

# EE/CprE/SE 491 – sdmay26-08

## GridSAFE

### Week 7 Report

Start date - End date: 11/5/25 – 11/11/25

Client: Nellie Leaverton

Advisor: Julie Rursch

### Team Members:

Nellie Leaverton – Hardware & Architectural Design Lead  
Jason Di Giovanni – Software and Security Lead  
Brant Gicante – Software and Security Assistant  
Evan Booze – Hardware & Architectural Design Assistant  
Kyle Maloney – Testing Lead & Design Assistant  
Anthony Nehring – Software and Security Assistant

### Weekly Summary:

This week, the GridSAFE team continued splice and 3D printing multiple prototypes of new skyscraper models. The hardware team tested new LEDs and verified single-LED circuit functionality. During testing, it was discovered that the current Raspberry Pi died, prompting research and selection of a new Raspberry Pi 4 as an upgrade from the previous Pi 3B. The software and cyber team continued to design their IT/OT network and research malicious logs and datasets. The team also progressed on the LED software and the Proxmox simulation network, which will be used to run attacks and signal alerts.

## Past week accomplishments:

### **3D Modeling and Printing – Nellie Leaverton**

- Continued 3D splicing and printing of models
  - Picked up 3D prints from SIC
  - Broke off print supports
- Tested new LEDs received from ETG
  - Tested a single LED to verify power supply and circuit functionality
  - Attempted to test other LEDs, but they did not turn on
  - Hypothesized that LEDs required a Raspberry Pi to operate
- Tested Raspberry Pi 3B with LEDs
  - Raspberry Pi 3B stopped working during testing
- Researched Raspberry Pi 4 vs Raspberry Pi 5 vs Raspberry Pi 3B
  - Selected Raspberry Pi 4 as replacement (cost-effective, met requirements, upgrade from 3B)

### **AI Training Datasets – Jason Di Giovanni**

- Looked at the Datasets and logs within from the Canadian Institute for Cybersecurity.
  - CSE-CIC-IDS2018 and CIC-DDoS2019 appear good for pretraining
  - Modbus 2023 and CIC IIoT 2025 seem the closest to power grid control systems
  - CIC IoT-DIAD 2024 and CICEVSE2024 appear useful for testing adaptability to mixed IoT+grid data
    - With this amount of data, the logs the software team has created so far will be used for testing/demo purposes rather than training.

### **Modeling and Printing – Brant Gicante**

- Fixed up and created 3d Prints and models to be printed
  - Looks ad misconfigurations on old prints and revised the prototype
  - Managed/dealt with complications of software version
  - Sent models ready to be printed over to hardware team
  - Assisted in the testing of LED and Raspberry pi
- Connected raspberry pi to hardware/circuits
  - Assisted and learned with the group the connection
  - Failure of the raspberry pi ended our development early

### **3D Modeling and Printing – Evan Booze**

- Made modifications to 3D models for printing
  - Added additional windows
  - Modified extrusions for a cleaner print
- Tested new LEDs received from ETG
  - Attempted to test LEDs but they did not turn on
- Tested Raspberry Pi 3B with LEDs
  - Connected Raspberry Pi 3B to a computer for testing
  - Raspberry Pi stopped working during testing

### **Finalizing Network Diagram for IT/OT logs – Anthony Nehring**

- Finalized IT/OT network diagram covering all project requirements.
  - Added external attacker host (outside perimeter) for red team simulation
  - Added perimeter devices: firewall, DMZ, possible VPN.
  - Defined OT zone: HMI/SCADA master, PLCs/RTUs, OT historian, PLC programming workstation.

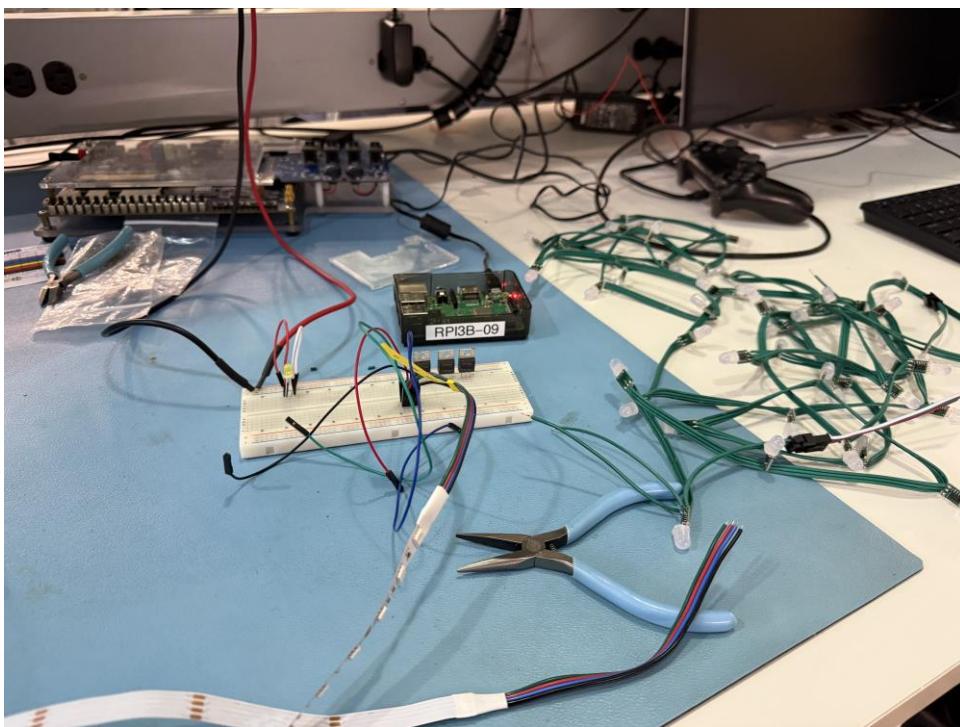
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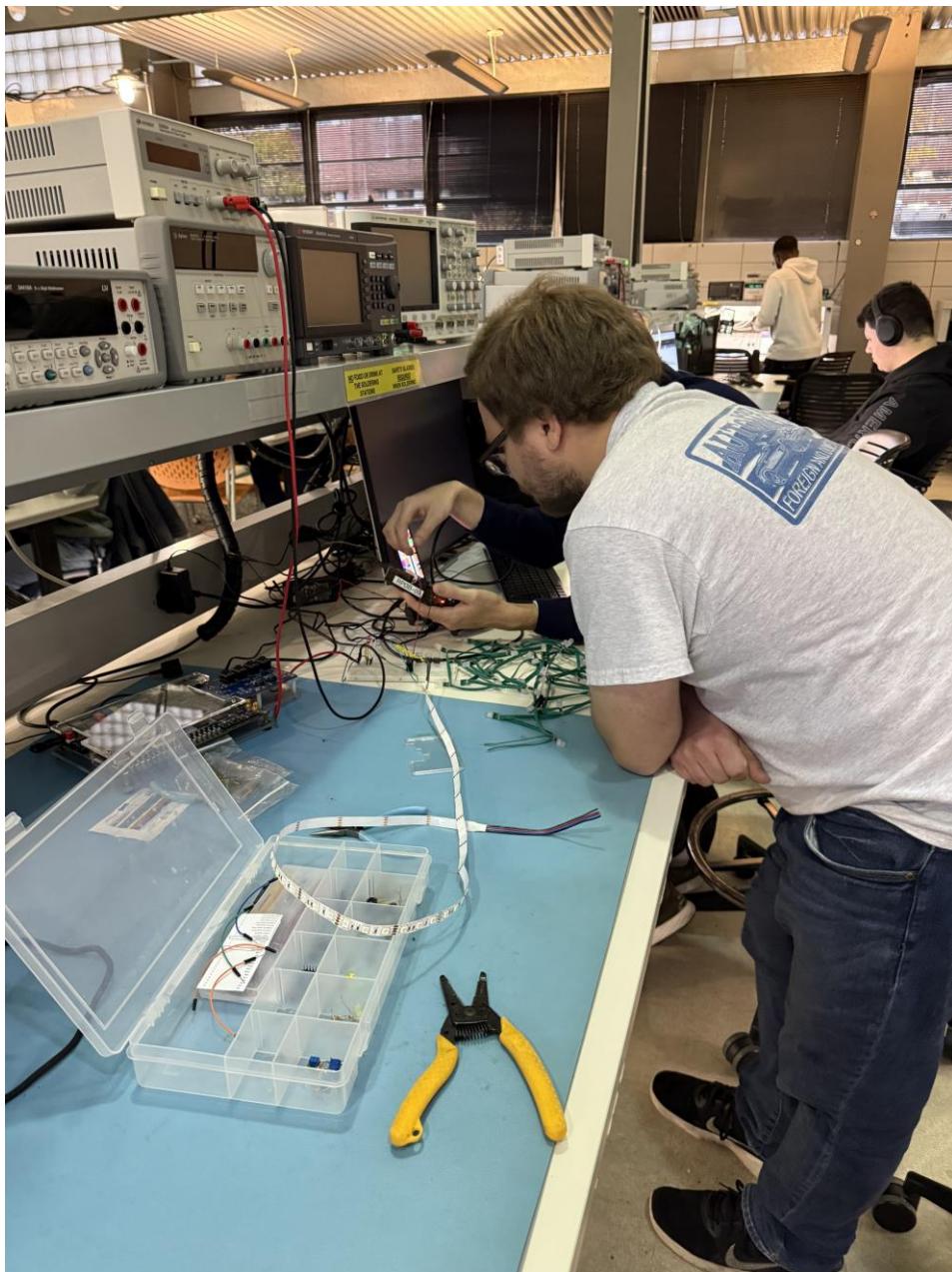
### Designing backend to host communication between project sections – Kyle Maloney

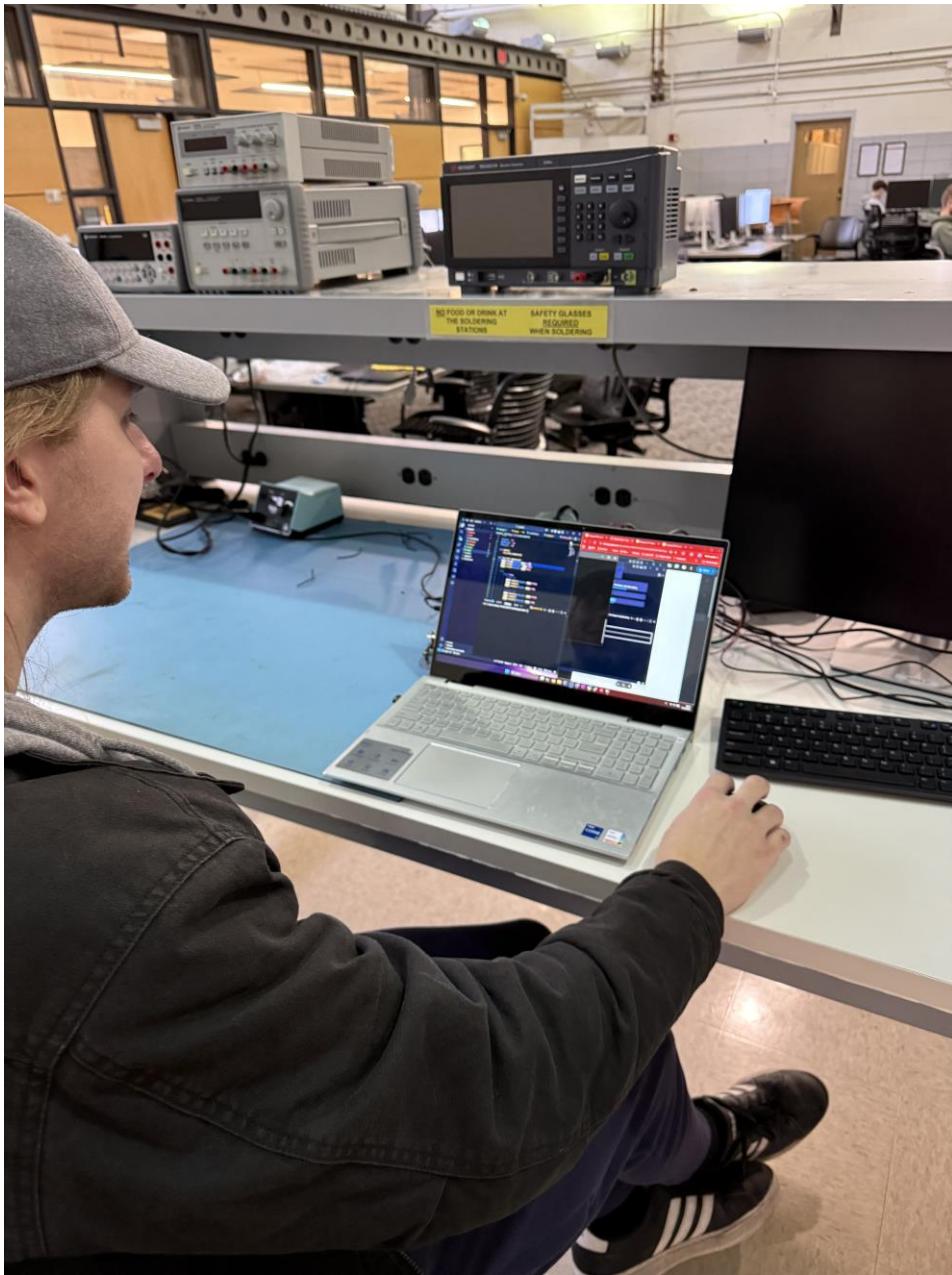
- Started implementing APIs to use for the lighting software that will control our visual display
- Implemented communication between the Proxmox server and raspberry pi to communicate and control the lighting

### Citations/Research:

Pictures of simple circuit prototype/working on testing LED's and Raspberry pi:







New Raspberry Pi Resources/Materials Researched:

[https://www.amazon.com/Raspberry-Model-2019-Quad-Bluetooth/dp/B07TD42S27/ref=sr\\_1\\_1?clid=1N0WR3Q82U3NB&dib=eyJ2ljojMSJ9.HEqjugt6NtfqFHpStRN SrlhvbDQZqu7RRWhQBresV0hC3tTHtLhOYVdjowONRCydt5ASq4x1MtYzjYh3V9rrZwlK1L4tONGGysNx1gmKPBa64vtzYIYroB5EhYf215BT96cOHS5vs3UkuYZrmm3BbUJsIOGn2jiv8iXGfvsGFiloslsZdIHlhEYV5ebFH8sexNnavXNuJsQN8Xf1i7FST6NOQFvh9P2iF7xuLu8JNxw.p9gMsuL8IL9MBZMHMGU0E55nAtuj\\_UemasFs31OAFes&dib\\_tag=se&keywords=raspberry%2Bpi%2B4&qid=1762889134&sprefix=rasb%2Caps%2C202&sr=8-1&th=1](https://www.amazon.com/Raspberry-Model-2019-Quad-Bluetooth/dp/B07TD42S27/ref=sr_1_1?clid=1N0WR3Q82U3NB&dib=eyJ2ljojMSJ9.HEqjugt6NtfqFHpStRN SrlhvbDQZqu7RRWhQBresV0hC3tTHtLhOYVdjowONRCydt5ASq4x1MtYzjYh3V9rrZwlK1L4tONGGysNx1gmKPBa64vtzYIYroB5EhYf215BT96cOHS5vs3UkuYZrmm3BbUJsIOGn2jiv8iXGfvsGFiloslsZdIHlhEYV5ebFH8sexNnavXNuJsQN8Xf1i7FST6NOQFvh9P2iF7xuLu8JNxw.p9gMsuL8IL9MBZMHMGU0E55nAtuj_UemasFs31OAFes&dib_tag=se&keywords=raspberry%2Bpi%2B4&qid=1762889134&sprefix=rasb%2Caps%2C202&sr=8-1&th=1)

Original pi 3B model reference: <https://www.raspberrypi.com/products/raspberry-pi-3-model-b/>

Raspberry Pi 3 Model B vs Raspberry Pi 4 Model B (2GB)	
Processor:	Quad-core ARM Cortex-A53 @ 1.2GHz
Architecture:	64-bit ARMv8
RAM:	1GB LPDDR2
Networking:	10/100 Ethernet, 2.4GHz WiFi, BT 4.1
USB Ports:	4 × USB 2.0
Video Output:	HDMI (1080p)
GPU:	VideoCore IV
Power Supply:	5V / 2.5A (Micro-USB)
GPIO Pins:	40-pin (same layout)
Storage:	microSD card slot
Thermals:	Runs cooler under light load
Use Case:	IoT, sensors, light projects
	Quad-core ARM Cortex-A72 @ 1.5GHz
	64-bit ARMv8-A
	2GB LPDDR4 (faster)
	Gigabit Ethernet, Dual-band WiFi, BT 5.0
	2 × USB 3.0 + 2 × USB 2.0
	2 × micro-HDMI (dual 4K)
	VideoCore VI
	5V / 3A (USB-C)
	40-pin (compatible)
	microSD (faster)
	Runs hotter – cooling recommended
	Desktop, media, networking, heavy projects

### Places to Buy PI4B:

<https://www.raspberrypi.com/products/raspberry-pi-4-model-b/>

[https://vilros.com/products/raspberry-pi-4-model-b-1?variant=40809478750302 : 4GB](https://vilros.com/products/raspberry-pi-4-model-b-1?variant=40809478750302:4GB)

### Rasberry Pi Cases:

[https://www.amazon.com/ElectroCookie-Raspberry-Aluminum-Cooling-Changing/dp/B09QG349ZL/ref=sr\\_1\\_15?crid=DABJR5NF68FC&dib=eyJ2ljoMSJ9.lgD49wd0I7yrBTb7KnRg5kOufiW8xIV-FsHtxeXqLWLKhIWfmTVjLebJG5-7hFLfSX14JOe15zbPtgs5fn8A1\\_eY1jbLx9rHlpf1p6df2oNFgg2C9f7drAL5TozT5tLDcmFgHDhuXsQZayJaCdOjJRbaZ87DNNDkwZYC1E\\_xgYUlhISry5lqkWH7ff5DAUQDOQL9o81U4eQPxYQ\\_cA-kSi-cC\\_1GXEtQMhPI\\_LLLQ.xF3bPHwxezqVdv4CTsr8bGtqADpFA0QosFa8JHdJHX4&dib\\_tag=se&keywords=raspberry+pi+4+case&qid=1762890041&sprefix=raspberry+pi+4+ca%2Caps%2C273&sr=8-15](https://www.amazon.com/ElectroCookie-Raspberry-Aluminum-Cooling-Changing/dp/B09QG349ZL/ref=sr_1_15?crid=DABJR5NF68FC&dib=eyJ2ljoMSJ9.lgD49wd0I7yrBTb7KnRg5kOufiW8xIV-FsHtxeXqLWLKhIWfmTVjLebJG5-7hFLfSX14JOe15zbPtgs5fn8A1_eY1jbLx9rHlpf1p6df2oNFgg2C9f7drAL5TozT5tLDcmFgHDhuXsQZayJaCdOjJRbaZ87DNNDkwZYC1E_xgYUlhISry5lqkWH7ff5DAUQDOQL9o81U4eQPxYQ_cA-kSi-cC_1GXEtQMhPI_LLLQ.xF3bPHwxezqVdv4CTsr8bGtqADpFA0QosFa8JHdJHX4&dib_tag=se&keywords=raspberry+pi+4+case&qid=1762890041&sprefix=raspberry+pi+4+ca%2Caps%2C273&sr=8-15)

[https://www.amazon.com/Components-Raspberry-Model-Clear-Case/dp/B07W72KL1W/ref=sr\\_1\\_16?crid=DABJR5NF68FC&dib=eyJ2ljoMSJ9.lgD49wd0I7yrBTb7KnRg5kOufiW8xIV-FsHtxeXqLWLKhIWfmTVjLebJG5-7hFLfSX14JOe15zbPtgs5fn8A1\\_eY1jbLx9rHlpf1p6df2oNFgg2C9f7drAL5TozT5tLDcmFgHDhuXsQZayJaCdOjJRbaZ87DNNDkwZYC1E\\_xgYUlhISry5lqkWH7ff5DAUQDOQL9o81U4eQPxYQ\\_cA-kSi-cC\\_1GXEtQMhPI\\_LLLQ.xF3bPHwxezqVdv4CTsr8bGtqADpFA0QosFa8JHdJHX4&dib\\_tag=se&keywords=raspberry+pi+4+case&qid=1762890041&sprefix=raspberry+pi+4+ca%2Caps%2C273&sr=8-16](https://www.amazon.com/Components-Raspberry-Model-Clear-Case/dp/B07W72KL1W/ref=sr_1_16?crid=DABJR5NF68FC&dib=eyJ2ljoMSJ9.lgD49wd0I7yrBTb7KnRg5kOufiW8xIV-FsHtxeXqLWLKhIWfmTVjLebJG5-7hFLfSX14JOe15zbPtgs5fn8A1_eY1jbLx9rHlpf1p6df2oNFgg2C9f7drAL5TozT5tLDcmFgHDhuXsQZayJaCdOjJRbaZ87DNNDkwZYC1E_xgYUlhISry5lqkWH7ff5DAUQDOQL9o81U4eQPxYQ_cA-kSi-cC_1GXEtQMhPI_LLLQ.xF3bPHwxezqVdv4CTsr8bGtqADpFA0QosFa8JHdJHX4&dib_tag=se&keywords=raspberry+pi+4+case&qid=1762890041&sprefix=raspberry+pi+4+ca%2Caps%2C273&sr=8-16)

### Mini BOM:

#### What we NEED:

Rasberry pi                    \$ 40-60

Rasberry pi Power Supply \$10

MICRO SD Card                \$ 20

### Pending issues:

- May not be able to test LEDs in a timely manner depending on how long it takes to get the new raspberry pi.

**Individual contributions:**

<b><u>NAME</u></b>	<b><u>Individual Contributions</u></b>	<b><u>Hours this week</u></b>	<b><u>HOURS cumulative</u></b>
Nellie Leaverton	<ul style="list-style-type: none"><li>• Continued 3D splicing and printing of models</li><li>• Picked up 3D prints from SIC and removed print supports</li><li>• Tested new LEDs received from ETG</li><li>• Tested Raspberry Pi 3B with LEDs (stopped working during testing)</li><li>• Researched and selected Raspberry Pi 4 as replacement (cost-effective, meets requirements, upgrade from 3B)</li></ul>	5	43
Brant Gicante	<ul style="list-style-type: none"><li>• Network Design drawing complete</li><li>• More models finished/fixed</li><li>• Prototype adjustments as needed</li><li>• Sample networks configurations in testbeds</li></ul>	4	31
Evan Booze	<ul style="list-style-type: none"><li>• Made modifications to second and third 3D model</li><li>• Tested LEDs ordered from ETG</li><li>• Tested Raspberry Pi 3B</li></ul>	4	25
Jason Di Giovanni	<ul style="list-style-type: none"><li>• Helped Hardware Team test RPI 3B</li><li>• Looked further at datasets for AI</li></ul>	4	31
Kyle Maloney	<ul style="list-style-type: none"><li>• Continued prototyping Proxmox server</li><li>• Continue designing the LED library to use in our city structure</li></ul>	6	26
Anthony Nehring	<ul style="list-style-type: none"><li>• Network Diagram Finalization</li><li>• Defined and relationships and machines in network with security team</li></ul>	4	28

**Plans for the upcoming week:**

- **Brant Gicante:**
  - Put the network map into a real setting/environment (awaiting servers still)
  - As Raspberry Pi is down and connections can't be made till supplies are in, I instead plan to write down the vulnerabilities and executable malware we plan to use for the environment
    - List CVE vulnerabilities for version
    - Mockup a phishing example for mail service
    - Designate an open port for "testing" like some networks have
  - Assist in hardware as needed
- **Evan Booze:**
  - Print modified 3D models at SIC.
  - Program LEDs for testing once a new Raspberry Pi is ordered
  - Take Metal & Wood Shop Makerspace training at SIC in preparation for making city baseboard
  - Print more 3D models at SIC.
- **Nellie Leaverton:**
  - Continue printing more 3D models, including different types of skyscrapers
  - Purchase a new Raspberry Pi and create a Bill of Materials (BOM) for it
  - Work on setting up a simple circuit to test lighting (LEDs) received from ETG, pending a new raspberry pi
- **Kyle Maloney:**
  - Meet with the software team to discuss MITRE attacks to analyze and create logs.
  - Finish designing the LED library we will use for our physical city
  - Continue setting up Proxmox server if we receive the resources we need
- **Jason Di Giovanni:**
  - Finish downloading and looking at the datasets from the Canadian Institute for Cybersecurity to check use cases
  - Start pretraining AI
- **Anthony Nehring:**
  - Get input on the Network Diagram Finalization from security team
  - Look into how this current network diagram can be reflected in our synthetic logs with the security team