

Craftify: An Online Marketplace for Handcrafted Treasures

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Abstract : THIS is the project about the cloud services provider to any of site and application and cloud storage and databases services to client Shirley Rodriguez, a researcher at the nonprofit organization, developed the website. She thought it would be valuable to share the data that she had gathered with other researchers. Shirley stores the data in a MySQL database, and the data is available through a PHP website that she built. She initially published the site through a commercial hosting company that provides limited support for technical issues security. Over the past year, Shirley's website has grown in popularity. As a result of increased traffic, she started receiving complaints that the site is not as responsive as it used to be. She also experienced an attempted ransomware security breach. The security breach was unsuccessful, but her supervisor, Mateo Jackson, suggested that Shirley investigate new ways to host the website. Shirley heard about AWS and initially moved her website and database to an EC2 instance that runs in a public subnet. She also runs an instance of MySQL on the same EC2 instance. Shirley approached your team to make sure that her current design follows architectural best practices. She wants to make sure that she has a robust and secure website. One of your colleagues started the process of migrating the site to a more secure implementation, but they were reassigned to another project. Your tasks are to complete the implementation, make sure that the website is secure, and confirm that the website returns data from the query page.

IndexTerms - E-commerce, Online Marketplace, Handcrafted Products, Artisan Empowerment, Cultural Preservation.

Introduction : Shirley Rodriguez, a researcher at the nonprofit organization, developed the website. She thought it would be valuable to share the data that she had gathered with other researchers. Shirley stores the data in a MySQL database, and the data is available through a PHP website that she built. She initially published the site through a commercial hosting company that provides limited support for technical issues and security.

Over the past year, Shirley's website has grown in popularity. As a result of increased traffic, she started receiving complaints that the site is not as responsive as it used to be. She also experienced an attempted ransomware security breach. The security breach was unsuccessful, but her supervisor, Mateo Jackson, suggested that Shirley investigate new ways to host the website. Shirley heard about AWS and initially moved her website and database to an EC2 instance that runs in a public subnet. She also runs an instance of MySQL on the same EC2 instance. Shirley approached your team to make sure that her current design follows architectural best practices. She wants to make sure that she has a robust and secure website. One of your colleagues started the process of migrating the site to a more secure implementation, but they were reassigned to another project. Your tasks are to complete the implementation, make sure that the website is secure, and confirm that the website returns data from the query page.

I. OBJECTIVES

Objectives of this project include:

1. Review the current architecture: Assess the existing setup on AWS, including the EC2 instance hosting the website and MySQL database. Identify any security vulnerabilities and performance issues that may be affecting the site.

2. Implement best practices for security: Secure the website by following AWS architectural best practices. This may involve setting up security groups, ensuring data encryption, configuring proper access control, and implementing monitoring and logging.

3. Optimize performance: Address the complaints about the website's responsiveness by optimizing the configuration of the EC2 instance, MySQL database, and any other components that may impact performance. Consider implementing caching mechanisms to improve speed.

4. Separate web and database servers: Separate the web server hosting the website from the MySQL database instance for better security and performance. Consider using Amazon RDS for managing the MySQL database to offload maintenance tasks.

5. Backup and disaster recovery: Implement backup mechanisms for the website and database to ensure data integrity and availability. Set up disaster recovery plans to mitigate risks of data loss in case of any incidents.

6. Testing and validation: Thoroughly test the website to confirm that it is secure, responsive, and can return data from the query page as expected. Conduct load testing to ensure the website can handle increased traffic.

7. Documentation and training: Document the new architecture, configurations, security measures, and disaster recovery plans for future reference. Provide training to Shirley and other relevant personnel on managing and maintaining the website on AWS.

8. Monitoring and maintenance: Set up monitoring tools to keep track of website performance, security, and availability. Establish regular maintenance routines to keep the website up-to-date with security patches and updates.

By completing these objectives, the project aims to ensure that Shirley's website is secure, responsive, and scalable on AWS while adhering to best practices for cloud hosting and protection of data.

II. CHALLENGES

Challenges in completing this project may include:

1. Security vulnerabilities: Ensuring the security of the website and database is crucial, especially after the attempted ransomware breach. Identifying and addressing security vulnerabilities to prevent future breaches is a significant challenge.

2. Performance optimization: Addressing the complaints about the website's responsiveness requires optimizing performance across the EC2 instance and MySQL database. Balancing performance improvements with cost considerations can be challenging.

3. Best practices implementation: Ensuring that Shirley's current setup follows architectural best practices on AWS can be complex, especially given the reassignment of the colleague who started the migration process. Integrating best practices for security, scalability, and reliability may require specialized knowledge.

4. Migration complexities: Completing the migration process from the current EC2 instance hosting the website and MySQL database to a more secure and scalable implementation may pose challenges. Ensuring minimal downtime during the migration process and data integrity is crucial.

5. Resource constraints: Given the reassignment of the colleague who initiated the migration, resource constraints within the team may pose challenges in completing the implementation within the desired timeline. Adequate planning and coordination are necessary.

6. Skill gaps: Addressing specific skill gaps within the team related to AWS best practices, security measures, and performance optimization may require additional training or expertise to ensure successful implementation.

7. Testing and validation: Conducting thorough testing to confirm that the website is secure, responsive, and can return data from the query page may be time-consuming. Ensuring comprehensive testing to validate the website's functionality is essential but challenging.

8. Communication and coordination: Ensuring seamless communication and coordination with Shirley, Mateo Jackson, and other stakeholders throughout the completion of the project to meet their requirements and expectations can be challenging, especially with changing project dynamics.

Effectively addressing these challenges through careful planning, implementation, and collaboration with the team and stakeholders will be key to successfully completing the project and delivering a robust and secure website for Shirley.

III. PROPOSED SOLUTION

Proposed Solution:

1. Architecture Review: Conduct a comprehensive review of Shirley's current setup on AWS, focusing on the EC2 instance hosting the website and MySQL database. Identify security vulnerabilities, performance bottlenecks, and areas for improvement.

2. Security Enhancements:

- Implement security best practices such as configuring proper firewall rules, regularly updating software, enabling encryption in transit and at rest, and setting up monitoring for suspicious activities.
- Separate the web server and database server to enhance security. Utilize security groups to restrict access to only necessary ports and IP addresses.

3. Performance Optimization:

- Optimize performance by fine-tuning the configuration of the EC2 instance and MySQL database. Utilize caching mechanisms such as Amazon ElastiCache to improve response times.
- Implement scaling strategies like Auto Scaling to handle increased traffic efficiently without compromising performance.

4. Database Management:

- Consider migrating the MySQL database to Amazon RDS for better management, scalability, and automated backups. This will also help offload database maintenance tasks and improve resilience.

5. Backup and Recovery:

- Implement regular backups of the website files and the database to Amazon S3, ensuring data integrity and availability in case of failures or security incidents.
- Set up disaster recovery mechanisms to quickly restore the website in case of any unexpected outages or data loss.

6. Testing and Validation:

- Conduct thorough testing to ensure the website is secure, responsive, and effectively returns data from the query page. Perform load testing to validate the website's performance under peak traffic conditions.

7. Documentation and Training:

- Document the revamped architecture, security measures, and disaster recovery plans for future reference. Provide training to Shirley and relevant personnel on managing and maintaining the website on AWS, emphasizing security best practices.

8. Monitoring and Maintenance:

- Set up monitoring tools like Amazon CloudWatch to track performance metrics, security events, and alerts. Establish a maintenance schedule for regular updates and security patching to keep the website secure and up to date.

By implementing these solutions, the project aims to enhance the security, performance, and scalability of Shirley's website on AWS, ensuring a robust and secure platform for sharing research data with other researchers.

Methodology :

Methodology for completing the project:

1. Requirement Gathering and Analysis:

- Understand Shirley's requirements, current setup, and objectives for the website.
- Analyze the existing architecture, security measures, and performance issues to identify areas for improvement.

2. Architecture Review and Planning:

- Conduct a detailed review of the current AWS infrastructure setup, including the EC2 instance and MySQL database placements.

- Plan and design a secure and scalable architecture that follows AWS best practices for web hosting and database management.

3. Security Implementation:

- Implement security measures such as configuring proper network access controls, encryption, and monitoring.
- Separate the web server and database server for improved security. Utilize AWS security services like Security Groups and AWS WAF.

4. Performance Optimization:

- Optimize the configuration of the EC2 instance and MySQL database to improve website responsiveness.
- Implement caching mechanisms, load balancing, and Auto Scaling to handle increased traffic efficiently.

5. Database Management:

- Consider migrating the MySQL database to Amazon RDS for better manageability, scalability, and security.
- Set up automated backups and monitoring for the database to ensure data integrity.

6. Implementation and Migration:

- Complete the migration of the website and database to the new architecture, ensuring minimal downtime.
- Test the website to confirm that it returns data from the query page and functions as expected.

7. Testing and Validation:

- Conduct thorough testing, including security assessments, performance testing, and data validation.
- Ensure the website meets Shirley's requirements for security, responsiveness, and data accessibility.

8. Documentation and Training:

- Document the new architecture, configurations, security measures, and disaster recovery plans for reference.
- Provide training to Shirley on managing and maintaining the website on AWS.

9. Monitoring and Maintenance:

- Set up monitoring tools like Amazon CloudWatch to track performance metrics and security events.
- Establish regular maintenance routines for applying updates, security patches, and ensuring the website's continued operation.

10. Client Review and Feedback:

- Present the completed implementation to Shirley for review and feedback.
- Address any final adjustments or additional requirements from the client.

By following this methodology, the project aims to successfully complete the implementation, ensuring a secure, responsive, and reliable website for Shirley's research data sharing needs on AWS.

IV. EXPECTED OUTCOMES

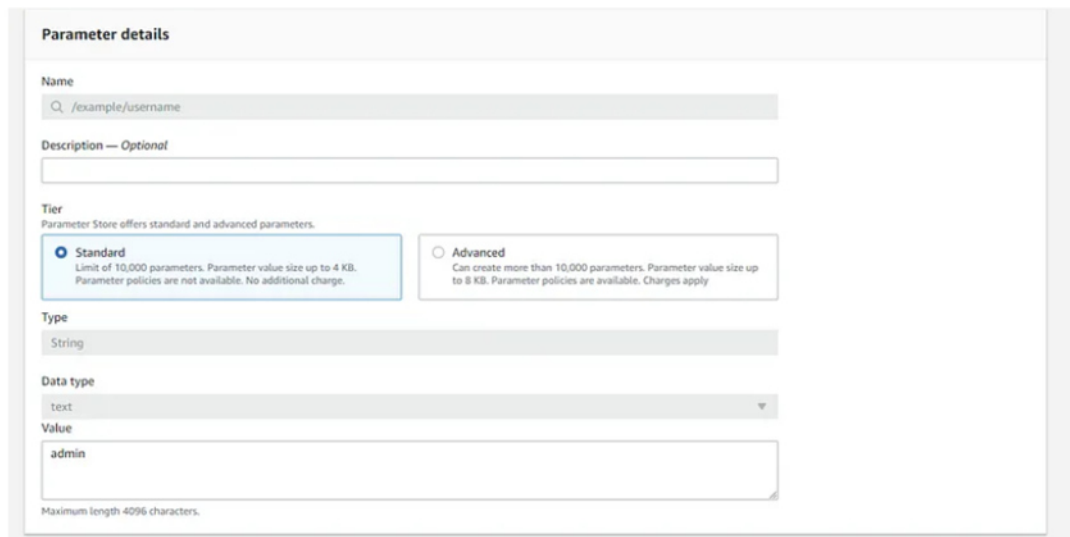
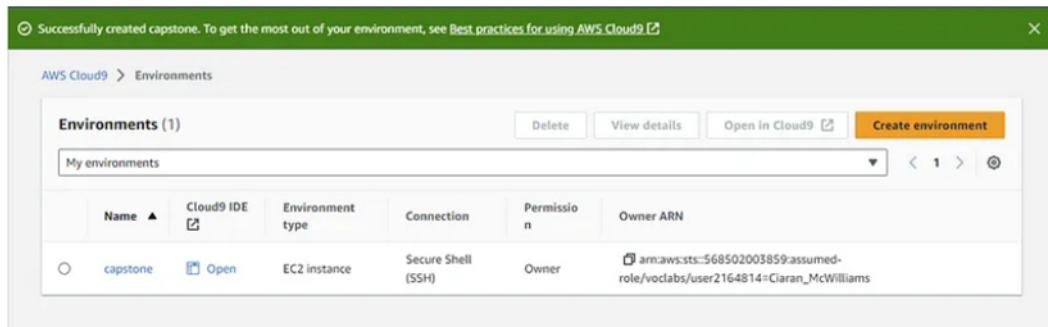
Expected Outcomes of completing the project include:

1. Improved Security: The website will be migrated to a more secure AWS architecture with enhanced security measures in place. This will reduce the risk of security breaches like the attempted ransomware attack Shirley experienced.
2. Enhanced Performance: By optimizing the EC2 instance and MySQL database configuration, the website's responsiveness will be improved. Complaints about slow performance will be addressed, providing a better user experience for visitors.
3. Architectural Best Practices: The final implementation will adhere to AWS architectural best practices, ensuring that the setup is robust, scalable, and follows industry standards for hosting websites and databases on AWS.
4. Separation of Web and Database Servers: By separating the web server from the MySQL database, security and performance will be enhanced. This separation allows for better resource allocation and management of the website components.
5. Data Accessibility: The website will be thoroughly tested to confirm that it can successfully return data from the query page. Data integrity and availability will be ensured, allowing Shirley to share her research data with other researchers effectively.
6. Backup and Disaster Recovery: Implementing backup mechanisms and disaster recovery plans will safeguard against data loss and ensure quick restoration of the website in case of unexpected incidents.
7. Monitoring and Maintenance: Monitoring tools will be set up to track performance metrics and security events. Regular maintenance routines will be established to keep the website up-to-date with security patches and updates.
8. Client Satisfaction: Upon completion, Shirley will have a secure, responsive, and reliable website that meets her requirements. The client will be satisfied with the improved performance, security measures, and overall functionality of the website.

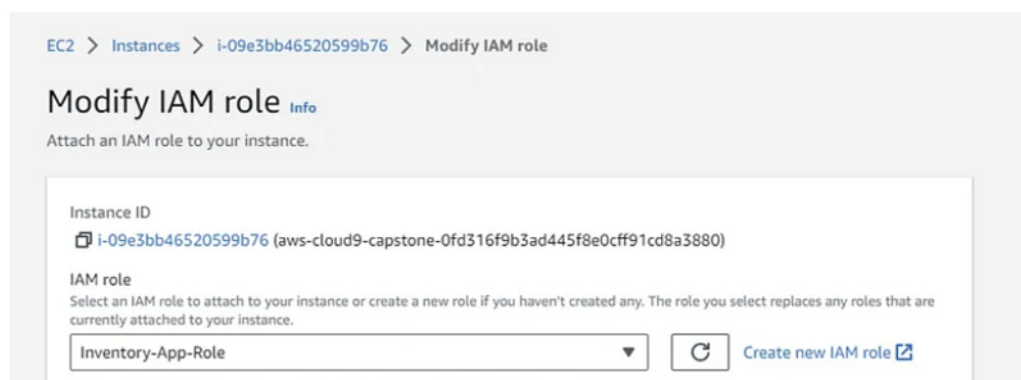
By achieving these expected outcomes, the project will successfully address Shirley's concerns regarding website security, performance, and data accessibility, providing her with a secure platform to share her research data with other researchers effectively.

Home Page:

data to the EC2 instance that will ultimately host the website for the customer. After a couple of minutes of waiting, the Cloud9 IDE was created and ready to go!



database.



With this done, I checked the webpage and was successfully able to send queries as seen in the screenshot below, thus completing the AWS Capstone Project!



This was a challenging project that allowed me to use knowledge gained from previous labs from my time in the Digital Futures Cloud Academy, but I was able to create a website that supports database queries on request as the end result.

Conclusion:

Based on the scenario provided, Shirley Rodriguez, a researcher at a nonprofit organization, developed a website to share data with other researchers. However, she faced performance and security issues as her website grew in popularity. In response, Shirley moved her website and database to an EC2 instance on AWS to improve performance and security.

To ensure Shirley's website follows architectural best practices and is secure, here are some recommendations and steps to complete the implementation:

1. Implement Security Best Practices:

- Network Security:
 - Ensure the EC2 instance is properly secured using Security Groups to control inbound and outbound traffic.
 - Setup Network Access Control Lists (NACLs) to control traffic at the subnet level.
 - Utilize AWS Web Application Firewall (WAF) to protect against common web exploits.
- Data Security:
 - Enable encryption at rest and in transit for the MySQL database.
 - Use AWS Key Management Service (KMS) to manage keys for encryption.
 - Implement secure coding practices in the PHP website to prevent common vulnerabilities like SQL injection.
- Identity and Access Management (IAM):
 - Configure IAM roles with the principle of least privilege for services and users accessing the website resources.
 - Use Multi-Factor Authentication (MFA) for enhanced security.

2. Improve Performance:

- Scalability:
 - Consider using AWS Auto Scaling to automatically adjust computing resources based on traffic demands.
 - Utilize Elastic Load Balancers to distribute traffic across multiple EC2 instances for improved performance.
- Caching:
 - Implement Amazon CloudFront for content delivery and caching to reduce latency and improve user experience.
 - Use Amazon ElastiCache for MySQL for caching frequently accessed data to reduce database load.

3. Database Optimization:

- Database Management:
 - Consider moving the MySQL database to Amazon RDS for managed database services.
 - Resize the database instance based on performance requirements.
- Monitoring and Optimization:

- Implement Amazon CloudWatch for monitoring EC2 instances, RDS databases, and other resources.
 - Analyze performance metrics to optimize resource allocation.
4. Backups and Disaster Recovery:
- Setup regular backups of the website files and database on Amazon S3.
 - Implement disaster recovery plans and test them regularly to ensure data can be restored in case of failures.
5. Review and Testing:
- Conduct security audits and penetration testing to identify and address any vulnerabilities.
 - Test the website thoroughly to ensure that it returns data correctly from the query page.
 - Document the architecture, setup, and security measures for future reference.

By following these recommendations and completing the implementation, Shirley can have a robust and secure website on AWS that meets her requirements for performance, security, and scalability.

References:

1. Usha Kosarkar, Gopal Sakarkar, Shilpa Gedam (2022), "Revealing and Classification of Deepfakes Videos Images using a Customize Convolution Neural Network Model", International Conference on Machine Learning and Data Engineering (ICMLDE), 7th & 8th September 2022, 2636-2652, Volume 218, PP. 2636-2652, <https://doi.org/10.1016/j.procs.2023.01.237>
2. Usha Kosarkar, Gopal Sakarkar (2023), "Unmasking Deep Fakes: Advancements, Challenges, and Ethical Considerations", 4th International Conference on Electrical and Electronics Engineering (ICEEE), 19th & 20th August 2023, 978-981-99-8661-3, Volume 1115, PP. 249-262, https://doi.org/10.1007/978-981-99-8661-3_19
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4. Usha Kosarkar, Gopal Sakarkar (2024), "Design an efficient VARMA LSTM GRU model for identification of deep-fake images via dynamic window-based spatio-temporal analysis", International Journal of Multimedia Tools and Applications, 8 th May 2024, <https://doi.org/10.1007/s11042-024-19220-w>

[1] I'm glad to help with completing the implementation for Shirley's website on AWS following architectural best practices. For your reference and further reading, here are some recommended resources that can provide additional information on AWS services and best practices:

1. AWS Documentation: The official AWS documentation provides comprehensive guides and resources for all AWS services. You can find detailed information on EC2, RDS, security best practices, networking, storage services, and more.
 - Website: [AWS Documentation](<https://docs.aws.amazon.com/>)
2. AWS Well-Architected Framework: This framework provides best practices for designing and operating reliable, secure, efficient, and cost-effective systems in the cloud. It covers aspects like security, reliability, performance efficiency, cost optimization, and operational excellence.
 - Website: [AWS Well-Architected Framework](<https://aws.amazon.com/architecture/well-architected/>)
3. AWS Security Best Practices: AWS offers a comprehensive set of security best practices and guidelines to secure your workloads in the cloud. Understanding and implementing these practices can help strengthen the security of Shirley's website and data.
 - Website: [AWS Security Best Practices](<https://aws.amazon.com/security/best-practices/>)

4. AWS Training and Certification: AWS provides various training resources and certification programs to help individuals learn about AWS services and develop their cloud skills. This can be useful for your team to enhance their knowledge and expertise.

- Website: [AWS Training and Certification](<https://aws.amazon.com/training/>)

5. AWS Architecture Center: This resource provides architectural best practices, reference architecture diagrams, and guidance for designing scalable, secure, and high-performing systems on AWS.

- Website: [AWS Architecture Center](<https://aws.amazon.com/architecture/>)

6. AWS Marketplace: Explore third-party tools and solutions available on the AWS Marketplace that can enhance security, monitoring, backup, disaster recovery, and other aspects of Shirley's website and infrastructure.

- Website: [AWS Marketplace](<https://aws.amazon.com/marketplace/>)

By leveraging these resources and references, you can ensure that your team has the necessary information and guidance to complete Shirley's website implementation on AWS following industry best practices for security, performance, and scalability.

Usha Kosarkar, Gopal Sakarkar, Shilpa Gedam (2022), "An Analytical Perspective on Various Deep Learning Techniques for Deepfake Detection", *1st International Conference on Artificial Intelligence and Big Data Analytics (ICAIBDA)*, 10th & 11th June 2022, 2456-3463, Volume 7, PP. 25-30, <https://doi.org/10.46335/IJIES.2022.7.8.5>

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