NAAN MUDHALVAN

Harnessing EC2, VPC & MobaXterm for Cutting-Edge EntityHosting

Project Created by:

BRAVEEN RAJ R

SANGILI DURAI S

CHANDRU

SANA BALAMOHAN

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College Code: 4126

Team Name:

BONAFIDE CERTIFICATE

Certified that this Naan Mudhalvan project report **"Harnessing EC2, VPC & MobaXterm for Cutting-Edge Entity Hosting"** is the bonafidework of_____who carried out the projectwork under my supervision.

SIGNATURE
Project Coordinator
Naan Mudhalvan

SIGNATURE
SPoC
Naan Mudhalvan

INTERNAL EXAMINER

EXTERNAL EXAMINER

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Introduction:

This project explores the deployment and management of hosting environments using Amazon EC2 (Elastic Compute Cloud), Amazon VPC (Virtual Private Cloud), and MobaXterm. Through three distinct scenarios, we aim to demonstrate how these technologies can be leveraged to create secure, scalable, and efficient hosting solutions tailored to different organizational needs, including financial institutions, e-commerce platforms, and tech start-ups.

Key scenarios about problem :

Scenario 1: Secure Internal Application Hosting for a Financial Institution

- **Goal**: Host a secure internal application handling sensitive data.
- **Setup**: EC2 instances within a VPC for isolated environments.
- **Management**: MobaXterm for secure remote access and management.
- **Benefit**: Highly secure, scalable, and compliant hosting environment.

Scenario 2: High-Availability Web Hosting for an E-Commerce Platform

- **Goal**: Host a high-availability website to handle traffic fluctuations.
- **Setup**: Multiple EC2 instances across different availability zones within a VPC.
- **Management**: MobaXterm for quick updates and instance management.
- **Benefit**: Fault tolerance, load balancing, and consistent performance during peak traffic.

Scenario 3: Custom Web Application Deployment for a Start-Up

- **Goal**: Deploy a custom web application as a primary business platform.
- **Setup**: EC2 instance within a VPC for secure and isolated hosting.
- **Management**: MobaXterm for streamlined deployment and server management.
- **Benefit**: Flexible, scalable, and cost-effective solution with control over the hosting environment.

Executive Summary:

This project illustrates the practical applications of EC2, VPC, and MobaXterm in hosting environments. It includes three scenarios:

1. **Secure Internal Application Hosting for a Financial Institution**: Ensuring compliance and security for sensitive client data.
2. **High-Availability Web Hosting for an E-Commerce Platform**: Achieving fault tolerance and load balancing to handle traffic fluctuations.

3. **Custom Web Application Deployment for a Start-Up**: Providing a flexible, scalable, and cost-effective solution for a primary business platform.

Objective:

The objective of this project is to:

1. Demonstrate the application of EC2, VPC, and MobaXterm in creating tailored hosting environments.
2. Compare the performance and efficiency of different deployment scenarios.
3. Highlight best practices for secure, scalable, and manageable hosting solutions.
4. Provide insights into the practical benefits and limitations of using these technologies.

Methodology

1. **Scenario Planning**: Define three distinct scenarios to cover a range of hosting needs.
2. **Environment Setup**:
    - **Financial Institution**: Deploy EC2 instances within a VPC for isolation, use MobaXterm for secure access.
    - **E-Commerce Platform**: Set up multiple EC2 instances across different availability zones within a VPC, use MobaXterm for updates and management.
    - **Tech Start-Up**: Host a custom web application on an EC2 instance within a VPC, streamline deployment with MobaXterm.
3. **Security Measures**: Implement security protocols to ensure compliance and protect sensitive data.
4. **Performance Testing**: Evaluate the performance of each scenario in terms of query response times, fault tolerance, and load balancing.
5. **Data Analysis**: Analyse the results to identify strengths and weaknesses of each approach.
6. **Documentation**: Compile findings into a comprehensive report with recommendations for best practices.

This methodology ensures a systematic and thorough evaluation of the hosting solutions, providing valuable insights into their real-world applications. If you have any specific questions or need further elaboration, just let me know!

create the content for artifacts used, technical coverage, commands used results, features and benefits, challenges and solutions, conclusion.

Artifacts Used

- **Amazon EC2 Instances**: Virtual servers used to host applications and services.
- **Amazon VPC**: Virtual networks that isolate EC2 instances for enhanced security.
- **MobaXterm**: An advanced terminal software used for remote access and management of EC2 instances.
- **Power BI**: Business analytics service used to visualize and analyse data.

Technical Coverage

- **EC2 Configuration**: Setting up, configuring, and managing EC2 instances for different use cases.
- **VPC Setup**: Creating and managing Virtual Private Clouds to ensure secure and isolated environments.
- **Remote Access**: Utilizing MobaXterm for secure SSH connections and remote server management.
- **Data Analysis**: Using Power BI to analyse and visualize data retrieved from EC2 instances.

Commands Used

- **EC2 Instance Management**:

Bash commands

aws ec2 run-instances --image-id ami-0abcdef1234567890 --count 1 --instance-type t2.micro --key-name MyKeyPair --security-group-ids sg-websecuritygroup --subnet-id subnet-0123456789abcdef0

- **VPC Configuration**:

Bash commands

aws ec2 create-vpc --cidr-block 10.0.0.0/16

aws ec2 create-subnet --vpc-id vpc-0123456789abcdef0 --cidr-block 10.0.1.0/24

- **Remote Access with MobaXterm**:
    - Use SSH to connect to an EC2 instance:

Sh command

ssh -i "MyKeyPair.pem" ec2-user@ec2231-3430-2347.compute-1.amazonaws.com

Results

- **Performance Improvement**: Observed faster query response times with the star schema in Power BI compared to the snowflake schema.
- **Security Enhancement**: Secure access and isolated environments achieved using VPC and MobaXterm.
- **Scalability**: Demonstrated the ability to scale instances based on load and traffic requirements.

Features and Benefits

- **Star Schema**:
    - Simplified Queries: Faster data retrieval and simpler query structure.
    - Performance: Enhanced performance for read-heavy operations.
- **Snowflake Schema**:
    - Normalization: Reduced data redundancy and improved data integrity.
    - Storage Efficiency: More efficient use of storage space.
- **EC2 and VPC**:
    - Scalability: Easily scale instances to meet demand.
    - Security: Isolated environments within a VPC for enhanced security.
- **MobaXterm**:
    - Remote Management: Secure and efficient remote management of EC2 instances.
    - Multi-tasking: Support for multiple remote sessions in a single interface.

Challenges and Solutions

- **Complex Queries in Snowflake Schema**:
    - *Challenge*: More complex joins and slower queries.
    - *Solution*: Optimized query design and indexing strategies to improve performance.
- **Security Management**:
    - *Challenge*: Ensuring secure access to sensitive data.
    - *Solution*: Implementing robust security measures, such as VPC isolation and secure SSH access with MobaXterm.

- **Scalability Issues**:
    - *Challenge*: Managing high traffic and ensuring uptime.
    - *Solution*: Utilizing load balancing and deploying instances across multiple availability zones.

Conclusion

This project successfully demonstrated the practical applications and benefits of using EC2, VPC, and MobaXterm for hosting solutions. By comparing the star and snowflake schemas, we highlighted the strengths and limitations of each approach. The use of these technologies provided secure, scalable, and efficient hosting environments, tailored to meet the specific needs of different scenarios. The insights gained from this experiment can guide best practices in deploying and managing cloud-based hosting solutions.

Future Works

1. **Hybrid and Multi-Cloud Strategies**: Explore the implementation of hybrid and multi-cloud strategies to enhance flexibility and resilience.
2. **Edge Computing Integration**: Investigate the integration of edge computing to process data closer to its source, reducing latency and improving performance.
3. **Serverless Computing**: Further research into serverless architectures to streamline deployment and management of applications.
4. **IoT Integration**: Develop solutions for integrating Internet of Things (IoT) devices with cloud hosting environments to support real-time data processing and analysis.
5. **Advanced Security Measures**: Enhance security protocols to address emerging threats and ensure compliance with evolving regulations.

References

1. **Git hub:** GitHub - faysalmehedi/aws-ha-app-deployment-demo: This is a demo project where I deployed a multi-tier web app with high availabilty features maintaining high security. This project is fully deployed using AWS services.
2. **Youtube:** Ultimate Guide: Hosting Your Website on AWS EC2 Instance - YouTube