CS410 Design Presentation

By: Team Orange (2024)

4/18/24

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Team Members

Team Leader

Hunter Pollock is a Senior at ODU currently studying and majoring in Computer Science, with the goal of getting a Master's degree in the graduate program. He enjoys playing video games, good food, listening to music, and learning about programming.

Frontend Lead

Ethan Barnes is another Senior at ODU, studying Computer Science. He is currently working at a flour mill as a Second Miller. He enjoys reading, the outdoors, and discovering new things. He has three children.

Team Members

Webmaster

Joshua Freeman is a senior at ODU and is majoring in Computer Science. He like to read and play video games.

Backend Lead

Dylan Via is an undergraduate student at ODU going for his bachelors in Computer Science. He plans on pursuing a career in Software Engineering after he graduates. Most of his training in coding has been in C++, but he does have experience in Java and Python.

Database Lead

Ralph Mpanu is a senior at ODU and is majoring in Computer Science. After graduating he plans on working as a software engineer. He enjoys fitness and practicing brazilian jiu-jitsu.

Mentor

Mustafa Ibrahim is a PhD student at ODU, specializing in Computer Science with a focus on Cybersecurity, particularly in Networking Security. He also enjoys playing soccer.

Universities - Some Background...

- Students at California State University were getting emails about their Office 365 accounts being terminated if they didn't cancel the request
- Except they *weren't* being terminated to begin with. It was a scam by a phisher to grab student info and hack into other student emails to extort them for money.[17]
- Stories such as this are occurring more frequently throughout the world at universities. Phishers are always changing tactics and getting smarter in how to perpetrate these crimes.
- This proves to be a massive challenge for universities. Why?

Problem Statement

Universities need innovative educational tools for teaching cybersecurity to their faculty, staff, and students so they can better identify and avoid phishing attacks.

Phishing

A scam where the perpetrator acquires sensitive data, such as bank account numbers, through a fraudulent solicitation in emails or on a web site masquerading as a legitimate business or reputable person[13]. This can also be done through other mediums, like SMS (“smshing”), and IM apps (Discord, Skype, etc.). This is done through vulnerabilities: weaknesses that phishers exploit. These can be things like weaknesses in the infrastructure of the tech, or lack of awareness on the part of the users.

Threat - Phishing

- Phishing is becoming more and more common in the modern world
  - Over **3.4 billion** phishing emails are sent a day, and email phishing accounts for **1.2%** of all email traffic globally![16]
  - **84%** of organizations [of all kinds] were the target of at least one phishing attack.
  - Education industries (such as universities) make up **9.3%** of these attacks.
    - That might not sound like much at first, but that's **316,200,000 emails per DAY** targeted at educational institutions!

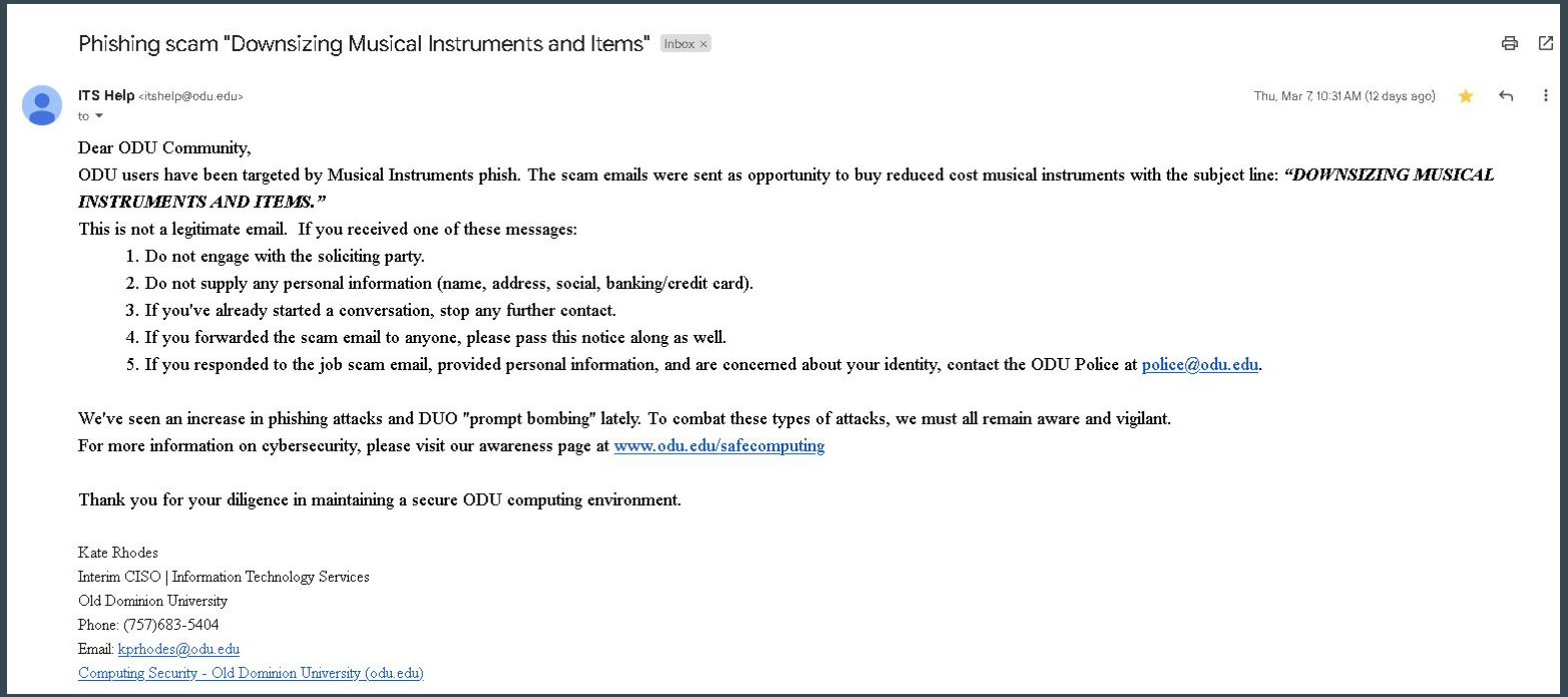
Mo’ Phishing, Mo’ Problems

Mo' Phishing, Mo' Problems

Universities, as stated before, are some of the most vulnerable institutions in terms of phishing attacks. California State University would know.

- **82** student accounts of theirs were compromised in Q2 of 2023, up from almost zero at the beginning of 2021.[17]
- These attacks pose as either threatening to shut down access to important services like email accounts or offering students jobs with very enticing pay.
  - The second one especially is tempting, as many newer students need the money to support themselves, especially those who moved to live near the university (especially those from out of town and/or state).
- Don't think it's just them either: The scam is present throughout most universities, as it's very tempting for newer students and others who might not be as aware of the tells of phishing scams. For example...

Mo’ Phishing, Mo’ Problems



Phishing scam "Downsizing Musical Instruments and Items" Inbox ×

ITS Help <itshelp@odu.edu>
to

Thu, Mar 7, 10:31 AM (12 days ago)

Dear ODU Community,

ODU users have been targeted by Musical Instruments phish. The scam emails were sent as opportunity to buy reduced cost musical instruments with the subject line: ***“DOWNSIZING MUSICAL INSTRUMENTS AND ITEMS.”***

This is not a legitimate email. If you received one of these messages:

1. Do not engage with the soliciting party.
2. Do not supply any personal information (name, address, social, banking/credit card).
3. If you've already started a conversation, stop any further contact.
4. If you forwarded the scam email to anyone, please pass this notice along as well.
5. If you responded to the job scam email, provided personal information, and are concerned about your identity, contact the ODU Police at police@odu.edu.

We've seen an increase in phishing attacks and DUO "prompt bombing" lately. To combat these types of attacks, we must all remain aware and vigilant.
For more information on cybersecurity, please visit our awareness page at www.odu.edu/safecomputing

Thank you for your diligence in maintaining a secure ODU computing environment.

Kate Rhodes
Interim CISO | Information Technology Services
Old Dominion University
Phone: (757)683-5404
Email: kprhodes@odu.edu
Computing Security - Old Dominion University (odu.edu)

Phishing Education

It's becoming more and more clear students and faculties at these universities do not have the proper training required to discern phishing scams from legitimate emails

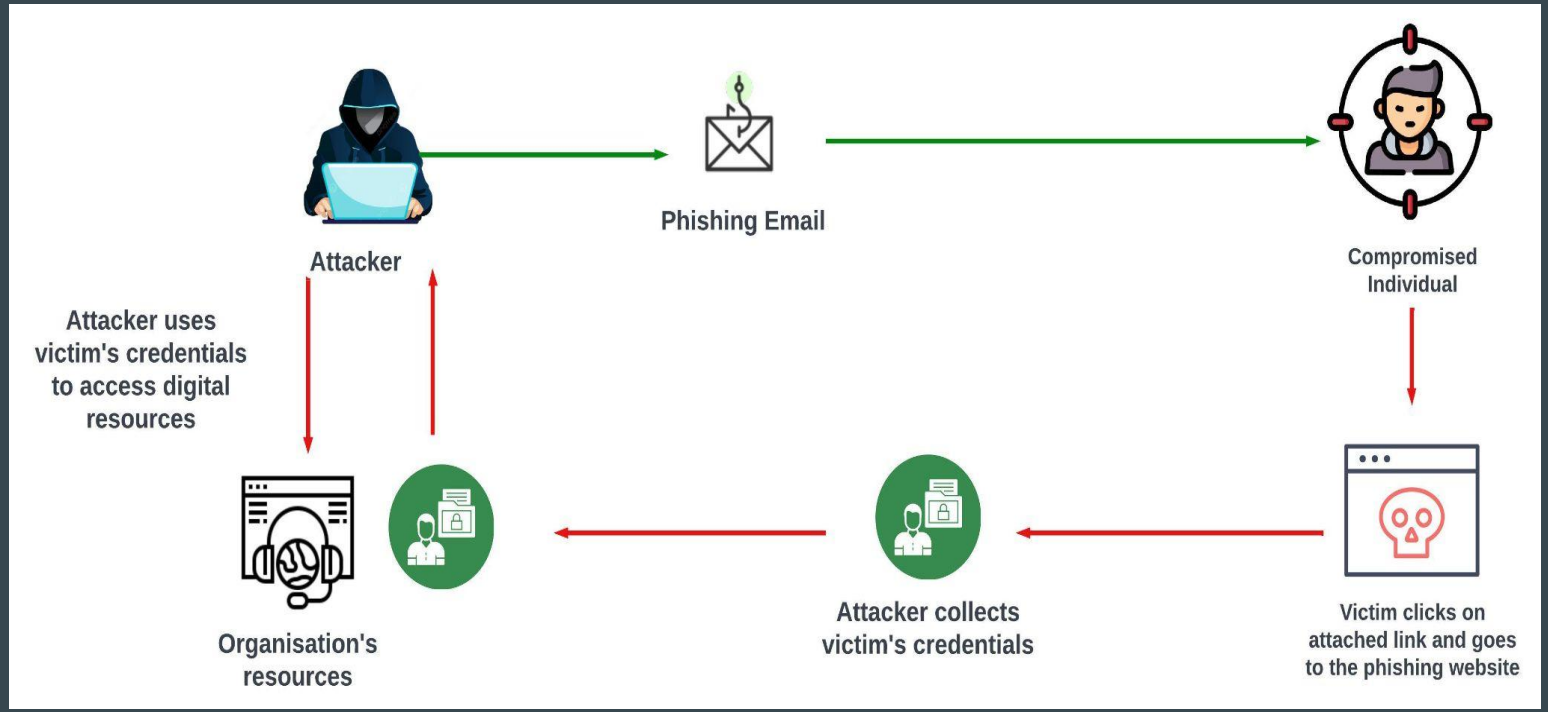
- The average click rate for a phishing attack is **17.8%**, going to to **53.2%** for more targeted spear phishing attacks![16]
- As well as all this, educational facilities have been reported to be some of the most likely to fall for phishing attacks, opening the emails **27.8%** of the time! It's becoming more and more of an issue, and educational institutions like universities are some of the most vulnerable entities out there.

Universities need a proper way to train their students so that they don't bite the hook.

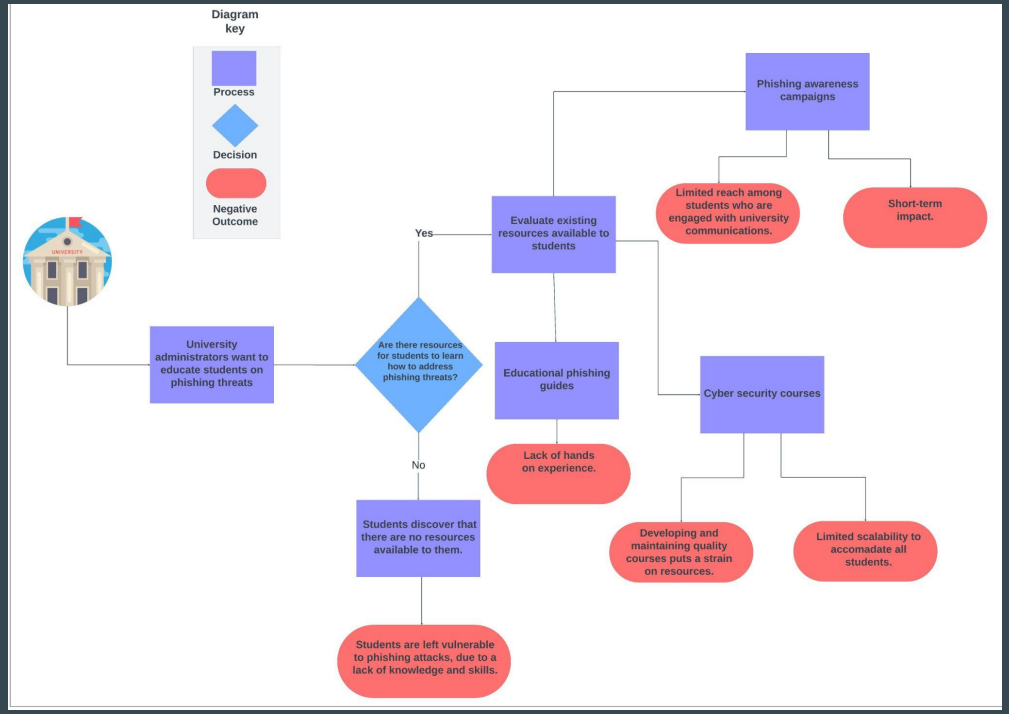
Problem Characteristics

- **Lack of Hands-On Experience:** Students and non-technical university personnel may lack the practical experience in identifying and avoiding phishing attacks.
- **Legacy Technology Infrastructure:** Due to resource constraints universities may rely on inadequate technology infrastructure which can impact students' learning experiences.
- **Resource Constraints:** Universities face resource constraints which can hinder implementing comprehensive phishing training programs.
- **Lack of Scalability:** Universities may encounter challenges in scaling their training initiatives to accommodate a growing student population.

Day In The Life



Current Process Flow



University Collaboration

Phisecure's goal is to collaborate with universities to offer a unique educational experience.

With the Phisecure tool, Universities can provide a unique solution to teaching employees how to identify and avoid phishing scams.

Solution Statement

Phisecure provides a customized training software solution, developing phishing simulations over a variety of platforms tailored to the user. The methods used during the simulation will be reported and explained in detail to the user. Creating a thorough teaching & grading process to help them identify phishing threats.

Solution Characteristics

Hands-On Experience: Phisecure tool will simulate phishing attacks, so users can gain first hand experiences with this issue.

Modern Technology: The environments used for the simulation will be the popular technologies used in present day.

Resource Management: The process is automated, creating an effective training experience for the user, while only requiring introductory inputs in the beginning stage.

Scalability: The software will not be restricted to only current technologies. It is intended to stay updated and adapt to newer technologies, as this will inevitably introduce new ways people can be attacked through phishing.

Simulation

- The templates will be selected that relate to the user

- Attack variation is important, email is not the only vulnerability

- The attacks will be randomized. The time of the attacks and platforms will be unknown by the user

- The goal of the attacks will be to get interaction from the user in these forms
  - A reply back to the message, exposing personal information(information will be deleted)
  - Clicking a link that will imitate Malware. (it will not be Malware) The link will just report back that it was clicked.
  - If user detects that this is a malicious message, they are incentivised to reply "SCAM" for reports

Feedback & Reports

- Feedback is given to the user after the simulation has been completed
- The user will be shown how well they performed
  - Did they spot the message and reply “SCAM”
  - Did they expose sensitive information
  - Did they click a link sent to them
- Phisecure will show the user what red flags they could have spotted
  - Were they asked to provide sensitive information
  - Was there unwarranted urgency or threat
  - Suspicious attachments sent
- All will be recorded for an overall progress report

Links Clicked	Compromising replies	Successful Attacks	Most Successful Platform	Least Successful Platform
…	…	…	…	….

Peer Phishing

- Students will select another student for a simulated attack

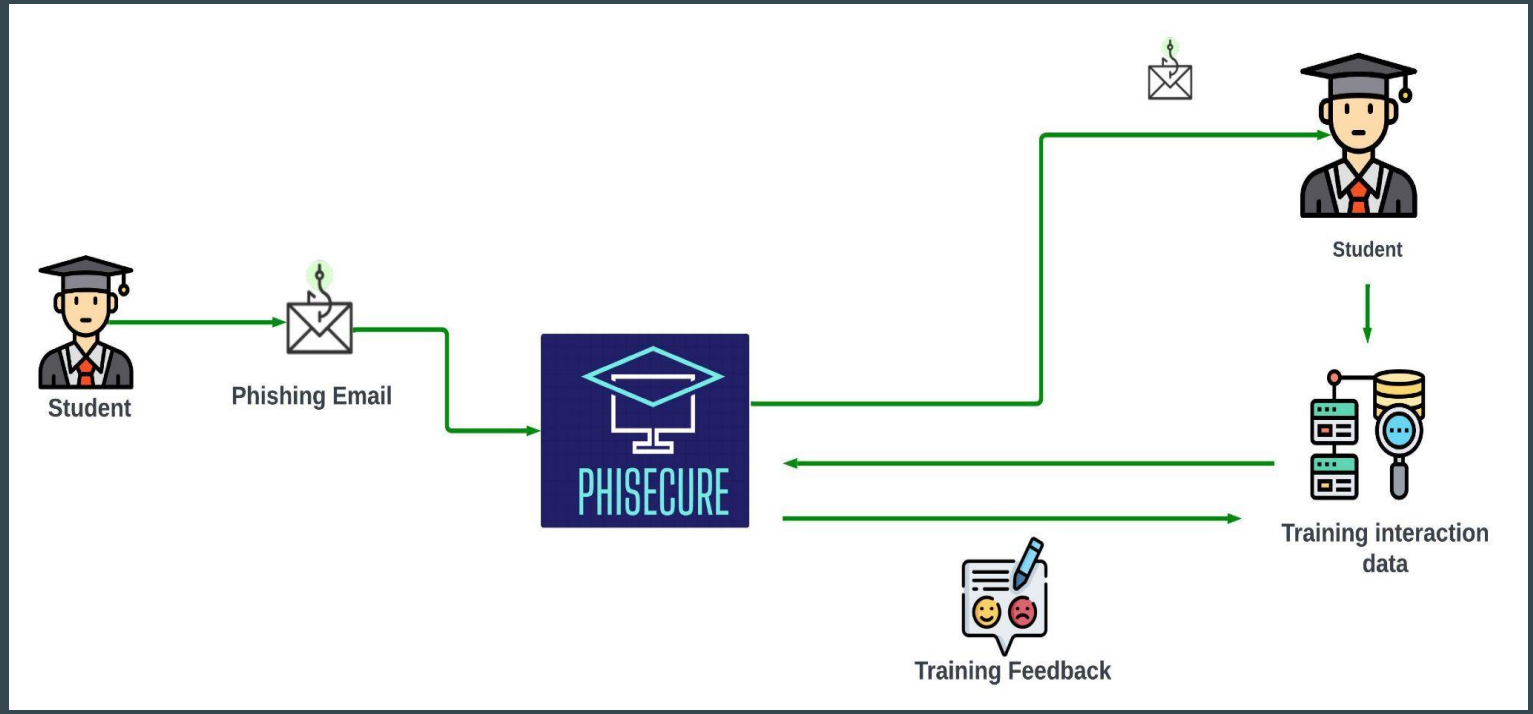
- Students will select the environment and create a template for phisecure to use

- Success of their attack will be recorded and reported to them (no sensitive information will be shared)

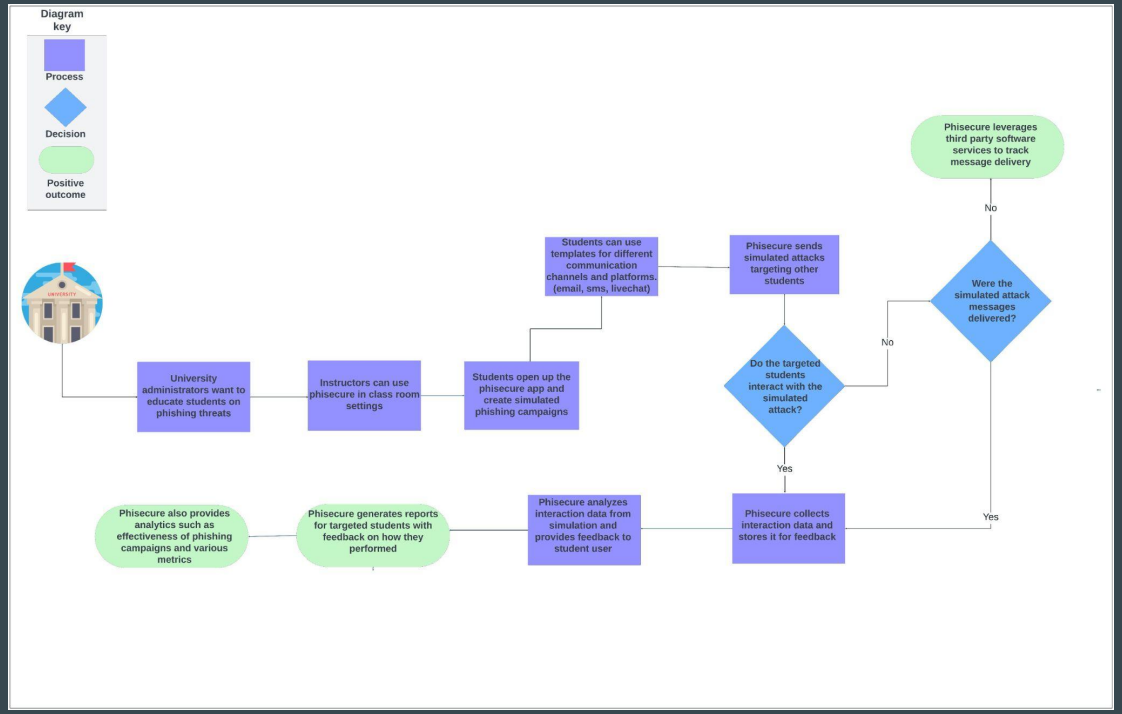
Purpose of Feature

  - This can promote more interaction and a different perspective
  - Successful templates can be adapted into Phisecure's template database for future use

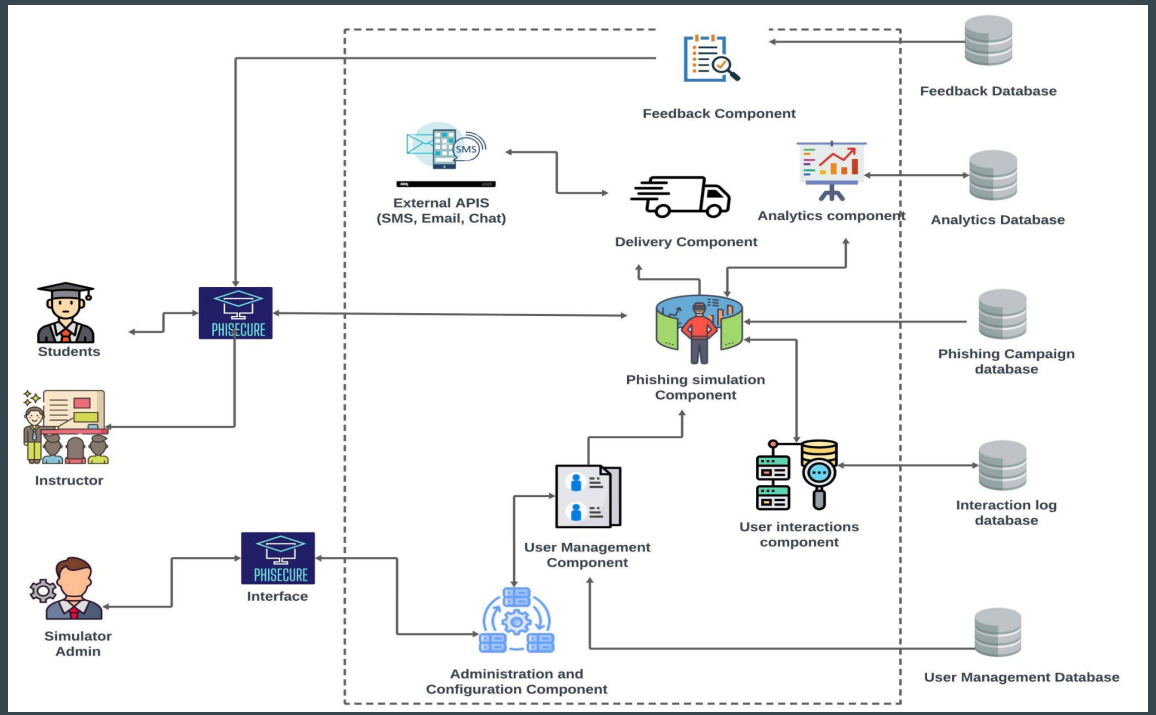
Day In The Life (Solution)



Solution Process Flow



Major Functional Component Design



What does Phisecure do?

- Simulate realistic phishing attacks at the user
- Customize the training environment to match user's environment
- Educates user on phishing methods
- Instill techniques that help mitigate chances of being phished

What does Phisecure not do?

- Does not defend against phishing

- Will not alert user of a real phishing attack

- Cannot simulate the entire spectrum of phishing techniques

Customers, End-Users, Stakeholders

Customers:

- Universities

End-Users:

- Students
- Instructor
- Simulator Administrators

Stakeholders:

- University Leadership/Administrators (Deans, University Presidents)
- Employers

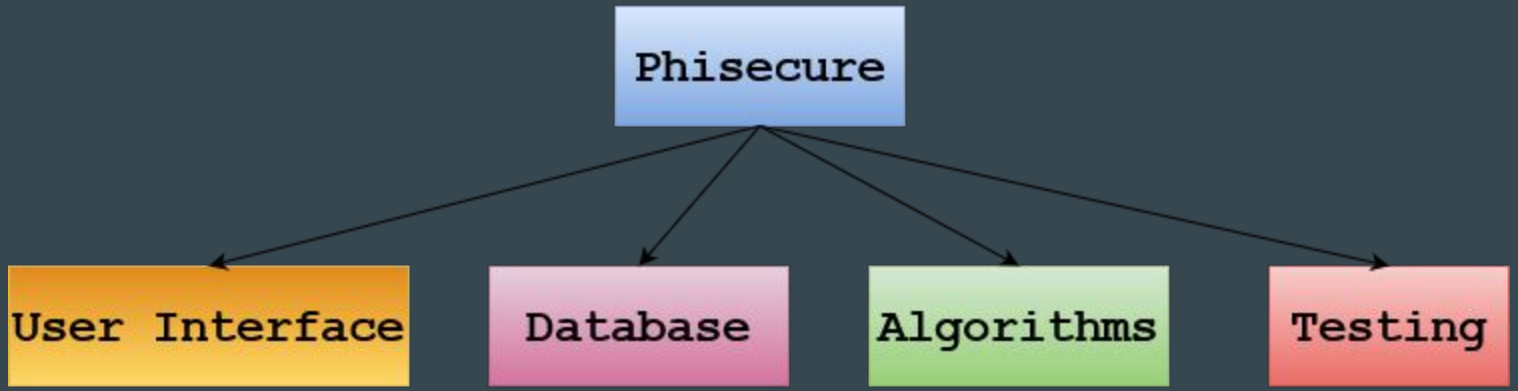
Feature List

Category	Features	Guest	Student	Instructor	Admin	Business Employee	Researcher
User Account Management	User registration		x	x	x	x	x
	Account creation/deletion		x	x	x	x	x
	Login using university credentials		x	x		x	x
	Role-based access control				x		
Phishing simulation	Create a phishing campaign		x	x	x	x	x
	Choose a phishing template		x	x	x	x	x
	Choose mode of delivery(email, sms)		x	x	x	x	x
	Target list of recipients		x	x	x	x	x
	Tutorial	x	x	x	x	x	x
Report/Feedback	Red flags missed		x	x	x	x	
	Links clicked		x	x	x	x	
	Comprosing replies		x	x	x	x	
	Successful attacks		x	x	x	x	
	Most successful platform		x	x	x	x	
	Least successful platform		x	x	x	x	
User interface	Admin dashboard				x	x	
	Student/instructor dashboard		x	x		x	x
	Home page	x	x	x	x	x	x
Simulator enviroment	Attack environment settings			x	x		x
	Email simulation server			x	x		x
	Fake web servers and services			x	x		x
	Customizable network configurations			x	x		x
Analytics	Click rate			x	x		x
	Disclosure rate			x	x		x

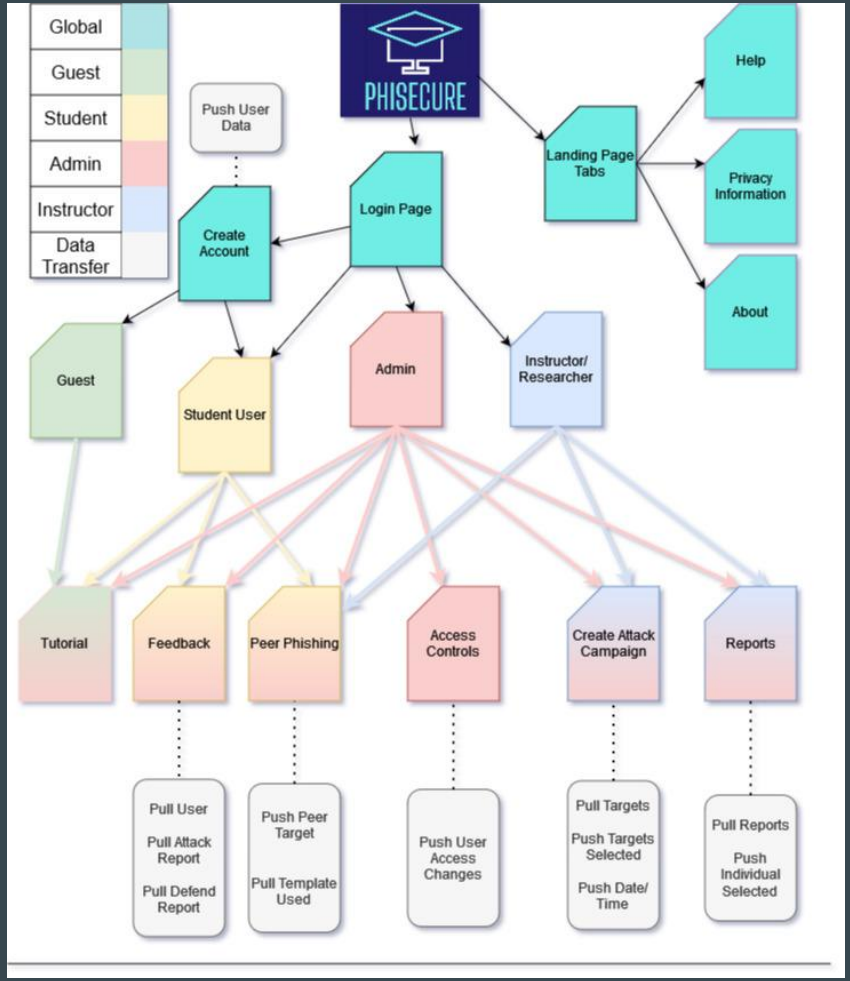
Software/Hardware Tools

- Frontend
  - Framework: React
  - Languages: Python, HTML, CSS
  - IDE: VS Code
- Backend
  - Framework: Flask
  - Languages: Python
  - IDE: VS Code
- Database
  - SQL
- Repository/Version Control Tools
  - Git and GitHub

Work Breakdown Structure Overview



User Interface Sitemap



PHISECURE

Login Page

About Privacy Help

Sign In

User Name:

johndoe

Password:

****

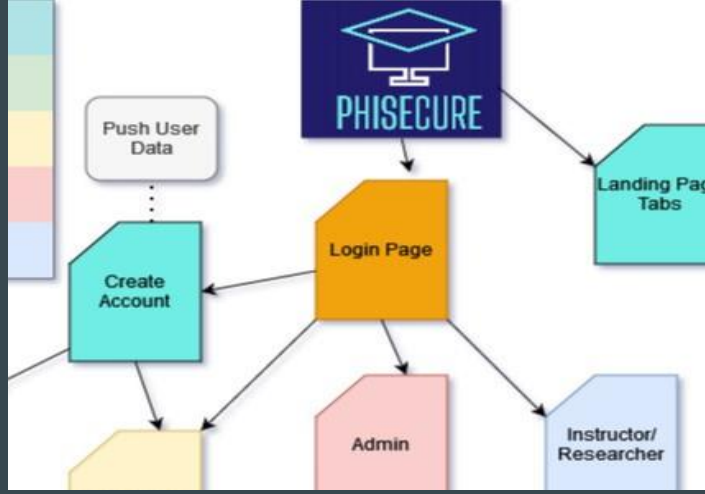
User Role

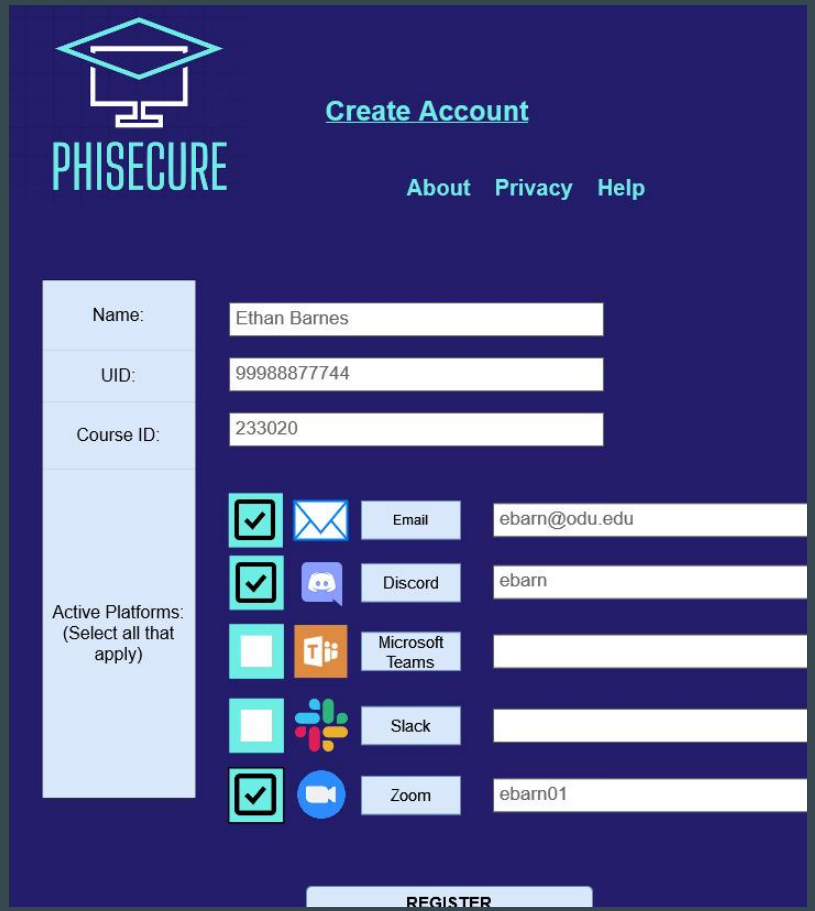
SIGN IN

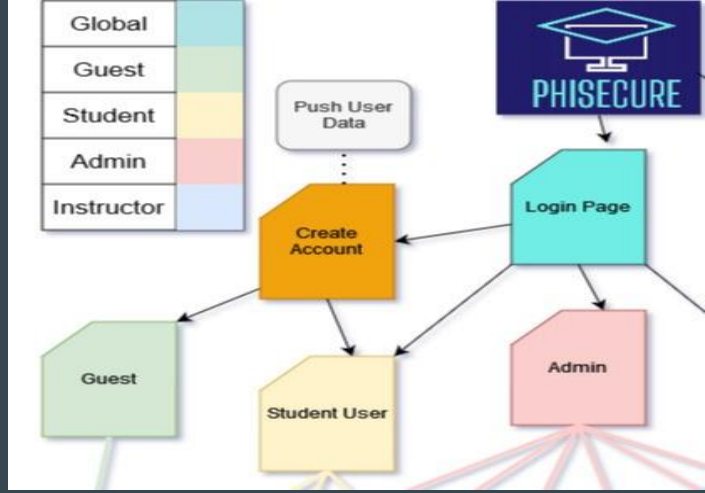
Forgot Password?

New User

SIGN UP




PHISECURE
Create Account
About Privacy Help
Name:
Ethan Barnes
UID:
99988877744
Course ID:
233020
Active Platforms: (Select all that apply)
Email
ebarn@odu.edu
Discord
ebarn
Microsoft Teams
Slack
Zoom
ebarn01
REGISTER


Global
Guest
Student
Admin
Instructor
Push User Data
PHISECURE
Login Page
Create Account
Guest
Student User
Admin

PHISECURE

Peer Phishing

About Privacy Help

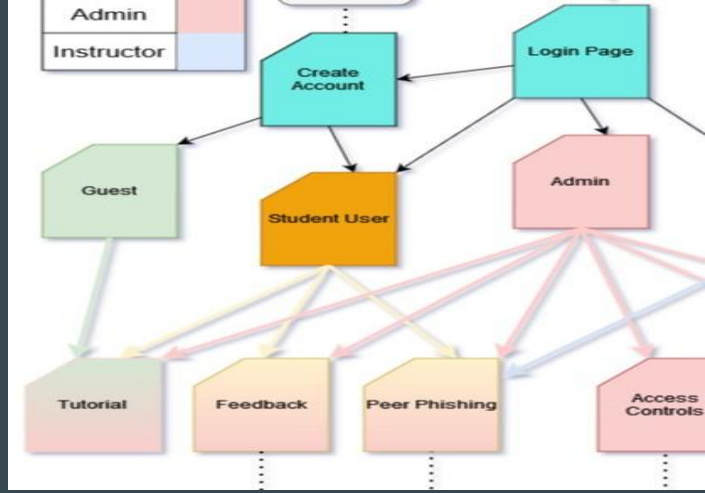
Search for Target

Name	Course
Barnes, Ethan	54631
Engaro, Meat	54631
Milhouse, Tricky	54631
Wrong, Hany	54631

Tooltip:
Currently only authorized to peer phish users in your course.

Launch Phisecure Template

Create Custom Template

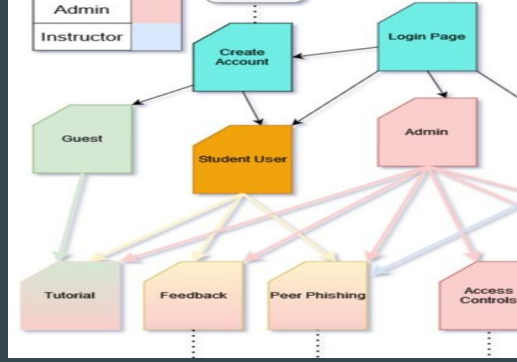


PHISECURE

Home About Privacy Help

Attacker Report

Report Card			
Name	John Doe	UID	02451121
Successful Attacks	3	Course ID	233023
Best Platform	Facebook		
Worst Platform	Discord		
Overall Grade	64%		



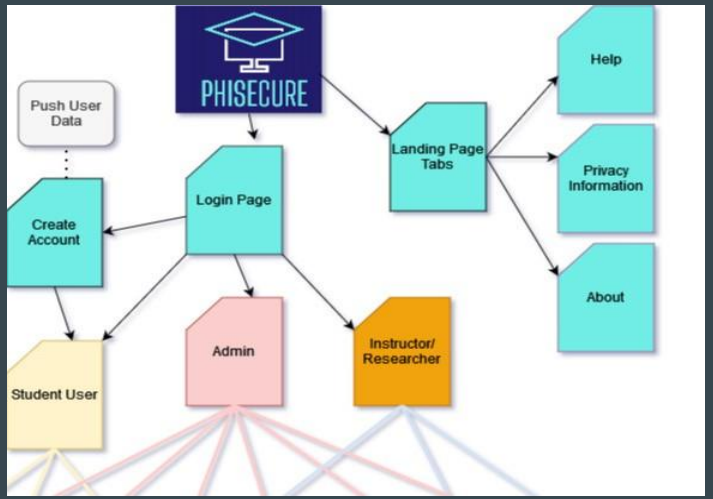
PHISECURE

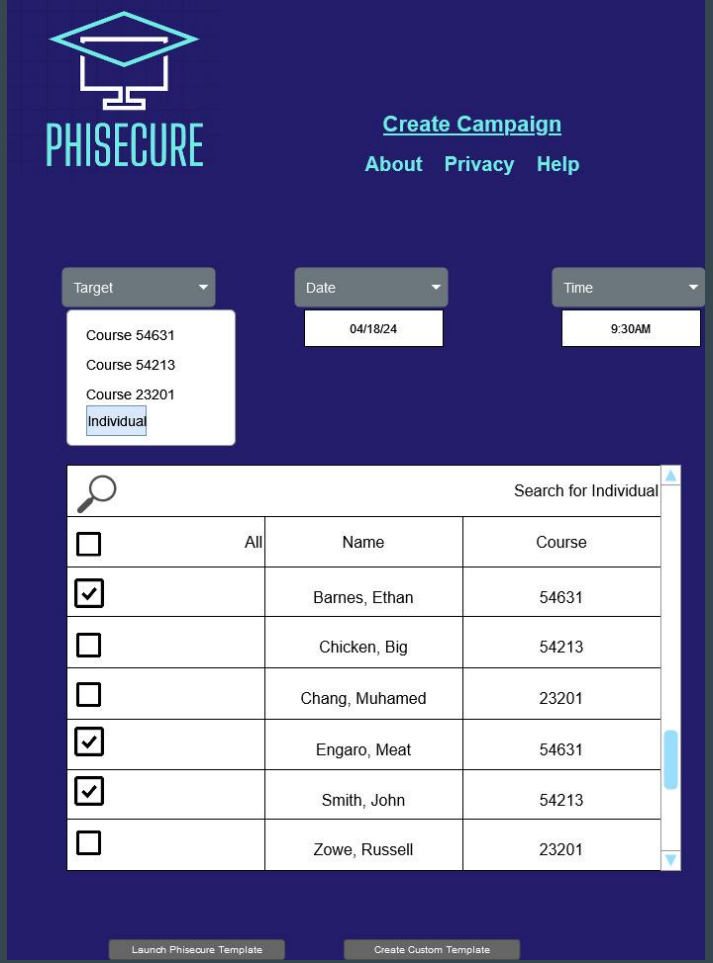
Home About Privacy Help

Defender Report

Report Card			
Name	John Doe	UID	11234542
Links Clicked	5	Course ID	233023
Red Flags Missed	3		
Number of emails reported	4		
Overall Grade	72%		

PHISECURE
Instructor
About Privacy Help
Reports
Peer Phishing
Create Campaign
Access Settings


PHISECURE
Push User Data
Create Account
Login Page
Landing Page Tabs
Help
Privacy Information
About
Admin
Instructor/ Researcher
Student User

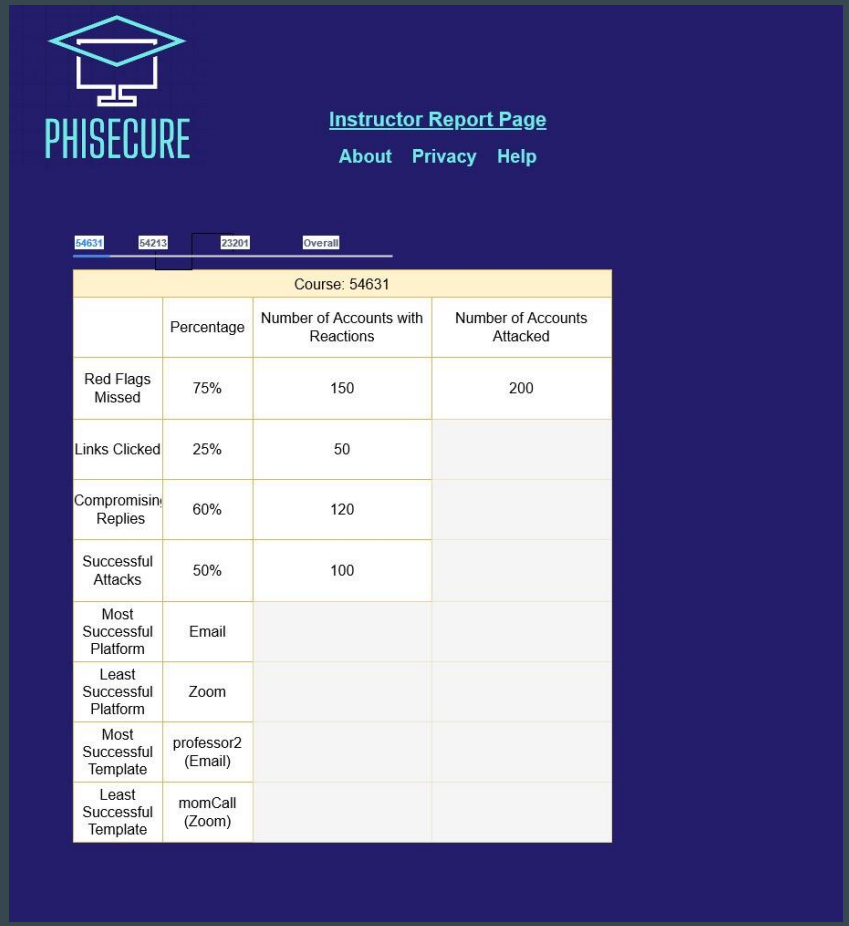

PHISECURE
Create Campaign
About Privacy Help
Target
Date
Time
Course 54631
Course 54213
Course 23201
Individual
04/18/24
9:30AM
Search for Individual
All
Name
Course
Barnes, Ethan 54631
Chicken, Big 54213
Chang, Muhamed 23201
Engaro, Meat 54631
Smith, John 54213
Zowe, Russell 23201
Launch Phisecure Template
Create Custom Template

Search for Individual Report

Name	UID	Course
Barnes, Ethan	555999444	54631
Chicken, Big	446464654	54213
Chang, Muhamed	123456888	23201
Engaro, Meat	987654555	54631
Smith, John	222333789	54213
Zowe, Russell	555987633	23201

Individual Report

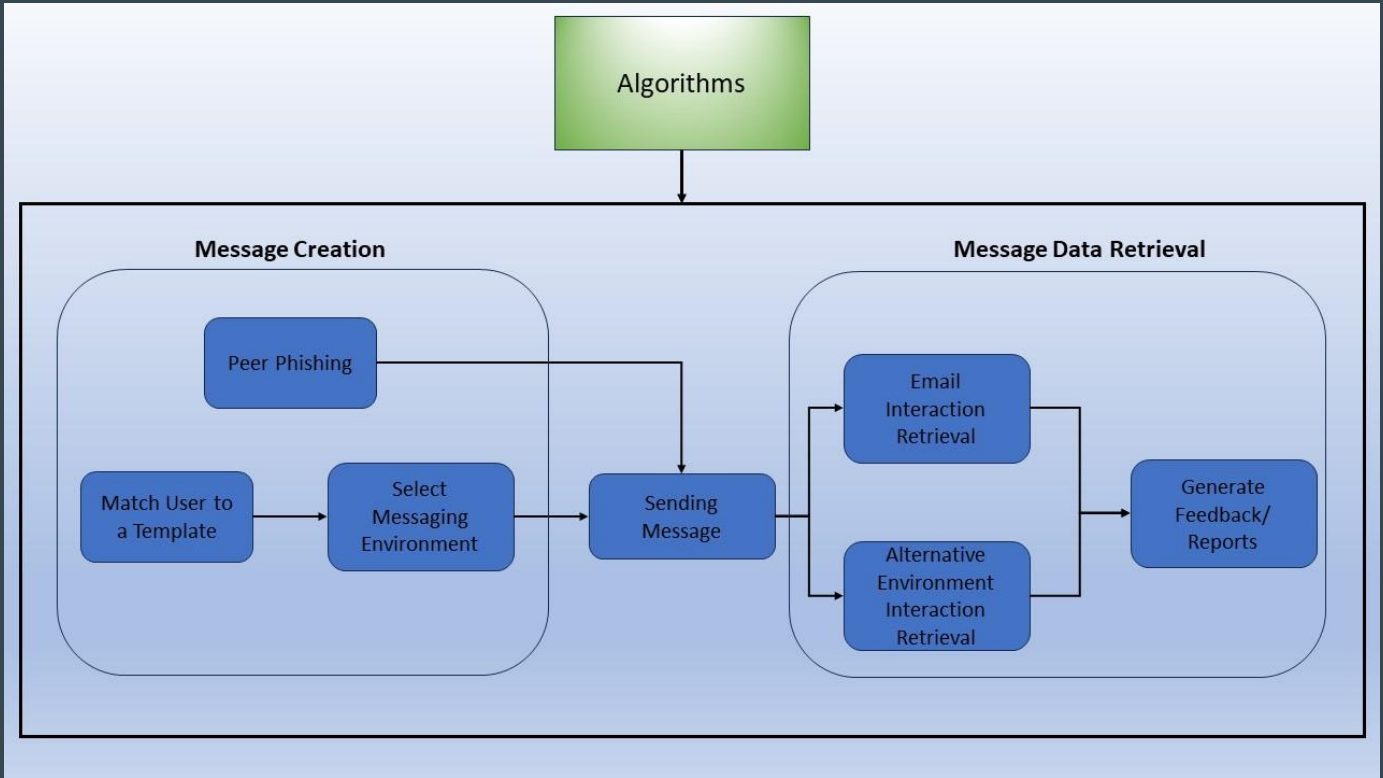
Name	UID	Course	
Barnes, Ethan	555999444	54631	
	Percentage	Number of Reactions	Number of Triggers
Red Flags Missed	10%	1	10
Links Clicked	50%	10	20
Compromising Replies	33%	2	6
Successful Attacks		0	
Most Successful Platform	Email		
Least Successful Platform	Discord		



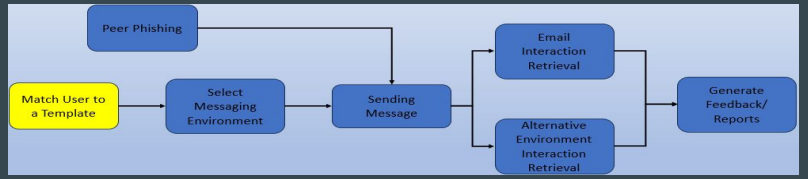
Course: 54631

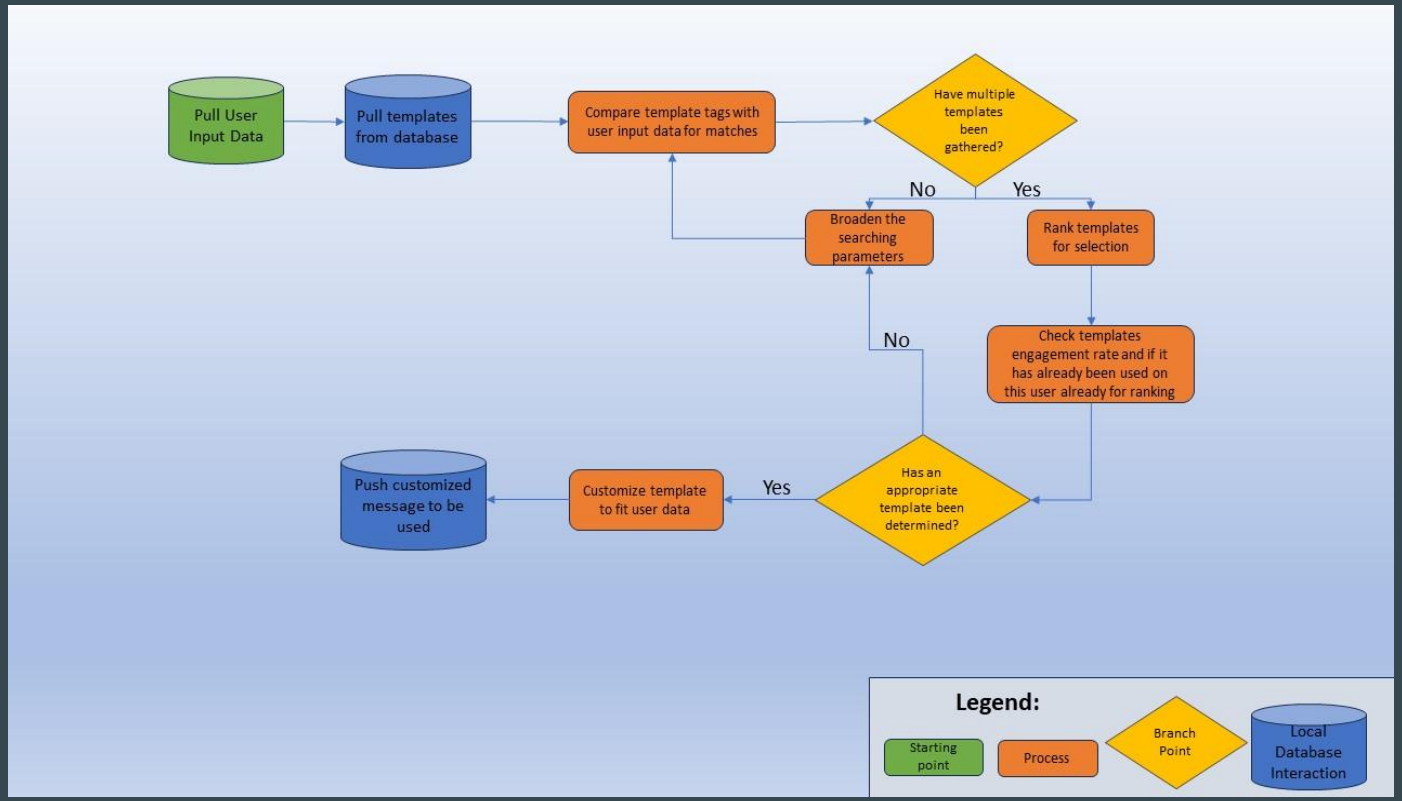
	Percentage	Number of Accounts with Reactions	Number of Accounts Attacked
Red Flags Missed	75%	150	200
Links Clicked	25%	50	
Compromising Replies	60%	120	
Successful Attacks	50%	100	
Most Successful Platform	Email		
Least Successful Platform	Zoom		
Most Successful Template	professor2 (Email)		
Least Successful Template	momCall (Zoom)		

Work Breakdown Structure - Algorithms

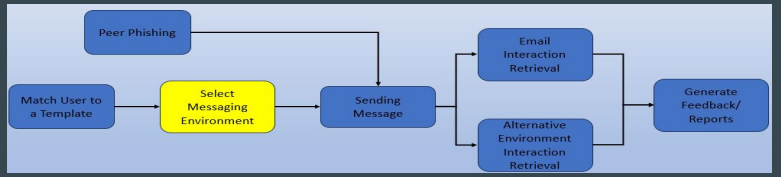


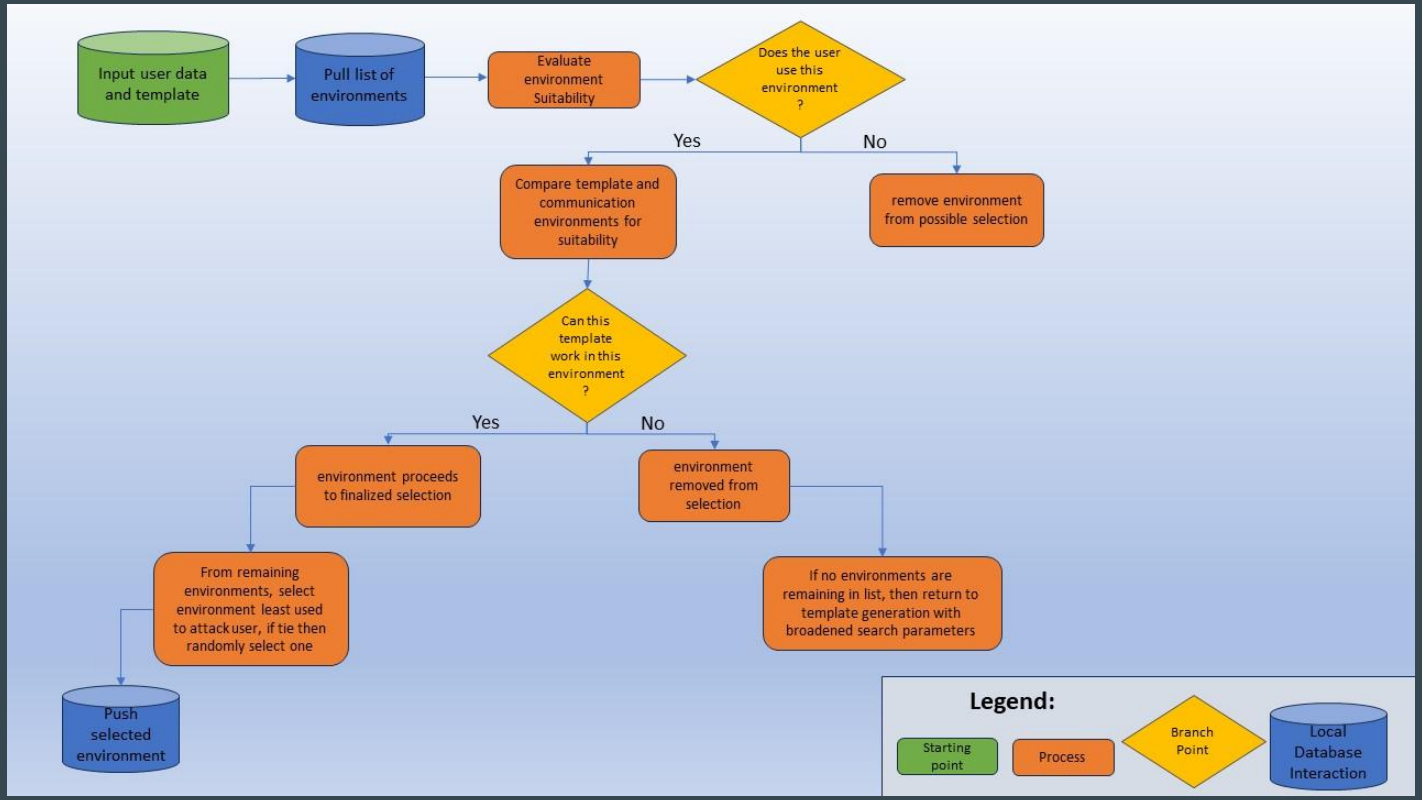
Match User to a Template



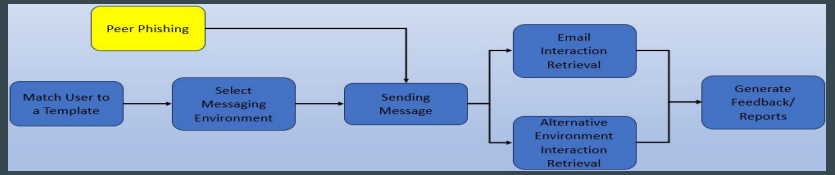


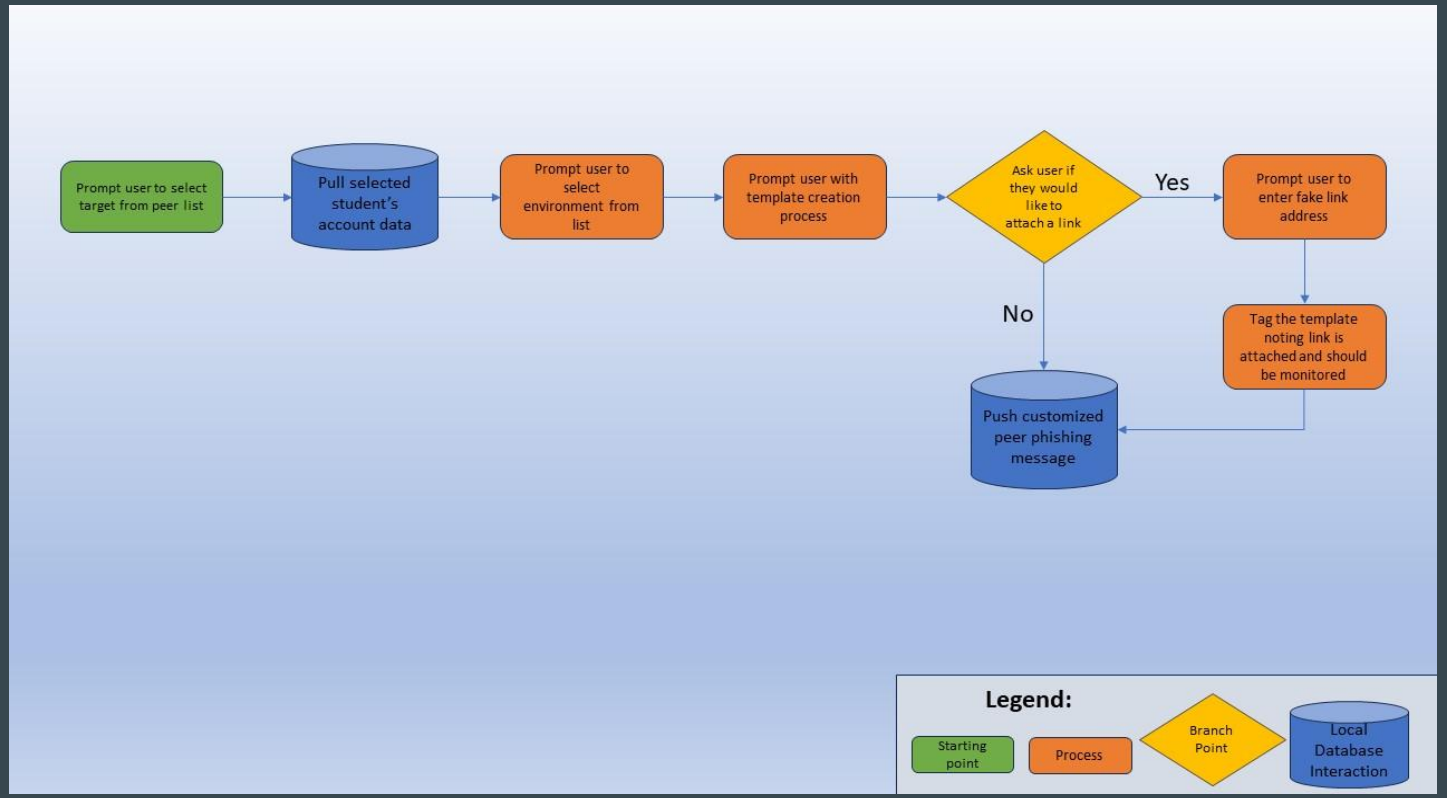
Select Messaging Environment



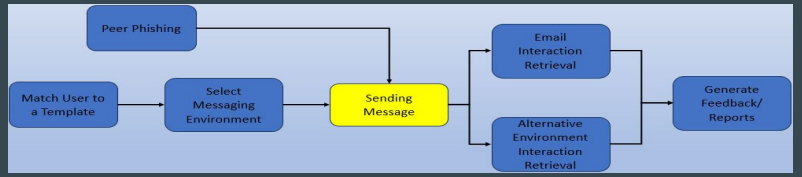


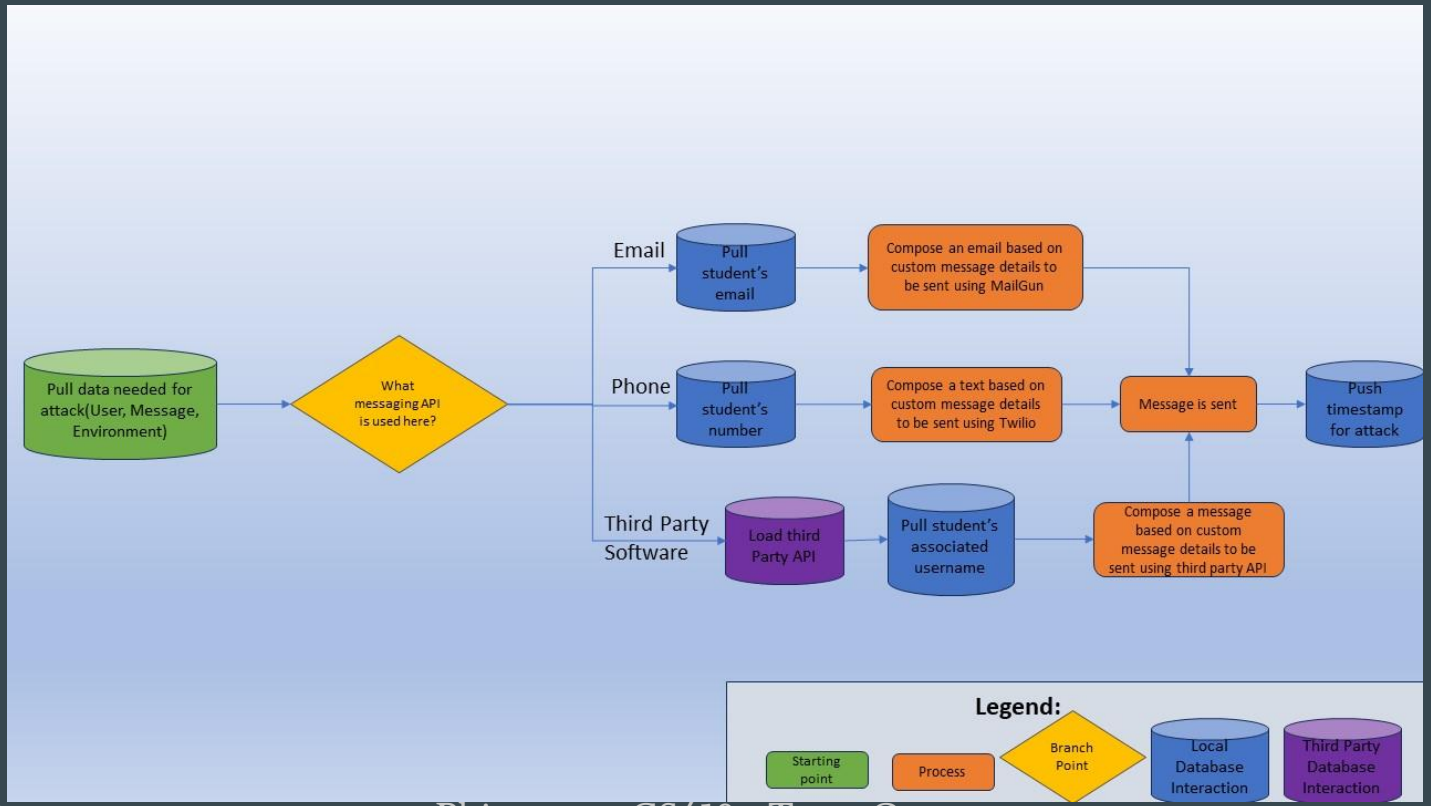
Peer Phishing



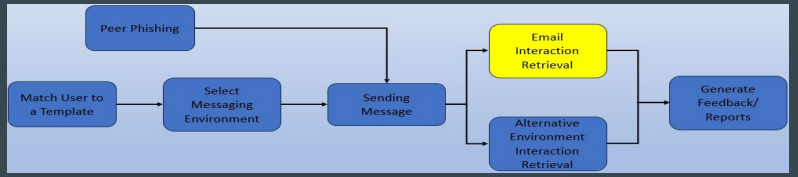


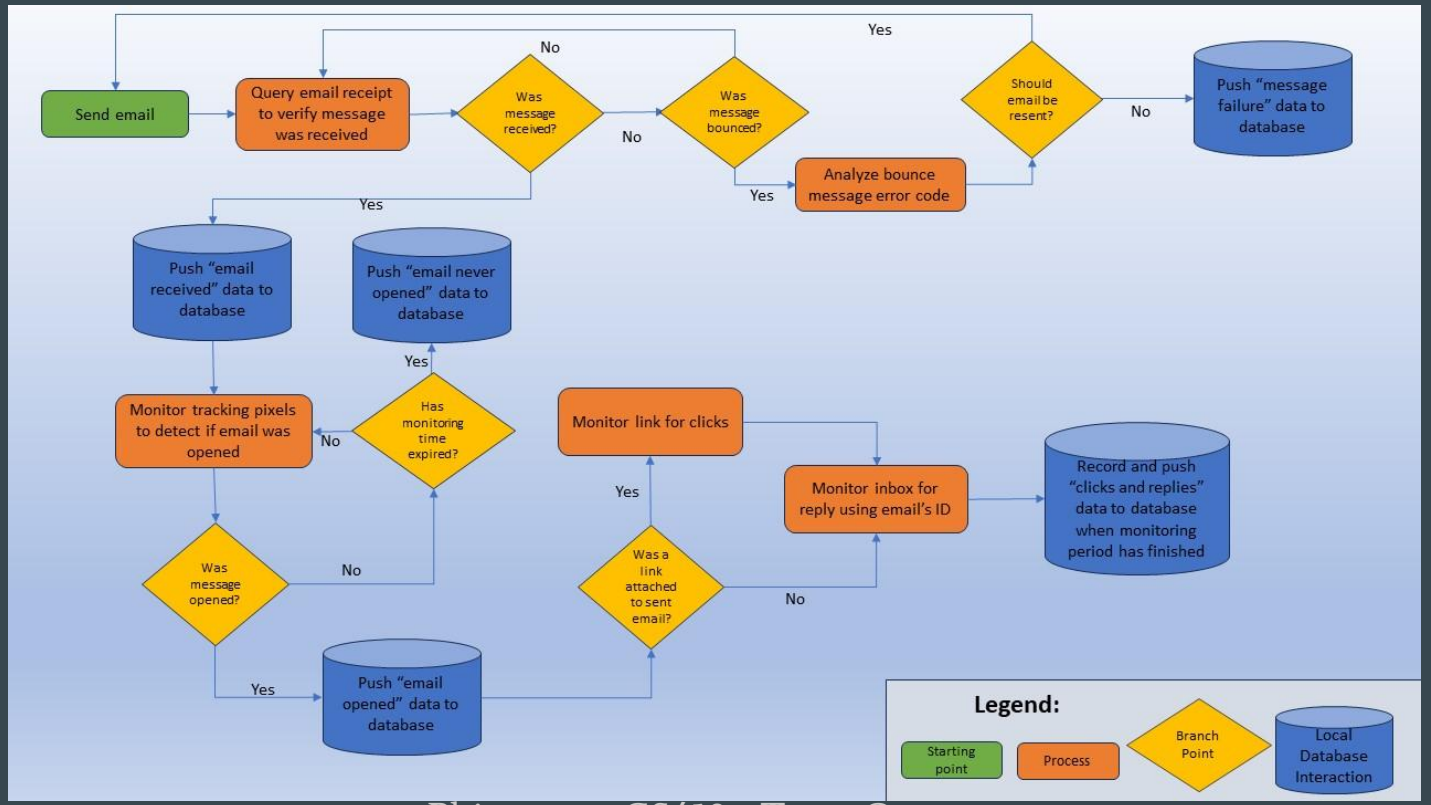
Sending Message



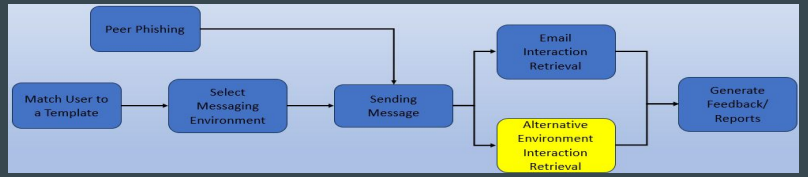


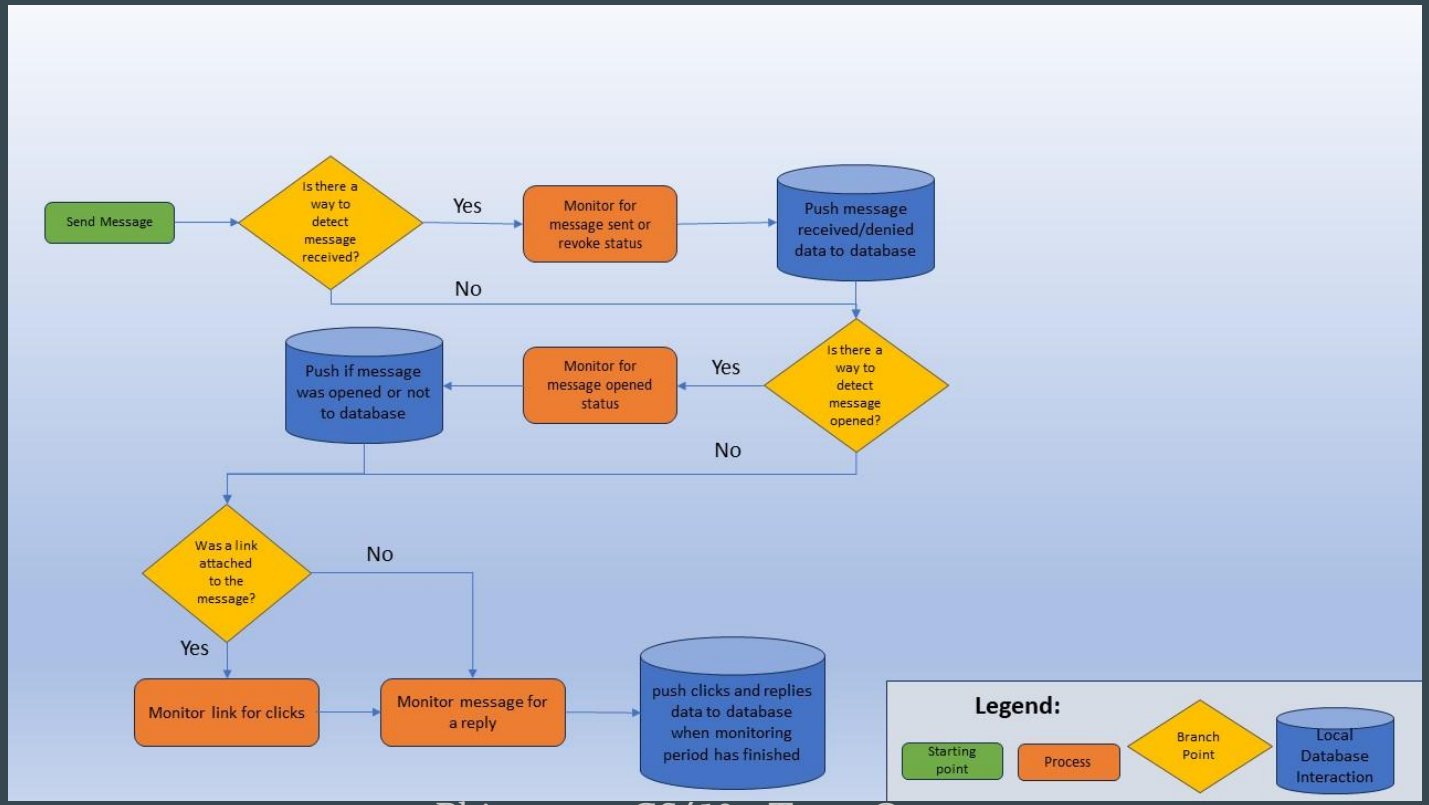
Email Interaction Retrieval



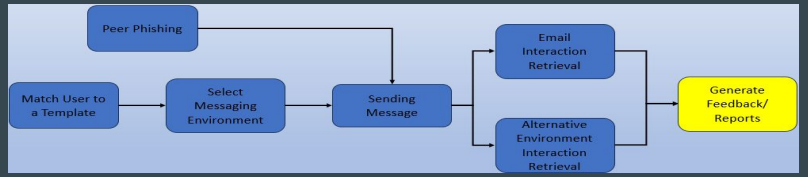


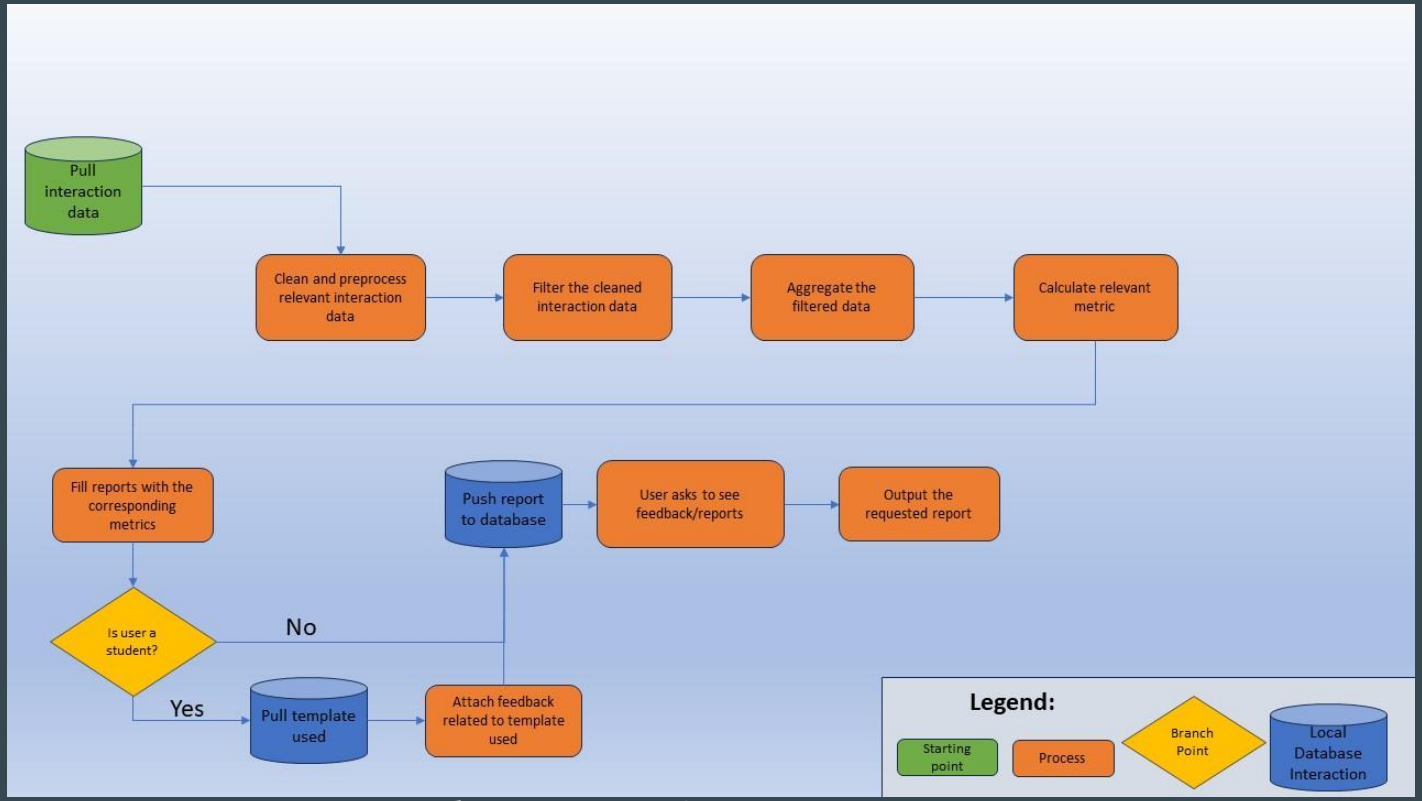
Alternative Environment Interaction Retrieval



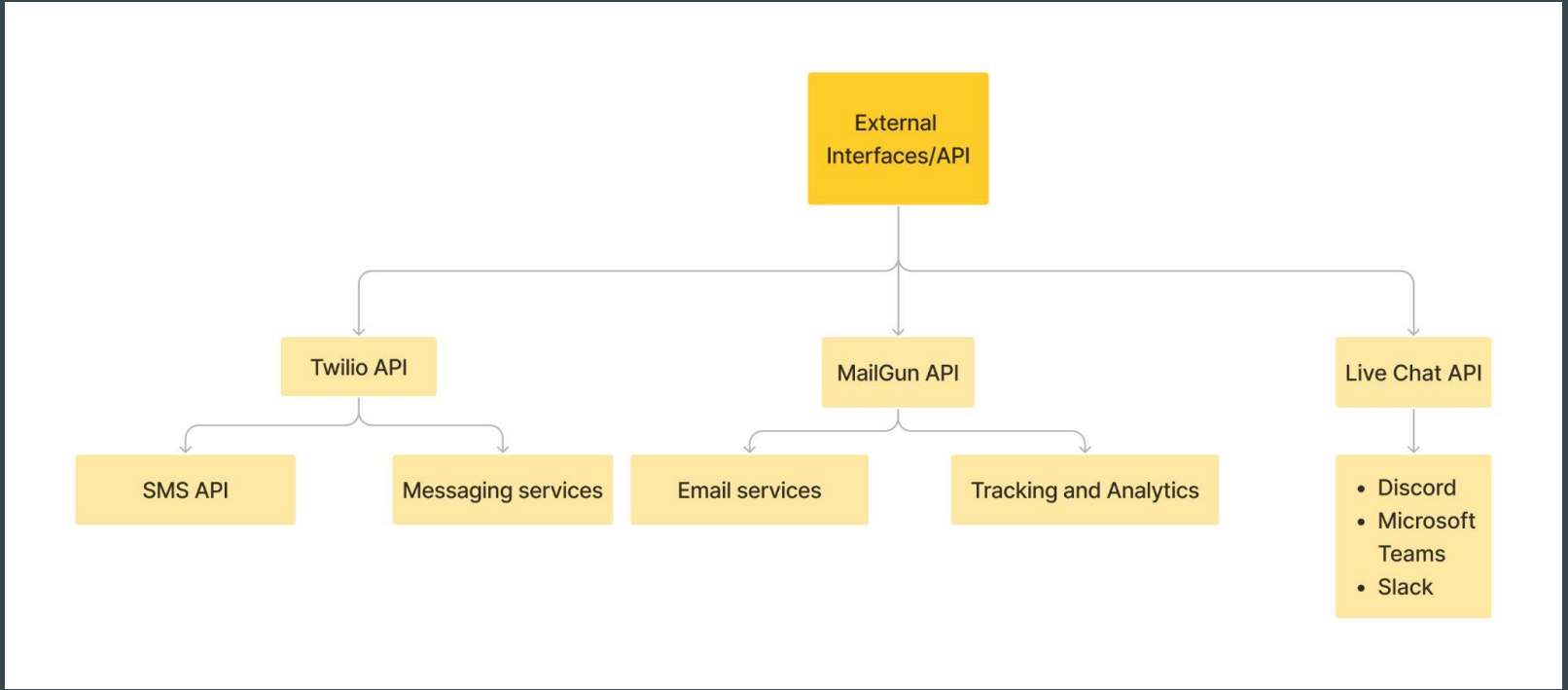


Generate Feedback/Reports

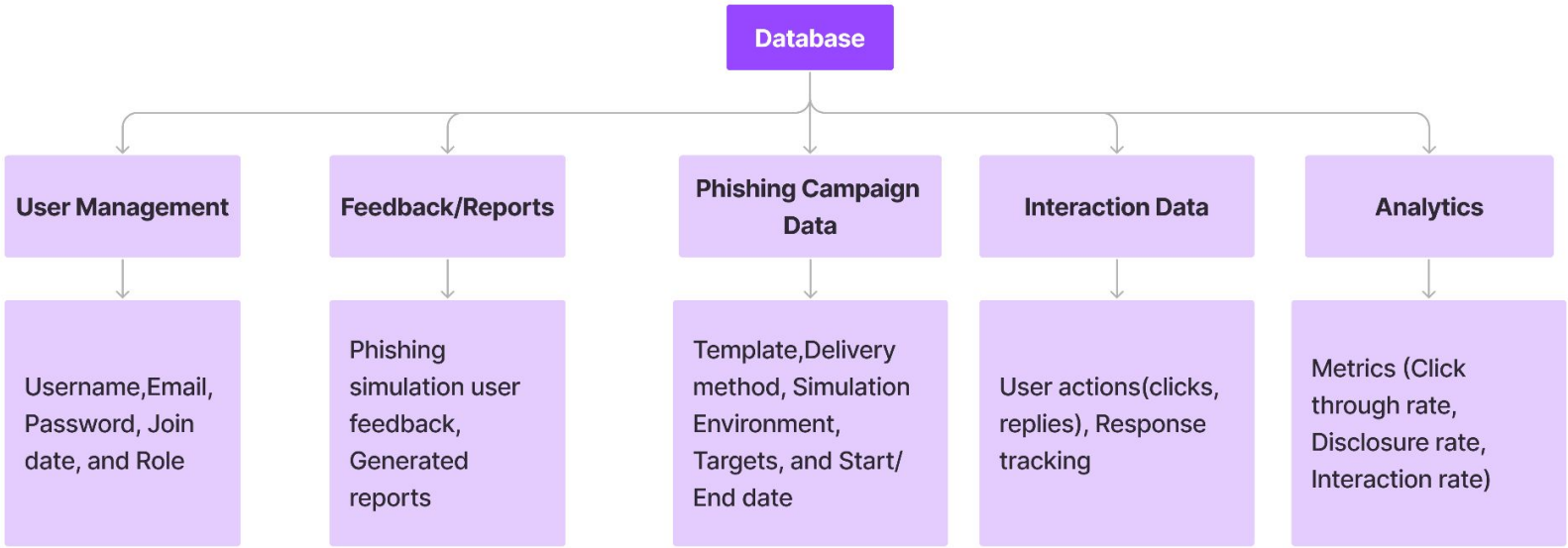




Work Breakdown Structure - External Interfaces/API



Work Breakdown Structure - Database



Database Schematic

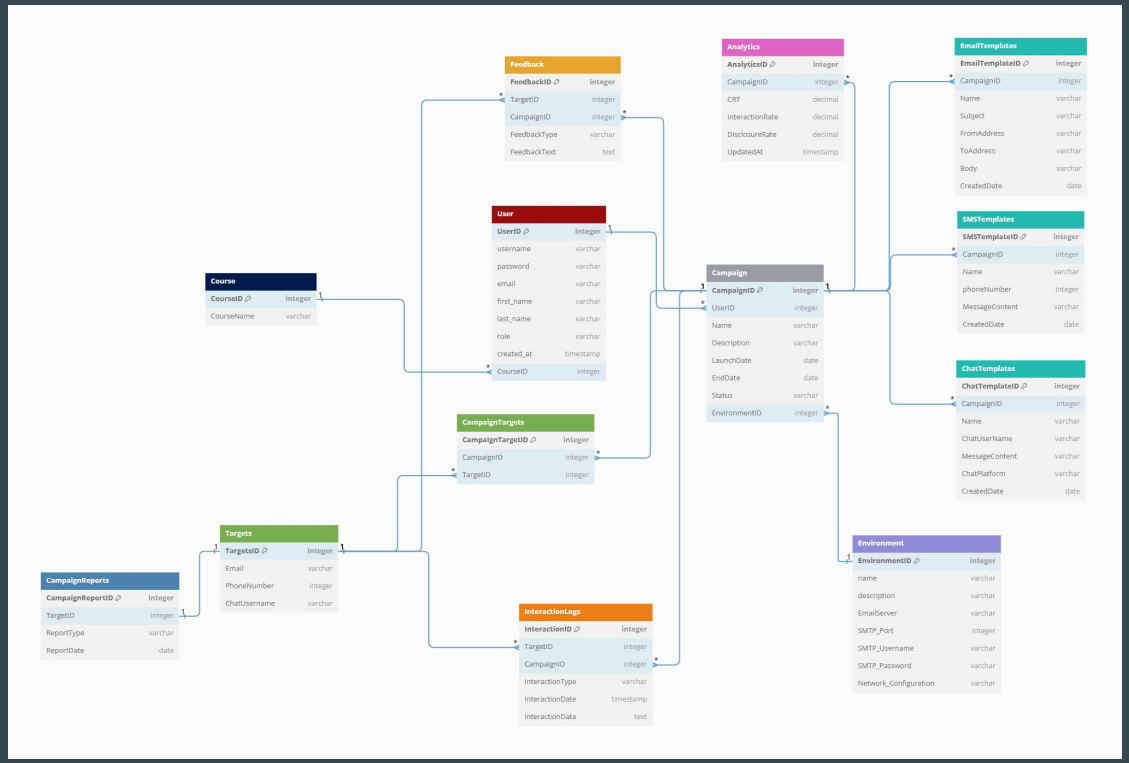


Table Legend

- User Table
- Course Table
- Environment Table
- Template Tables
- Target-related Tables
- Feedback Table
- Analytics Table
- Campaign Table
- Reports Table

Data Management

Data Sources

- User data: Data from user registration, campaign creation, and interactions with campaign.
- Logs: Logs of user activity, campaign execution, and errors.
- External integrations: Data obtained from external sources such as email service providers, SMS gateways, and live chat platforms

Storage Locations

- Database: MySQL
- File Storage: Amazon S3 (Simple Storage Service)

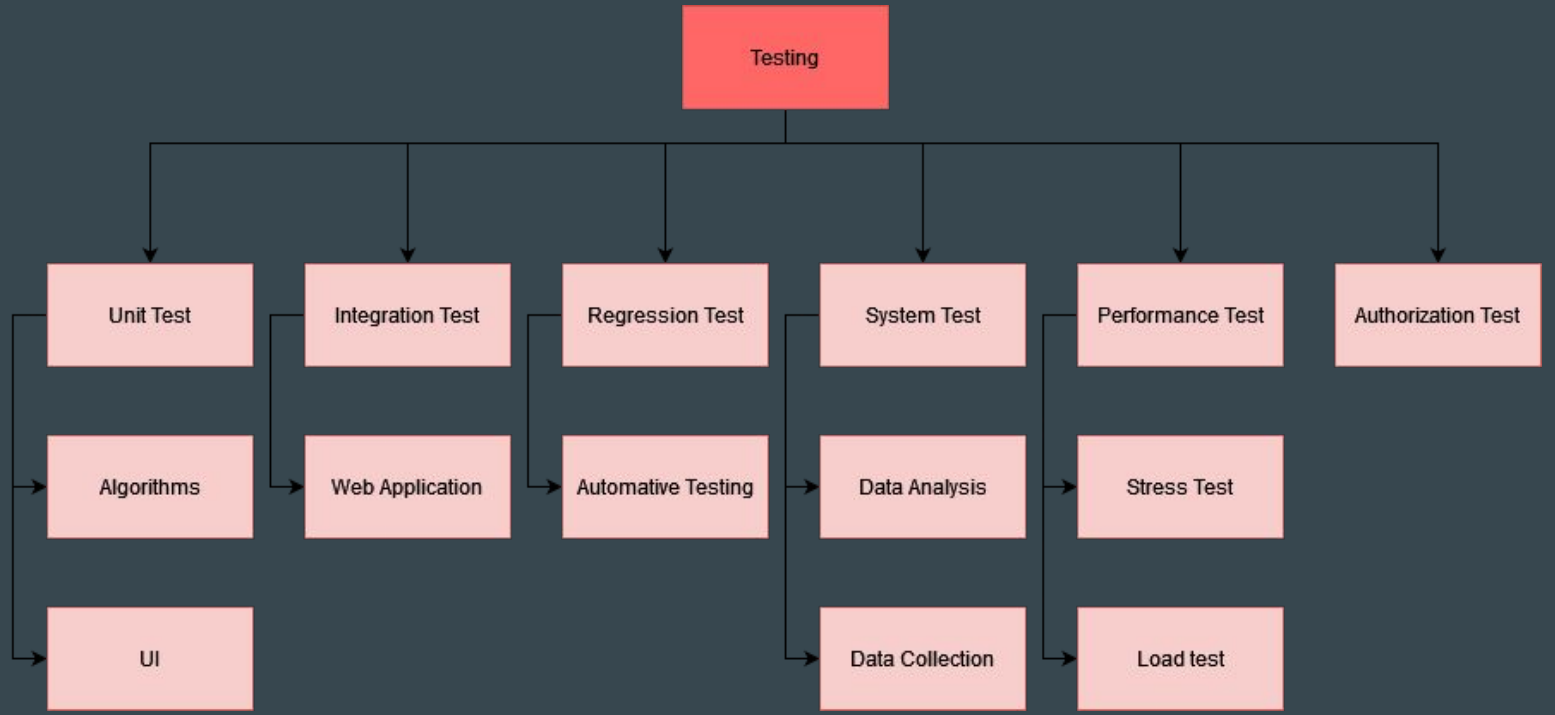
Collected data

- User account information.
- Phishing campaign results.
- Interaction metadata.
- System logs.

Data Security

- Encryption: Encrypt sensitive data such as passwords, API keys, and any metadata.
- Access control: IAM (Identity and Access Management) AWS

Work Breakdown Structure - Testing



Sprint Breakdown

Sprint 0

- Establish development environment
- Setup front and back end infrastructure
- Develop UI framework
- Design database schema
- Design basic layouts for user registration and login screens

Sprint 1

- Develop the phishing campaign features
- Implement basic admin, student, and teacher dashboard
- Implement homepage layout

Sprint 2

- Implement phishing campaign feature
- Implement dashboard statistics/performance metrics
- Set up email simulation and fake web servers
- Configure customizable network configurations

Sprint 3

- Implement role-based access control
- Fine tune phishing campaign features
- Implement click rate tracking for phishing links
- Refine UI
- Develop tutorial features

Sprint 4

- Add features for managing user accounts, permissions and campaigns
- Implement advanced analytics and reporting functionality
- Ensure readiness for production deployment
- Setup deployment configurations

	PHISECURE	Direct Competition				Indirect Competition
		Universities	Nice Challenge Project	Gophish	TrustedSec's Social Engineer Toolkit	KnowBe4
Free for Educational Institutions	✅	✅	✅	✅	✅	☐
SMS Spoofing	✅	☐	☐	☐	✅	✅
Discord, Slack, and Microsoft Teams	✅	☐	☐	☐	☐	✅
Designed for the Average User	✅	✅	☐	✅	☐	✅
Focus on Educating Targets	✅	✅	✅	☐	☐	✅
Peer Driven Spear Phishing	✅	☐	☐	☐	☐	☐
Peer Training Effectiveness Assessment	✅	✅	✅	✅	☐	✅

Technical Risk Matrix

T1. Tool exposes sensitive information of users due to security vulnerabilities.

- Conduct regular security audits and penetration testing.
- Implement encryption protocols to protect user data.
- Provide secure authentication methods.

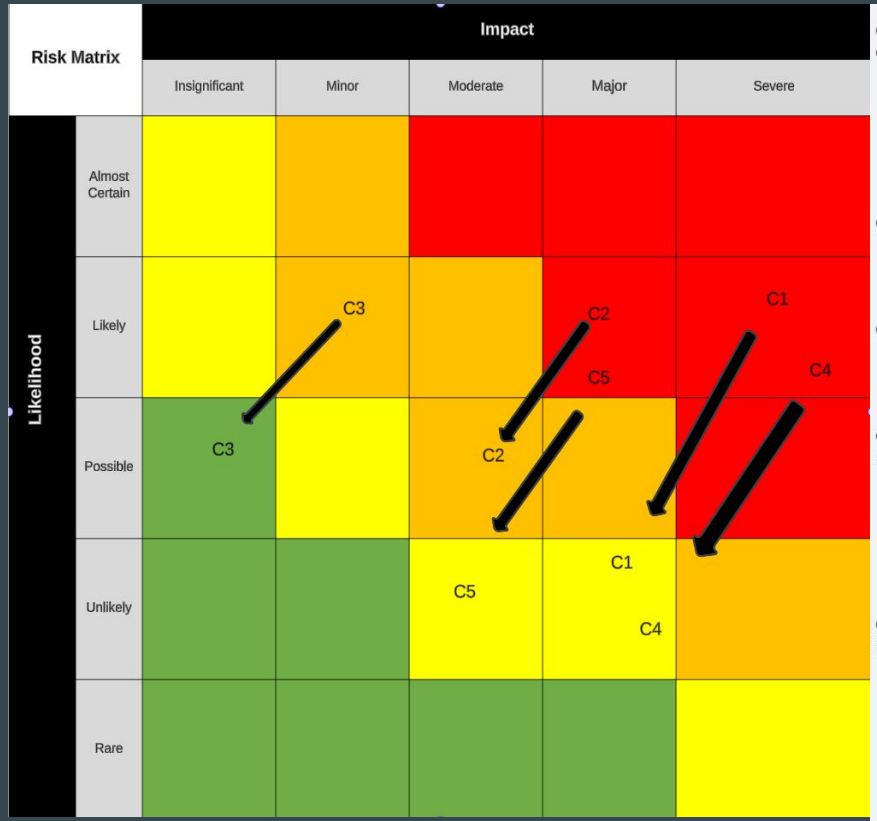
T2. Tool is susceptible to being hacked, leading to unauthorized access to user data.

- Employ strong security measures such as firewalls, intrusion detection systems, and access controls.
- Regularly update and patch software vulnerabilities.
- Implement multi-factor authentication.

T3. A lack of regular updates and maintenance may render the tool ineffective against evolving phishing techniques.

- Establish a maintenance schedule for updating content and addressing software vulnerabilities.
- Monitor emerging trends in phishing attacks and update the tool accordingly.

Customer Risk Matrix



C1. Simulations within the education tool may not accurately reflect real-world phishing scenarios, leading to a disconnect between learning outcomes and practical application.

- Conduct thorough research to ensure simulations reflect current phishing techniques and trends accurately.
- Regularly update simulations to incorporate new phishing methods and tactics as they emerge.
- Solicit feedback from users to identify areas where simulations may be lacking or could be improved.
- Provide supplementary resources or exercises to reinforce learning and bridge any gaps between simulation and real-world scenarios.

C2. Users may not fully engage with the educational material, leading to ineffective learning.

- Design interactive and engaging content.
- Incorporate gamification elements to make learning enjoyable.
- Gather user feedback for continuous improvement.

C3. Users may feel overwhelmed or intimidated by the complexity of the tool, leading to disengagement

- Provide clear and intuitive user interfaces.
- Offer tutorials and support resources to assist users in navigating the tool.
- Conduct user testing to identify and address usability issues.

C4. Frequent exposure to simulated phishing attacks within the education tool may desensitize users to real-world threats.

- Implement varied and realistic phishing simulations to maintain user engagement and prevent desensitization.
- Provide ongoing education and reinforcement of phishing awareness best practices to remind users of the importance of remaining vigilant.
- Monitor user feedback and engagement metrics to identify signs of desensitization and adjust simulation frequency or intensity accordingly.
- Emphasize the dynamic and evolving nature of phishing threats to reinforce the need for continued vigilance and awareness.

C5 Users may develop a misleading perception that phishing is a static or predictable environment based on their interactions with the education tool.

- Provide clear messaging and educational content emphasizing the constantly evolving nature of phishing attacks.
- Incorporate real-world case studies and examples to illustrate the dynamic and adaptive tactics employed by cybercriminals.
- Encourage users to remain vigilant and proactive in staying informed about emerging phishing trends and techniques.
- Regularly update the education tool with new content and simulations that reflect current phishing landscape and trends.

Legal Risk Matrix

Legal Risks

L1. Legal and compliance issues could arise due to mishandling of user data or failure to meet regulatory requirements

- Comply with data protection laws such as GDPR, CCPA, etc.
- Obtain necessary permissions for data collection and processing.
- Implement privacy policies and terms of use

L2. Non-compliance with accessibility standards and regulations, leading to discrimination claims.

- Design and develop the tool following accessibility principles and guidelines (e.g., WCAG).
- Conduct regular accessibility audits and testing. Provide accessible alternatives and accommodations for users with disabilities.

Conclusion

- Phishing is a widespread issue that presents a significant challenge for universities.
- Phisecure offers a tailored solution, which provides customizable phishing simulations.
- Through collaboration with universities, Phisecure enhances its reach, offering innovative cybersecurity education.

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Glossary and Appendices

Phishing- The fraudulent practice of sending emails or other messages purporting to be from reputable companies to induce individuals to reveal personal information, such as passwords and credit card numbers.

Spear Phishing - A type of phishing involving personalization and targeting a specific individual.

Malware- Software that compromises the operation of a system by performing an unauthorized function or process.

Ransomware- A malware designed to deny a user or organization access to files on their computer.

Attack- An attempt to gain unauthorized access to system services, resources, or information, or an attempt to compromise system integrity.