

MICHIGAN STATE

UNIVERSITY

Project Plan Presentation

Command and Control Simulator

The Capstone Experience

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*From Students...
...to Professionals*

Project Sponsor Overview

- Threat detection and response
- Real time detection across variety of networks
- SaaS that tracks activity stacks of endpoints and users
- AI models to enrich detection and prioritize attacks
- Detect and identify threats based on network behavior instead of byte signatures



Project Functional Specifications

- C2 channels used by attackers to control devices
- Application to simulate C2 channels
- Configurable parameters and protocols
- Web UI to analyze channel traffic and control channel generation and client activity
- Used as training data for AI model



Project Design Specifications

- **Server App**

- Process input from API.
- Spawn tunnel(s) w/ client over multiple protocols and connection profiles.
- Deliver payloads to client and return client response and meta-data to user.

- **Client App**

- Establish initial connectivity with server
- Customizable behavior received from server (jitter, beacon interval, padding, etc..)
- Handle payloads from server and return simulated data and status.

- **Web-Based UI and Rest API**

- Allow user to customize tunnel config and parameters
- Package and deliver jobs from user input to server
- Provide user with graphed time series displaying beacon activity.



Screen Mockup: Simulation Overview

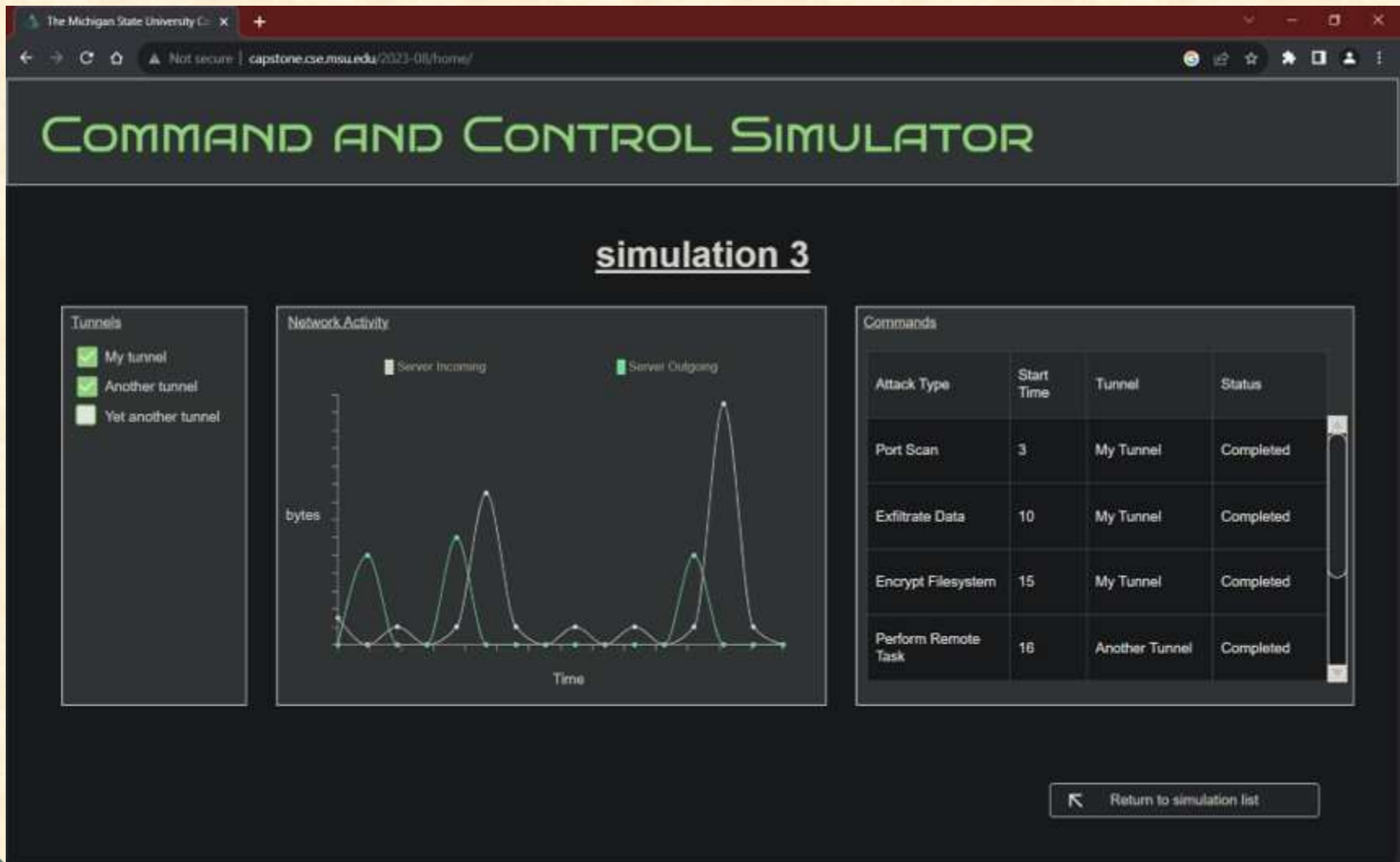
The screenshot displays a web browser window with the following details:

- Browser Tab: The Michigan State University Co
- Address Bar: Not secure | capstone.cse.msu.edu/2023-08/home/
- Page Title: COMMAND AND CONTROL SIMULATOR
- Section Header: Simulation Overview
- Button: Create New Simulation
- Table of Simulations:

Simulation Name	Status	Start Date	Actions
My new simulation	Running	09/14/2023 05:55:15 PM	View / Edit Delete
simulation 3	Ended	09/14/2023 02:22:22 PM	View / Edit Delete
simulation 2	Ended	09/14/2023 01:33:52 PM	View / Edit Delete
simulation 1	Ended	09/14/2023 06:02:36 AM	View / Edit Delete



Screen Mockup: View Simulation



Screen Mockup: New Simulation

The Michigan State University C... x +

Not secure | capstone.cse.msu.edu/2023-08/home/

COMMAND AND CONTROL SIMULATOR

New Simulation

New Simulation Name:

Tunnel Name	Protocol	Port Number	Jitter Range	Padding Range	Number of Commands	Actions
My tunnel	HTTP	8	5-30	13-50	4	<input type="button" value="Edit"/> <input type="button" value="Delete"/>
Another Tunnel	HTTPS	10	1-5	6-8	2	<input type="button" value="Edit"/> <input type="button" value="Delete"/>
Yet Another Tunnel	TCP	2	6-10	16-30	0	<input type="button" value="Edit"/> <input type="button" value="Delete"/>



Screen Mockup: Edit Tunnel

The screenshot shows a web browser window with the title 'The Michigan State University' and the URL 'cspstone.cba.msu.edu/3222-08/frames'. The main heading is 'COMMAND AND CONTROL SIMULATOR' in green text.

Edit Tunnel

Tunnel Name:

Protocol:

Port Number:

Site Range: to

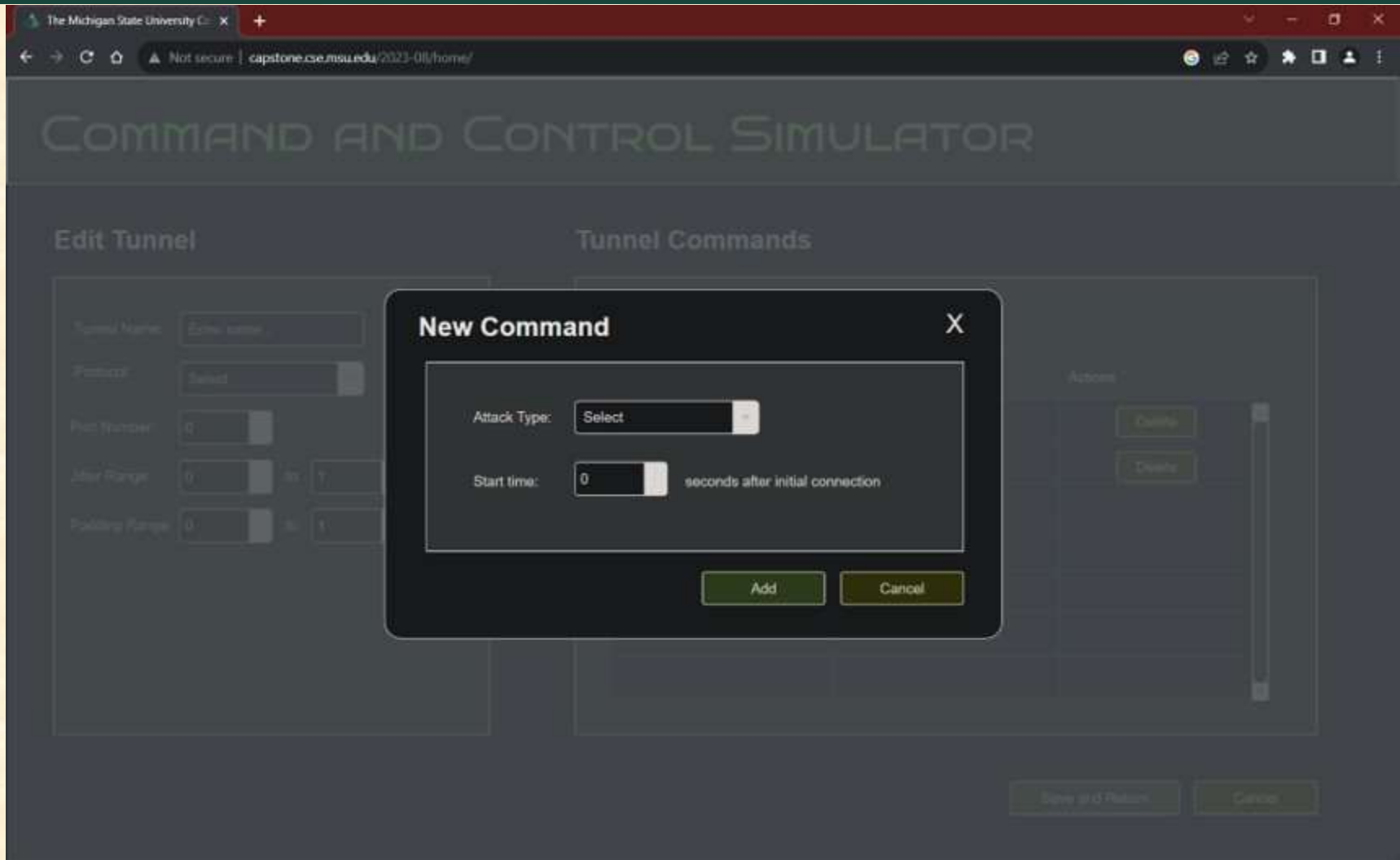
Padding Range: to

Tunnel Commands

Attack Type	Start Time	Actions
Exfiltrate Data	15	<input type="button" value="Delete"/>
Run Port Scan	30	<input type="button" value="Delete"/>



Screen Mockup: Add Command Pop-Up

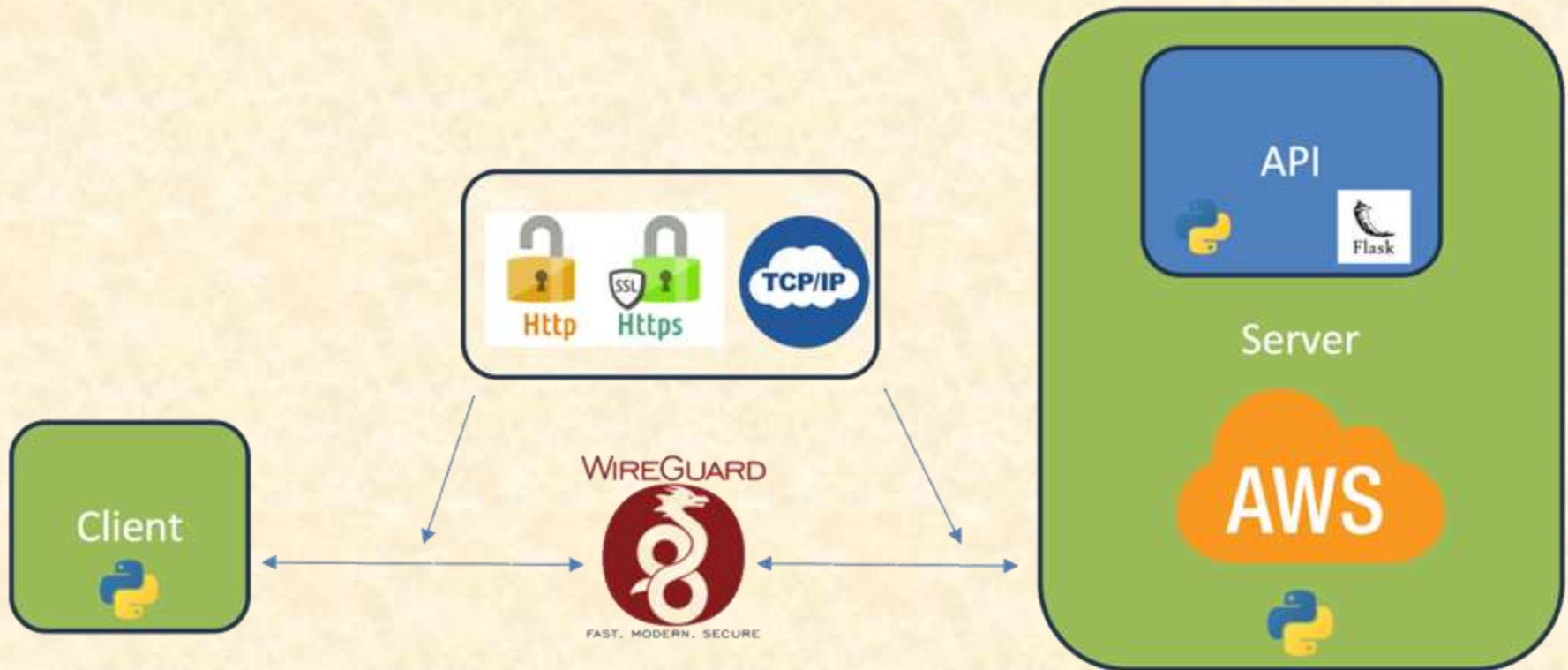


Project Technical Specifications

- Backend consists of server-client program and API for controlling server
- Backend will be built in Python, using networking libraries
- Client and server will communicate with Wireguard
- Server and API will be hosted on AWS
- API will have a WebUI to view results of connection



Project System Architecture



Project System Components

- Hardware Platforms
 - Rak server used during development
- Software Platforms / Technologies
 - AWS will be used to host server platform
 - Wireguard used as a means of communication between client and server
 - Backend of API, client, and server built in Python



Project Risks

- Handling lost UDP traffic
 - UDP does not guarantee the delivery of packets or provide mechanisms for retransmission in case of packet loss
 - Design our communication protocol to include packet acknowledgment mechanisms.
- Timing Delays after migrating to cloud
 - Timing delays can manifest affecting user experience and potentially causing synchronization problems among our system's components.
 - Choose the AWS availability zones that best align with our project's requirements and we will design our system to be asynchronous and capable of handling timing variations gracefully using asyncio co-routines.
- Process packet capture data received by server to display in Web UI
 - Efficient processing and storage of pcap data, which can impact system performance and the responsiveness of our front-end web UI.
 - Employ a SQL database management system to store pcap data efficiently.
- Memory Management with Asyncio
 - If we don't properly manage/close out resources (sockets and async routines), we will have memory leak which will be a big issue on AWS.
 - Use tracemalloc to test memory usage of our application during run time



Questions?

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