

Florida International University
Knight's Foundation School of Computing and Information Sciences

Final Deliverable

Capstone Project Selection Secured by AWS
Spring 2023

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Instructor: Dr. Masoud Sadjadi

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Abstract

This document outlines the necessary information for a comprehensive understanding of Capstone Selection Secured by AWS. It is a platform designed for students to view and select their capstone projects with enhanced security features provided by Amazon Web Services. Users can easily register on the platform's website and choose their preferred capstone project while ensuring data security and privacy. The platform utilizes AWS security measures to protect sensitive information from unauthorized access. With Capstone Selection Secured by AWS, students can manage their projects with confidence and focus on achieving their academic goals.

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INTRODUCTION

This documentation paper describes the implementation of a secure capstone selection process using Amazon Web Services (AWS).

Current System

The current system for students to select their capstone project involves the distribution of an unsecured Excel sheet link by the professor.

Purpose of New System

The purpose of the new system is to provide a more secure and user-friendly way for students to select their capstone projects by utilizing several AWS such as Cognito for authentication, RDS for database storage, and an S3 bucket for securing static content for the front-end.

User Stories

These stories assisted us when implementing our software security solution. They allowed us to be more user friendly and to allow more accessibility. Our user stories are limited as the first half of the semester we spend learning about AWS.

Implemented User Stories

- As a student, I want the excel sheet to be more secure, so students do not alter my project selection.
- As a student, I wish for clear and simple instructions when signing up for a project.
- As a professor, I want to track the accounts students create, and when they enter the excel sheet.
- As a student, I wish for a secure sign on service when choosing my project.
- As a student, I wish for the process to be easier to read and understand.
- As a professor, I want the data to be stored in a database instead of excel.
- As a professor, I want the website to be scalable, so it is always accessible regardless of how many people try to access it at once.

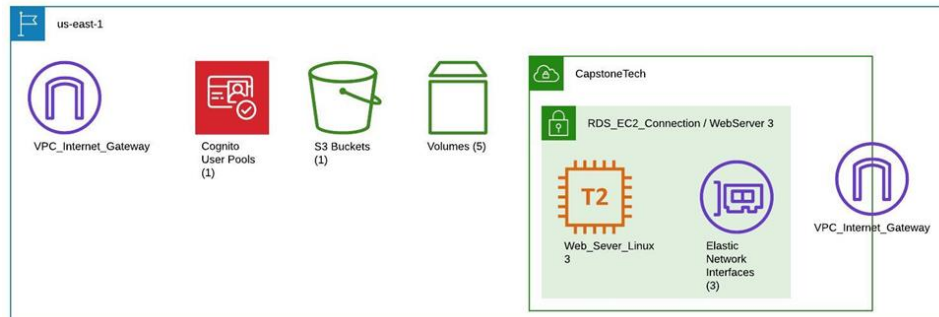
Pending User Stories

- As a professor, I wish for a website that hosts the project list to allow a section to make it easier to add and remove projects.
- As a student, I wish the project list and selection was on the same page to make it easier and more efficient for me.
- As a student, I wish to only see projects I am able to select and for the full projects to be hidden.

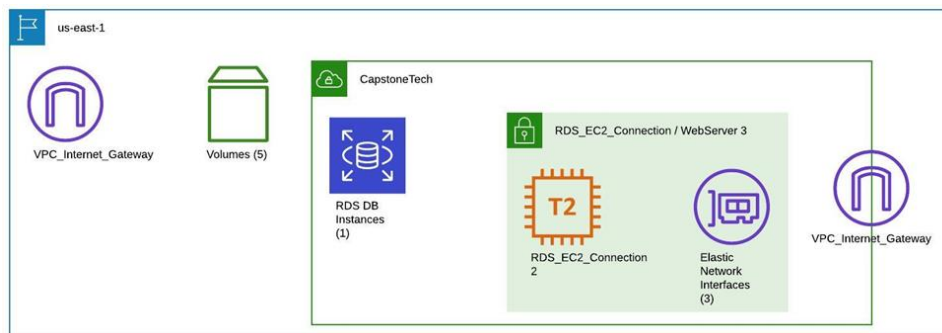
Required Software API's within AWS implemented in infrastructure



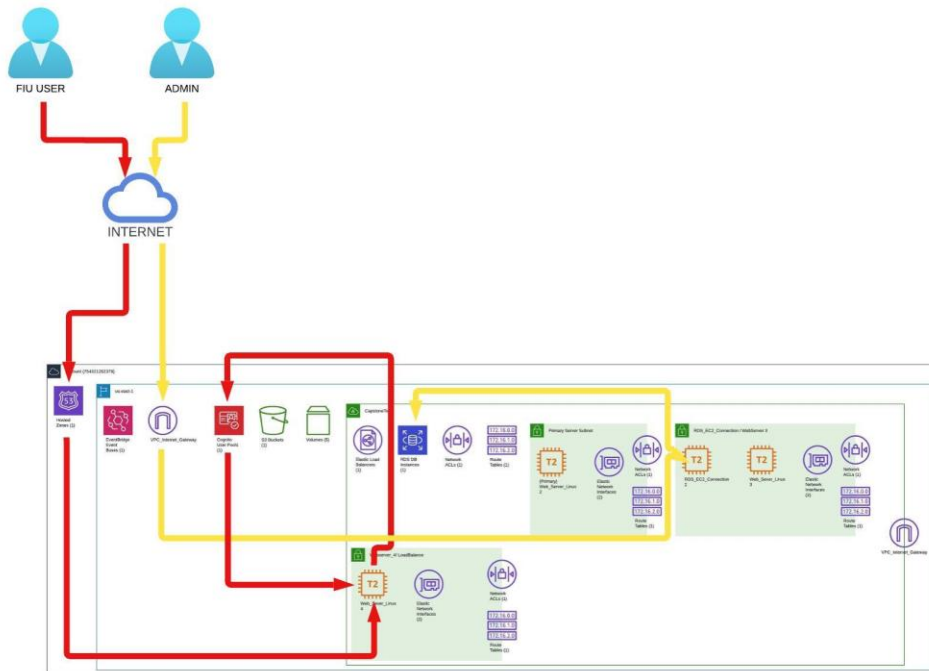
Overview of the resources hosting the website



Overview of the resources hosting Relational Database



Deployment Diagram



Risk Analysis

	Negligible	Moderate	Severe
Very Likely	Student signs in using non-FIU account	Students alter other student's information	Student deletes all information on excel
Somewhat Likely	Student signs in using another student's account	Student accesses AWS account that hosts the website and resources	Student emails classmates fake link leading to malicious site
Unlikely	Non-FIU student signs in and alters information	Students to DDOS server	Students access AWS using unsecure ports (80, 443, 3306, 22)

Security Recommendations

- Move selection process off of excel hosted by Microsoft Sharepoint and use an SQL database hosted on an RDS.
 - This provides more security and will record any changes a user has made.
 - RDS uses ElastiCache as a middleman to provide data faster.
 - Elastic Load Balancers will prevent too much traffic from crashing the website.
- Modify inbound and outbound rules to prevent ports from being accessible from internet gateways.
 - Creating specific policies per application will help prevent unsecured ports from being accessible.
- Use FIU SSO instead of Microsoft sign in
 - This will prevent students from using non-FIU emails.
 - Will prevent non-FIU students from signing in.
 - Provides 2 step authentication
- Ensure project selection link is only linked via Canvas to ensure students do not send malicious links.

System validation

Purpose: The purpose of the system validation is to ensure that the website, AWS Cognito, and SharePoint spreadsheet are functioning correctly and that users are able to log in, access the spreadsheet, and enter FIU login credentials without any issues.

Scope: The system validation will cover the entire process from the website login page to the SharePoint spreadsheet page, including the AWS Cognito authentication process and the FIU login process.

Requirements: The following requirements must be met during the system validation:

- The website login page must display properly and allow users to enter their credentials.
- The AWS Cognito authentication process must successfully authenticate users and allow them to access the SharePoint spreadsheet.
- The SharePoint spreadsheet must be accessible to users who have successfully authenticated through AWS Cognito.
- Users must be able to enter their FIU login credentials into the SharePoint spreadsheet without any errors or issues.
- User data must be securely transmitted and stored throughout the process.

Test Cases: The following test cases will be used to validate the system:

Test Case 1: Verify that the website is accessible, login button is displaying properly and allows users to reach AWS Cognito.

Test Case 2: Verify that the AWS Cognito authentication process is working correctly and allows users to access the SharePoint spreadsheet.

Test Case 3: Verify that the SharePoint spreadsheet is accessible to users who have successfully authenticated through AWS Cognito.

Test Case 4: Verify that users can enter their FIU login credentials into the SharePoint spreadsheet without any errors or issues.

Test Case 5: Verify that user data is securely transmitted and stored throughout the process.

Validation Results: The validation results will be documented and will include any issues or defects found during the validation process. The results will be used to make any necessary improvements or corrections to the system.

Project Plan: Hardware and Software resources

HARDWARE

- Android or Apple phones
- HP or Apple laptops, etc.
- PC system

SOFTWARE

- VPC
- EC2
- Elastic Load Balancers
- RDS
- S3
- Cognito
- CloudTrail

Sprint Plannings

Sprint 1

Sprint Planning - Sprint 1

Project: AWS Security Project 1

Attendees: Ethan Schnellinger, Manuel Muniz, Fares Almoshaikah, Damaso Alberto, German Alvarenga

Start time: 5:45

End time: 6:45

Estimated team velocity:

- 100 hours

Goals:

- Read modules
- Discuss what we learned in modules and how they're applicable

User Stories:

- Continue reading modules and completing exercises

Sprint 2

Sprint Planning - Sprint 2

Project: AWS Security Project 1

Attendees: Ethan Schnellinger, Manuel Muniz, Fares Almoshaikah, Damaso Alberto, German Alvarenga

Date: 1/30/2022

Start time: 5:45

End time: 6:45

Estimated team velocity:

- 100 hours

Goals:

- Read modules
- Discuss what we learned in modules and how they're applicable

User Stories:

- Continue reading modules and completing exercises

Sprint 3

Sprint Planning - Sprint 3

Project: AWS Security Project 1

Attendees: Ethan Schnellinger, Manuel Muniz, Fares Almoshaikah, Damaso Alberto, German Alvarenga

Date: 2/12/2022

Start time: 5:45

End time: 6:45

Estimated team velocity:

- 100 hours

Goals:

- Read modules
- Discuss what we learned in modules and how they're applicable

User Stories:

- Continue reading modules and completing exercises

Sprint 4

Sprint Planning - Sprint 4

Project: AWS Security Project 1

Attendees: Ethan Schnellinger, Manuel Muniz, Fares Almoshaikah, Damaso Alberto, German Alvarenga

Start time: 5:45

End time: 6:45

Estimated team velocity:

- 100 hours

Goals:

- Begin AWS project

User Stories:

- Research AWS projects

Sprint 5

Sprint Planning - Sprint 5

Project: AWS Security Project 1

Attendees: Ethan Schnellinger, Manuel Muniz, Fares Almoshaikah, Damaso Alberto, German Alvarenga

Date: 3/20/2022

Start time: 5:45

End time: 6:45

Estimated team velocity:

- 100 hours

Goals:

- Secure cap 2 project selection
- Figure an optimal way to secure cap 2 project selection

User Stories:

- Team is becoming more accustomed to AWS as we try to secure cap 2 project selection

Sprint 6

Sprint Planning - Sprint 6

Project: AWS Security Project 1

Attendees: Ethan Schnellinger, Manuel Muniz, Fares Almoshaikah, Damaso Alberto, German Alvarenga

Date: 4/3/2022

Start time: 5:45

End time: 6:45

Estimated team velocity:

- 100 hours

Goals:

- Secure cap 2 project selection
- Figure an optimal way to secure cap 2 project selection

User Stories:

- Team is becoming more accustomed to AWS as we try to secure cap 2 project selection

Sprint 7

Sprint Planning - Sprint 7

Project: AWS Security Project 1

Attendees: Ethan Schnellinger, Manuel Muniz, Fares Almoshaikah, Damaso Alberto, German Alvarenga

Date: 4/17/2022

Start time: 5:45

End time: 6:45

Estimated team velocity:

- 100 hours

Goals:

- Work on final deliverable
- Create videos

User Stories:

- Team is working together on final deliverable

Glossary

AWS (Amazon Web Services): Amazons cloud computing services.

Instances: A virtual server.

Capstone: A project accumulating all the knowledge students' have gained over their college career.

Virtual Private Cloud (VPC): A personal private cloud hosted by AWS.

Elastic Compute Cloud (EC2): Host an instance for OS, storage, or processing.

Operating System: System Software that manages hardware and resources.

Elastic Load Balancers (ELB): Automatically distributed incoming traffic across multiple targets.

Relational Database Service (RDS): A cloud-based database.

S3: Amazons cloud-based storage.

Cognito: Amazons secure sign-up and sign-in service.

CloudTrail: Monitor and record account activity across AWS infrastructure.

ElastiCache: In-memory data store and cache service allowing for quicker information retrieval.

Hardware: The physical components of a computer.

Software: Allows users to interact with the computer's hardware.

User Modeling Language (UML): Modeling language that provides a visualization of the system design.

Front-End: How a webpage looks.

Back-End: How the webpage works.

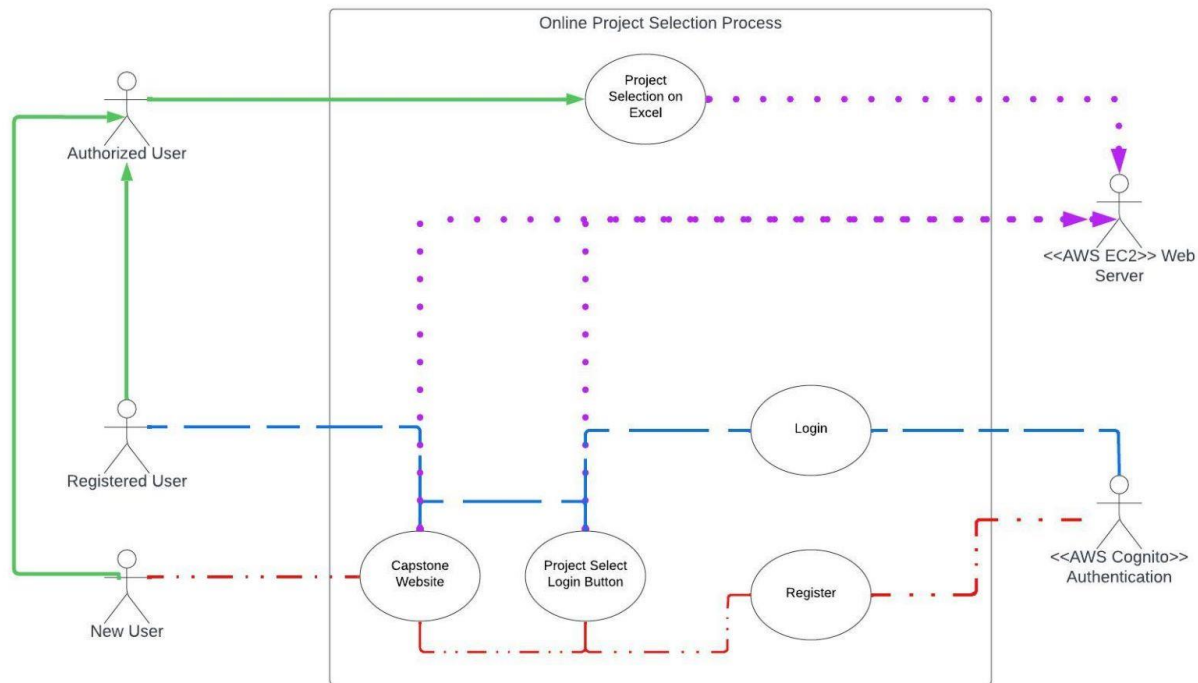
User Story: A general explanation of the software from the perspective of an end user.

Database: An organized collection of structured information that is stored electronically.

Appendix

Appendix A – UML Diagram

Sequence Diagram



Actor	Capstone student
Flow of Events	1. Student wants to sign up for capstone project selection 2. Student enters the website 3. Student will click login/sign-up button 4. Student will register using FIU credentials 5. After the student registers they will sign in again 6. When the student signs in, it will bring them to the Excel sheet where they can select a project

Appendix B – User Interface Design

• Project Title: AmLight - Learning OpenFlow/SDN network Research and Experimentation

• Project Short Description:

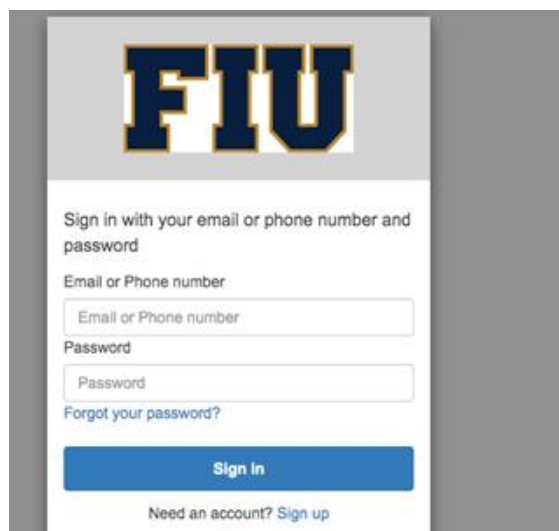
The FIU's Center for Internet Augmented Research & Assessment (CIARA) is a center involved with the Internet of future, and it operates a network infrastructure that connects more than 1,500+ institutions in the U.S. and Latin America to the rest of the world. This network infrastructure is based on a new paradigm referred to as Software-Defined Networking (SDN), which brings new challenges and opportunities to those in the networking field. One of the challenges being faced by CIARA is the lack of tools to do network operation and troubleshooting. In previous years, some Python scripts were created to address the lack of network visibility, and some of these tools need to be enhanced. NO NETWORKING KNOWLEDGE is required to work on this project. Knowledge required: Python 3. Depending on the tool, the students can learn about PerfSONAR measurement tools, Zabbix, SDN, OpenFlow, OESS, FSPW, Kytos.

- Professor: Dr. Masoud Sadjadi, PhD, sadjadi@fiu.edu

Spreadsheet Access Rules:

- Access the spreadsheet only by using your fiu.edu account.
- Do NOT share the link with anyone else; no one is an exception.
- Find your name; that row belongs to you and you must not touch any other row.
- In your row, you are only allowed to select a project from the dropdown box under the "Project" column and ONLY for yourself. You may later announce your role under the "Lead" and "Role" columns, again just for yourself.
- No other action is permitted and if you happen to change someone else's entries or use other functions, I would need to refer back to the revision history and find out who did not follow the rules and created problems for everyone. So, please play nice.
- If you see the project that you worked on while taking your Cap I, you have precedence to others to join that project again. Note that we cannot afford more than five members per team. You are more than welcome to join other projects if there are still spots available.
- In case of going over five members, please try to find another project to join. Try to resolve such issues among yourselves and avoid bringing me in the middle of it! ;)
- There are 22 projects for CS students (one is AWS Developing; I will provide more details on that). There should be enough projects for everyone to join.
- There are 3 projects for CY students. No mixing of CS and CY students, please. There should be sufficient projects for everyone.

Project Selection Login



The image shows a sign-in form for FIU. At the top is the FIU logo. Below it, the text reads "Sign in with your email or phone number and password". There are two input fields: "Email or Phone number" and "Password". Below the password field is a link that says "Forgot your password?". At the bottom is a blue "Sign in" button. Below the button is a link that says "Need an account? Sign up".

FIU

Sign up with a new account

Email or Phone number

Name

Email

Password

Sign up

Already have an account? Sign in

FIU

Choose a multi-factor authentication (MFA) method

You must configure MFA before you can sign in. Choose how you want to authenticate.

☒


SMS
Authenticate using a code sent via text message to your phone.

☐


Authenticator app
Authenticate using a code generated by an app installed on your mobile device or computer.

Continue

my.sharepoint.com/:x/g/personal/sadjadi_fiu_edu/EeiA2-GrObdLoz7v4Z_o3xQBOE6z-pYnZe4MKWoodBIUBA?e=m5PR2A&code=109f75e0-969f-4799-...

3 - Cap II and SP

Search (Option + Q)

Draw Page Layout Formulas Data Review View Help Table Design Comments Catch up Editing Share

11 B General \$ +.00 .00 -0.0

/fs kreiz002@fiu.edu

Names	Program	Level	Class	Mode	Project	Prog Mem	Total
Reiz, Kathryn Sybille	Computer Science	Senior	Capstone II	Hybrid	Office Online Frame		6
Lopez, Rogelio	Computer Science	Senior	Capstone II	Hybrid	University Social App		5
Aviles, Sebastian Daniel	Computer Science	Senior	Capstone II	Hybrid	University Social App		5
Cala Jr, Arquimides	Computer Science	Senior	Capstone II	Hybrid	University Social App		5
Gonzalez, Rebeca	Computer Science	Senior	Capstone II	Hybrid	University Social App		5
Venegas, Justin	Computer Science	Senior	Capstone II	Hybrid	University Social App		5
Perez, Evers	Computer Science	Senior	Capstone II	Hybrid	VIRS - Vocabulary in Reading Study		5
De Los Santos, Keiss	Computer Science	Senior	Capstone II	Hybrid	VIRS - Vocabulary in Reading Study		5
Megene, Kendy	Computer Science	Senior	Capstone II	Hybrid	VIRS - Vocabulary in Reading Study		5
Orozco, Jose	Computer Science	Senior	Capstone II	Hybrid	VIRS - Vocabulary in Reading Study		5
Zimmer, Kyle Keethan	Computer Science	Senior	Capstone II	Hybrid	VIRS - Vocabulary in Reading Study		5
Schnellinger, Ethan Michael	Cybersecurity	Senior	Capstone II	Hybrid	Capstone Project Selection Secured by AWS		5
Alberto Damaso Emmanuel	Cybersecurity	Senior	Capstone II	Hybrid	Capstone Project Selection Secured by AWS		5
Almoshaikah, Fares Hamoud	Cybersecurity	Senior	Capstone II	Hybrid	Capstone Project Selection Secured by AWS		5
Alvarenga, German A	Cybersecurity	Senior	Capstone II	Hybrid	Capstone Project Selection Secured by AWS		5
Muniz, Manuel Alejandro	Cybersecurity	Senior	Capstone II	Hybrid	Capstone Project Selection Secured by AWS		5
Hill, John Clifford	Cybersecurity	Senior	Senior Project	Hybrid	Multifactor Authentication Enforcement tool		4
Barreto Henriquez, Stephanny	Cybersecurity	Senior	Senior Project	Hybrid	Multifactor Authentication Enforcement tool		4
Cuellar, Elsa Nell	Cybersecurity	Senior	Senior Project	Hybrid	Multifactor Authentication Enforcement tool		4
Esquijerosa, Daniel Enrique	Cybersecurity	Senior	Senior Project	Hybrid	Multifactor Authentication Enforcement tool		4
Yauener, Marcos	Cybersecurity	Senior	Senior Project	Hybrid	Securing an AWS Serverless Application		5
Leal, Carlos Alberto	Cybersecurity	Senior	Senior Project	Hybrid	Securing an AWS Serverless Application		5
Pina, Sebastian	Cybersecurity	Senior	Senior Project	Hybrid	Securing an AWS Serverless Application		5
Sadiku, Nicholas	Cybersecurity	Senior	Senior Project	Hybrid	Securing an AWS Serverless Application		5
Simon, Michael	Cybersecurity	Senior	Senior Project	Online	Securing an AWS Serverless Application		5

Appendix C – Sprint Reviews

Sprint 1

AWS Security Project 1

Sprint Review/Retrospective Meeting - Sprint 1

Date: 1/29/2023

Start Time: 6:00 PM

End Time: 6:30 PM

Attendees: Ethan Schnellinger, Manuel Muniz, Fares Almoshaikah, Damaso Alberto, German Alvarenga

Completed/Approved User Stories:

- Continue reading through modules and completing assessments
- Discuss real-world scenarios

User Stories moved to Backlog:

- Continue reading through modules

What the team should start doing in future sprints:

- Read modules
- Complete assessments
- Discuss real-world applications

What the team should stop doing in future sprints:

- Nothing at the moment

What the team should continue to do for future sprints:

- Read through modules thoroughly

Sprint 2

AWS Security Project 1

Sprint Review/Retrospective Meeting - Sprint 2

Date: 2/12/2023

Start Time: 6:00 PM

End Time: 6:30 PM

Attendees: Ethan Schnellinger, Manuel Muniz, Fares Almoshaikah, Damaso Alberto, German Alvarenga

Completed/Approved User Stories:

- Continue reading through modules and completing assessments
- Discuss real-world scenarios

User Stories moved to Backlog:

- Continue reading through modules

What the team should start doing in future sprints:

- Read modules
- Complete assessments
- Discuss real-world applications

What the team should stop doing in future sprints:

- Nothing at the moment

What the team should continue to do for future sprints:

- Read through modules thoroughly

Sprint 3

AWS Security Project 1

Sprint Review/Retrospective Meeting - Sprint 3

Date: 2/26/2023

Start Time: 6:00 PM

End Time: 6:30 PM

Attendees: Ethan Schnellinger, Manuel Muniz, Fares Almoshaikah, Damaso Alberto, German Alvarenga

Completed/Approved User Stories:

- Continue reading through modules and completing assessments
- Discuss real-world scenarios

User Stories moved to Backlog:

- Continue reading through modules

What the team should start doing in future sprints:

- Read modules
- Complete assessments
- Discuss real-world applications

What the team should stop doing in future sprints:

- Nothing at the moment

What the team should continue to do for future sprints:

- Read through modules thoroughly

Sprint 4

AWS Security Project 1

Sprint Review/Retrospective Meeting - Sprint 4

Date: 3/19/2023

Start Time: 6:00 PM

End Time: 6:30 PM

Attendees: Ethan Schnellinger, Manuel Muniz, Fares Almoshaikah, Damaso Alberto, German Alvarenga

Completed/Approved User Stories:

- Migrate excel project selection sheet to AWS

User Stories moved to Backlog:

- How to properly secure excel sheet on AWS

What the team should start doing in future sprints:

- Properly secure excel sheet from unwanted changes
- Make sure only certain people are allowed to access excel sheet

What the team should stop doing in future sprints:

- Nothing at the moment

What the team should continue to do for future sprints:

- Continue securing excel sheet on AWS

Sprint 5

AWS Security Project 1

Sprint Review/Retrospective Meeting - Sprint 5

Date: 4/2/2023

Start Time: 6:00 PM

End Time: 6:30 PM

Attendees: Ethan Schnellinger, Manuel Muniz, Fares Almoshaikah, Damaso Alberto, German Alvarenga

Completed/Approved User Stories:

- Migrate excel project selection sheet to AWS

User Stories moved to Backlog:

- How to properly secure excel sheet on AWS

What the team should start doing in future sprints:

- Properly secure excel sheet

What the team should continue to do for future sprints:

- Continue securing excel sheet on AWS

Sprint 6

AWS Security Project 1

Sprint Review/Retrospective Meeting - Sprint 6

Date: 4/16/2023

Start Time: 6:00 PM

End Time: 6:30 PM

Attendees: Ethan Schnellinger, Manuel Muniz, Fares Almoshaikah, Damaso Alberto, German Alvarenga

Completed/Approved User Stories:

- Work on final deliverable

User Stories moved to Backlog:

- Project members will work on final deliverable

What the team should start doing in future sprints:

- Continue working on final deliverable

Sprint 7

AWS Security Project 1

Sprint Review/Retrospective Meeting - Sprint 6

Date: 4/30/2023

Start Time: 6:00 PM

End Time: 6:30 PM

Attendees: Ethan Schnellinger, Manuel Muniz, Fares Almoshaikah, Damaso Alberto, German Alvarenga

Completed/Approved User Stories:

- Finish final deliverable

User Stories moved to Backlog:

- Project members will finish final deliverable