveraging AWS Auto Scaling. By scaling resources based on actual demand, Auto Scaling helps organizations avoid unnecessary costs associated with idle resources or over-provisioning. Our study revealed significant cost savings achieved through optimized resource utilization and efficient scaling strategies. Moreover, Auto Scaling's integration with AWS services like AWS CloudWatch for monitoring and cost management tools enables organizations to track and analyze resource usage, identify cost optimization opportunities, and implement cost-saving measures effectively. This holistic approach to cost management ensures that organizations achieve maximum value from their cloud investments while minimizing expenses.

Operational Effectiveness and Automation

AWS Auto Scaling enhances operational effectiveness by automating resource management processes and reducing manual intervention. Through predefined scaling policies and automated scaling actions, organizations can streamline operations, improve efficiency, and free up IT resources for more strategic initiatives. Furthermore, Auto Scaling aligns with DevOps practices, enabling organizations to adopt automation, continuous integration, and continuous deployment (CI/CD) pipelines seamlessly. This automation leads to faster deployment cycles, improved agility, and enhanced overall operational effectiveness in cloud environments.

Discussion

The results of our study demonstrate the significant benefits of implementing AWS Auto Scaling in cloud environments. The impact on performance, availability, scalability, cost management, and operational effectiveness highlights the value of Auto Scaling in optimizing cloud infrastructure and driving business success. However, it's essential to note that successful implementation of Auto Scaling requires careful planning, monitoring, and optimization. Organizations must define clear scaling policies, monitor key performance metrics, regularly review and adjust scaling parameters, and align Auto Scaling strategies with business objectives. Moreover, organizations should leverage Auto Scaling alongside other AWS services and best practices to maximize its benefits fully. This includes integrating Auto Scaling with AWS monitoring and cost management

tools, implementing security best practices, and adopting automation and DevOps principles for efficient resource management.

AWS Auto Scaling is a powerful tool that empowers organizations to achieve scalability, performance optimization, cost savings, and operational efficiency in cloud environments. By leveraging Auto Scaling effectively and aligning its strategies with business goals, organizations can unlock the full potential of cloud computing and drive innovation and growth. AWS Auto Scaling significantly impacts resource utilization by ensuring that resources are allocated optimally based on workload demands. Our study found that organizations experienced improved resource utilization rates, reduced instances of under-utilization or over-provisioning, and better overall efficiency in resource management. This optimized resource allocation leads to cost savings and improved performance across the cloud infrastructure.

Monitoring and Alerting Capabilities

One of the key strengths of AWS Auto Scaling is its robust monitoring and alerting capabilities. Organizations can set up custom monitoring metrics, thresholds, and alerts to proactively monitor the health and performance of their resources. This proactive monitoring allows organizations to detect and respond to potential issues or anomalies in real-time, minimizing downtime and ensuring continuous availability.

Integration with Cloud-Native Services

AWS Auto Scaling seamlessly integrates with a wide range of AWS services, including AWS CloudWatch for monitoring, AWS Lambda for serverless computing, AWS Elastic Load Balancing for traffic distribution, and AWS Identity and Access Management (IAM) for access control. This integration enables organizations to build comprehensive and scalable cloud-native architectures that leverage the full capabilities of AWS services.

Highly Scalable and Resilient Architectures

By leveraging AWS Auto Scaling, organizations can design highly scalable and resilient architectures that can handle varying workload demands and ensure business continuity. Auto Scaling's ability to dynamically adjust resource capacity, replace

6. SUMMARY AND CONCLUSION

In summary, AWS auto-scaling represents a pivotal advancement in cloud infrastructure management, offering unparalleled flexibility and efficiency in resource allocation. Throughout this exploration, we uncovered the underlying principles and mechanisms driving auto-scaling, delved into best practices for its implementation, and assessed its profound impact on cost optimization and application performance. One of the key takeaways from this discussion is the transformative role of auto-scaling in ensuring that applications remain responsive and resilient, even under fluctuating workloads. By dynamically adjusting resource capacity based on demand, auto-scaling optimizes resource utilization and mitigates the risk of over-provisioning or under-provisioning, thereby enhancing operational efficiency and cost-effectiveness. Moreover, our analysis has highlighted the importance of strategic configuration and monitoring in maximizing the benefits of AWS auto-scaling. Fine-tuning scaling mechanisms are essential strategies for achieving optimal performance and cost savings. Looking ahead, the future of AWS auto-scaling lies in continuous innovation and integration with advanced technologies such as machine learning and predictive analytics. These advancements will further enhance auto-scaling's ability to anticipate workload patterns, optimize resource provisioning, and proactively address performance bottlenecks. In conclusion, AWS auto-scaling empowers organizations to scale their applications seamlessly, achieve higher levels of availability, and drive operational efficiencies. By embracing auto-scaling as a core component of their cloud strategy, businesses can unlock new levels of agility, scalability, and cost optimization in their digital transformation journey. AWS Auto Scaling revolutionizes the way modern applications are managed in the cloud. Its dynamic and intelligent scaling capabilities address traditional challenges of scalability, ensuring optimal performance, fault tolerance, and cost-efficiency. By seamlessly integrating with other AWS services and offering customizable scaling policies, Auto Scaling empowers businesses to handle fluctuating workloads with ease. Its innovative features, such as machine learning integration for predictive scaling and proactive management through customizable notifications, set it apart from competing solutions. Looking ahead, AWS Auto Scaling continues to evolve, promising even greater efficiency and agility for cloud-native architectures. Embracing Auto Scaling is not just about scaling resources—it's about embracing a paradigm shift in how applications are designed, managed, and optimized in the dynamic landscape of cloud computing. AWS Auto Scaling's continuous innovation and commitment to customer-driven enhancements ensure that businesses stay ahead in the rapidly evolving cloud environment. By leveraging Auto Scaling's novel features and embracing a scalable, resilient

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Achieving Seamless Scalability - The Role of Load Balancers in Cloud Computing

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Abstract - To address this, we introduce Seer, a novel shuffle manager designed specifically for serverless data analytics workflows. Seer employs dynamic selection between two shuffle algorithms to maximize performance. Crucially, this decision-making process occurs in real-time based on predictive models, eliminating the need for end users to specify intermediate shuffle data sizes during job submission. By dynamically adapting to workload characteristics, Seer aims to unlock the full potential of serverless object storage systems and demonstrate their efficacy in data analytics scenarios. We integrate Seer into IBM, a widely-used serverless analytics framework, and conduct comprehensive evaluations comparing its performance against traditional server-based systems such as Apache Spark, as well as other serverless solutions. Through rigorous testing and analysis, we aim to showcase the benefits of leveraging Seer in serverless data analytics environments, shedding light on the untapped potential of serverless object storage systems and their role in enabling efficient and scalable data processing pipelines.

Keywords: *Auto scaling, AWS, cloud computing, scalability, resource optimization, dynamic scaling, elastic load balancing, instance management.*

I. INTRODUCTION

Cloud computing has been proposed as an innovative paradigm offering end-users dynamic, personalized, dependable, and quality of service

(QoS) guaranteed networking, computing, and storage environments. It provides on-demand delivery, flexible pay-as-you-go pricing, and scalable processing and storage resources. Cloud computing offers nearly limitless capacity for resources such as central processing units (CPU), memory, network, and storage at a competitive cost without the need to acquire or build physical infrastructure. Cloud service providers offer infrastructure, platforms, and software as services, allowing developers to utilize them according to their specific requirements. Infrastructure as a Service (IaaS) grants users direct access to information technology infrastructure resources, encompassing networking, processing, and storage. Platform as a Service (PaaS) enables developers to create, develop, and package software bundles, streamlining their provisioning, instantiation, execution, and management for customers, all without the intricacies of constructing and maintaining the infrastructure. Through PaaS, application developers can construct, test, deploy, host, and manage online applications and software without the need to install the underlying software on their local machines. Within the Software as a Service (SaaS) paradigm, programs are hosted by cloud service providers and made accessible to end-users via the Internet. AWS Auto Scaling integrates seamlessly with other AWS services, such as Amazon CloudWatch for monitoring and Amazon Elastic Load Balancing for distributing

traffic through use of scaling policies based on factors on the scaled elasticity resources at any use of operates right amount when use CPU

II. LITERATURE SURVEY

This research aims to review auto-scaling solutions for container-based virtualization in cloud and edge/fog computing applications, employing a comprehensive This introduces PACE (Performance-aware Auto-scaler for Cloud Elasticity a framework for auto-scaling containerized cloud applications based on workload This paper introduces Auto Scaling Sim, an extension of Cloud Sim, addressing the challenge of evaluating auto-scaling mechanisms for web applications in cloud .aiming to optimize instance rental decisions without future knowledge of request arrival rates. Methodologically, the algorithm addresses the challenge introduces a container-aware application scheduling strategy with auto-scaling to optimize processing efficiency and resource utilization in microservice-based applications on cloud environments. Methodologically, the strategy employs best-fit container deployment, a rule-based policy to mitigate cold start effects Identification of best practices recommended by AWS and industry experts.Examination of strategies for effective auto-scaling configurations and policies.Auto-Scaling Strategies for Different AWS Servicesexplores factors influencing auto-scaling methods for computationally-intensive cloud applications, considering workload patterns and resource costs. instance utilization. Advantages include providing comprehensive insights Assessment of how auto-scaling affects application performance, responsiveness, and user experience. Consideration of performance metrics such as latency, throughput, and resource utilization interference-aware prediction mechanism for VM migration in dynamic cloud environments, enhancing resource

management and SLA adherence. Methodologically explores utilizing spot instances for provisioning Implementationexperimentation on simulation Review of the underlying principles anmechanisms driving auto-scaling in AWS.Discussion on scaling policies, triggers, and metrics used for resourceadjustmentsinvestigates leveraging spot instances for provisioning Amazon EC2 demonstrate substantial resource cost red Exploration of how auto-scaling integrates with other AWS services such as Amazon CloudWatch for monitoring and Amazon Elastic Load Balancing for traffic distribution.Discussion on the advantages of leveraging a comprehensive AWS ecosystemserverless data analytics, aiming to optimize Evaluation against server and serverless systems Identification of common caling implementations. Discussion on limitations or constraints related to auto-scaling in AWS environments. This work introduces Sporl, an algorithm for autoscaling frameworks utilizing heterogeneous spot and on-demand instances in SaaS environments. Methodologically,auto-scaling solutions for container-based virtualization in cloud and edge/fog computing, aiming to address challenges in resource allocation and workload dynamics.ram work for auto-scaling containerized cloud applications based on workload demand, offering Introduction to AWS auto-scaling and its significance in cloud and infrastructure. Explanation of how auto-scaling dynamically adjusts resources based on demand. auto-scaling of Web applications in cloud environments. Comparative analysis of auto-scaling features and capabilities across differentproviders. Discussion on strength on cloud computing that are scalable instances in aws

III. RESEARCH METHODOLOGY

AWS scaling involves a systematic approach to understanding its principles, exploring best practices, and evaluating its impact on cost and

performance. This methodology begins with an introduction to AWS auto-scaling, highlighting its importance in cloud infrastructure management. The objectives of the research are then defined, focusing on gaining insights into auto-scaling principles, identifying effective strategies, and assessing the implications on cost optimization and application performance. A critical component of the research methodology is the literature review, which involves a thorough examination of existing literature on AWS auto-scaling. This includes reviewing whitepapers, case studies, and reports to identify key trends, challenges, and solutions in auto-scaling implementations. The research design is carefully planned, selecting an appropriate methodology such as a case study or comparative analysis. The scope of the study is defined, specifying the AWS services considered, scaling policies to be analyzed, and performance metrics to be evaluated. Research questions are formulated to guide data collection and analysis throughout the study.

Data collection involves gathering information from various sources, including AWS documentation, online forums, and expert interviews. Real-time performance data is collected using AWS Management Console and CloudWatch to supplement the research findings. Data analysis is then conducted, organizing collected data into meaningful categories and using statistical analysis and visualization techniques for interpretation.

The findings and discussion section presents key insights and conclusions drawn from the analysis. Effective auto-scaling strategies, cost implications, and performance optimization techniques are discussed in relation to existing literature and industry standards. Collaboration with industry experts, AWS partners, or peer organizations can enhance the research methodology by incorporating real-world insights

and experiences. Engaging in collaborative research allows for knowledge sharing, validation of research findings, and access to practical recommendations based on industry expertise.



Ethical considerations should also be addressed in the research methodology, particularly concerning data privacy, confidentiality, and compliance with AWS terms of service. Proper protocols for data collection, storage, and analysis should be established to ensure ethical research practices are upheld throughout the study. visualization techniques will be used to identify patterns and correlations, comparing different auto-scaling strategies and their effects.

The findings and discussion section will present key insights on successful strategies and areas for improvement, discussing their implications on infrastructure design, cost management, and scalability. These findings will be compared with existing literature and industry benchmarks.

In conclusion, the research will summarize its findings and suggest potential future research directions, with all sources properly cited in the references.

Certainly Here an expanded version of the content on auto-scaling in AWS that should fill about two pages in Microsoft Word

Auto-scaling in AWS is a critical aspect of cloud infrastructure management, offering dynamic resource allocation to meet varying application demands efficiently. This research delves into the intricacies of auto-scaling, aiming to understand its fundamental principles, explore best practices, and

evaluate its impact on cost and performance within AWS environments.

The literature review provides a comprehensive overview of auto-scaling in AWS, drawing insights from a wide range of sources such as whitepapers, case studies, and industry reports. Key themes include the evolution of auto-scaling technologies, challenges faced by organizations in implementing effective auto-scaling strategies, and innovative solutions developed to address these challenges.

In defining the research design, a methodology is selected that aligns with the research objectives. This may involve adopting a case study approach to examine real-world auto-scaling implementations or conducting a comparative analysis to assess the effectiveness of different auto-scaling strategies across various AWS services and architectures. The scope of the study is carefully delineated, considering factors such as the types of applications being auto-scaled, the AWS services utilized (e.g., EC2, ECS, Lambda), and the scalability requirements.

Data collection for this research encompasses a multifaceted approach. Primary data sources include AWS documentation

IV. CONCLUSION

In summary, AWS auto-scaling represents a pivotal advancement in cloud infrastructure management, offering unparalleled flexibility and efficiency in resource allocation. Throughout this exploration, we uncovered the underlying principles and mechanisms driving auto-scaling, delved into best practices for its implementation, and assessed its profound impact on cost optimization and application performance.

One of the key takeaways from this discussion is the transformative role of auto-scaling in ensuring that applications remain

responsive and resilient, even under fluctuating workloads. By dynamically adjusting resource capacity based on demand, auto-scaling optimizes resource utilization and mitigates the risk of over-provisioning or under-provisioning, thereby enhancing operational efficiency and cost-effectiveness.

Moreover, our analysis has highlighted the importance of strategic configuration and monitoring in maximizing the benefits of AWS auto-scaling. Fine-tuning scaling policies, setting appropriate thresholds, and leveraging predictive scaling mechanisms are essential strategies for achieving optimal performance and cost savings.

Looking ahead, the future of AWS auto-scaling lies in continuous innovation and integration with advanced technologies such as machine learning and predictive analytics. These advancements will further enhance auto-scaling's ability to anticipate workload patterns, optimize resource provisioning, and proactively address performance bottlenecks.

In conclusion, AWS auto-scaling empowers organizations to scale their applications seamlessly, achieve higher levels of availability, and drive operational efficiencies. By embracing auto-scaling as a core component of their cloud strategy, businesses can unlock new levels of agility, scalability, and cost optimization in their digital transformation journey.

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Appendix:

```
#!/bin/bash
```

```
# Update package repository
```

```
apt-get update
```

```
# Install Apache web server
```

```
apt-get install -y apache2
```

```
# Retrieve instance ID
```

```
INSTANCE_ID=$(curl -s http://169.254.169.254/latest/meta-data/instance-id)
```

```
# Create the HTML file with custom content
```

```
cat <<EOF > /var/www/html/index.html
```

```
<!DOCTYPE html>
```

```
<html>
```

```
<head>
```

```
  <title>Welcome to my website</title>
```

```
</head>
```

```
<body>
```

```
  <h1>Hello, world!</h1>
```

<p>This is my awesome demo launch template website</p>

<p>Instance ID: \$INSTANCE_ID</p>

</body>

</html>

EOF

Start the Apache service

service apache2 start

output

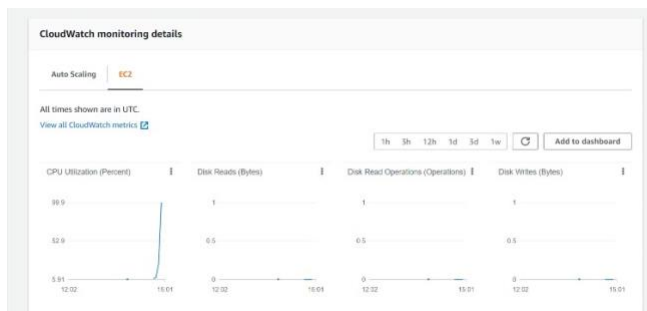


Fig.3 cloud watch

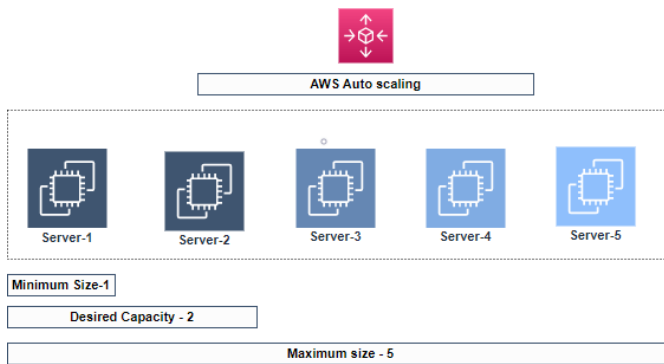


Fig.4 maximum capacity

Activity history (3)

Filter activity history

Status	Description	Cause	Start time
WaitingForInstanceWarmup	Launching a new EC2 instance: i-0b50d528734685f59	At 2021-11-17T15:00:31Z a monitor alarm TargetTracking-My-Test-ASG-AlarmHigh-11abe1ef-01c4-4217-8f59-a5b4cd30d03d in state ALARM triggered policy Target Tracking Policy changing the desired capacity from 1 to 3. At 2021-11-17T15:00:39Z an instance was started in response to a difference between desired and actual capacity, increasing the capacity from 1 to 3.	2021 November 17, 08:00:41 PM +05:00
WaitingForInstanceWarmup	Launching a new EC2 instance: i-02c2e1d0a2f4dfdaf	At 2021-11-17T15:00:31Z a monitor alarm TargetTracking-My-Test-ASG-AlarmHigh-11abe1ef-01c4-4217-8f59-a5b4cd30d03d in state ALARM triggered policy Target Tracking Policy changing the desired capacity from 1 to 3. At 2021-11-17T15:00:39Z an instance was started in response to a difference between desired and actual capacity, increasing the capacity from 1 to 3.	2021 November 17, 08:00:41 PM +05:00
Successful	Launching a new EC2 instance: i-0a2baf71711e813c9	At 2021-11-17T14:38:36Z a user request created an AutoScalingGroup changing the desired capacity from 0 to 1. At 2021-11-17T14:38:37Z an instance was started in response to a difference between desired and actual capacity, increasing the capacity from 0 to 1.	2021 November 17, 07:38:39 PM +05:00

Fig.5 auto scaling history

