EE/CprE/SE 491 WEEKLY REPORT 01

Start date - End date: 8/25/25 – 9/18/25

Group-number: sdmay26-08

Project title: GridSAFE

Client: Nellie Leaverton

Advisor: Julie Rursch

Team Members/Role:

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, we held an introductory meeting with our advisor, Julie Rursch, to discuss project plans and establish a direction for our work. We explored strategies to make our services more affordable for clients, focusing upcoming research on cost-effective options for educational teaching. Additionally, we decided to create a mockup example city to generalize a "normal" city layout, which can later be represented as a map for other cities.

  Independent Research:

  - **AI Training & Deployment:** Investigated pretrained AI models for temporary use and assessed the feasibility of training custom models. Evaluated strengths and weaknesses of pretrained models to determine features to include or avoid. Explored local AI hosting, including input/output methods and integration with code and physical systems. Researched AWS usage, focusing on S3 buckets and options to remain within the free tier.
  - **City & Electrical Systems:** Studied electrical grids, power outage effects, and city district layouts. Created rough sketches of selected districts for mapping purposes and defined system functionality, such as whether district outages occur simultaneously.
  - **Materials & Components:** Researched lighting and material options and created a preliminary Bill of Materials (BOM) for implementation.
  - **Real-world attack techniques:** Researched different grid based cyber-attacks.
  - **IT and OT networks:** Researched possible solutions / implementations on setting up IT and OT networks.
  - Completed **Weekly Report 1** and conducted independent research in preparation for upcoming project tasks.

- **Past week accomplishments:**
    - Brant Gicante: Researched resources on the architecture for our model, including different types of infills and layers, as well as PLA material options (1.75 mm vs. 2.85 mm).
    - Nellie Leaverton: Conducted research on architecture models, focusing on how lighting functions within models and studying electrical grids.
    - Jason Di Giovanni: Investigated AI models for our project and explored potential risks and attacks on the power grid.
    - Evan Booze: Assisted with research on architectural models and lighting systems within those models.
    - Kyle Maloney: Researched various AI models, began analyzing how logs will appear and how to generate them, and investigated AWS services and their potential applications.
    - Anthony Nehring: Researched real-world attack techniques, IT / OT networks, and possible VM solutions for use in our project.
- **Citations/Research:**
    - **Formlabs.** *The Ultimate Guide to 3D Printing Architectural Models: Revolutionizing Design and Visualization.* Formlabs Blog.
    - **Architectural Models Guide.** *Guide to 3D Printing Architectural Models.* ArchitecturalModels.net.
    - **Juceart.** *ARCHITECTURAL MODEL / 3D PRINTING OF ILLUMINATED BUILDINGS.* YouTube Video.
    - **Bambu Lab US.** *Best 3D Printing Filament for Architecture Models.* Bambu Lab.
    - **Reddit – BambuLab Community.** *What Filament Should I Get for Architectural Models?* Reddit Post.
    - **Kathy Millatt Modelling.** *How to Add Lighting to a Model Building.* Kathy Millatt Blog.
    - **Maadhu Creatives.** *How to Make a City Model: A Simple Guide.* Maadhu Creatives Blog.
    - **London Art Roundup.** *The City Model.* London Art Roundup.
    - **TheSketchUpEssentials.** *EASY CITY CREATION in SketchUp with Placemaker - One Click Cities!* YouTube Video.
    - **FiXR.** *Map of U.S. Power Outages in 2020 and Solutions for Homeowners.* FiXR.
    - **U.S. Census Bureau.** *About 1 in 4 Households Experienced a Power Outage in the Span of a Year.* Census.gov.
    - **U.S. Government Accountability Office (GAO).** *Securing the U.S. Electricity Grid from Cyberattacks.* GAO Blog.
    - **ScienceDirect.** *[Relevant Article on Electrical Grid or Power Systems]* (https://www.sciencedirect.com/science/article/pii/S2214629621001997).
    - **WTVR News.** *Richmond Water Plant Power Failure Update – Jan 9, 2025.* WTVR.
    - **Wiki:** https://en.wikipedia.org/wiki/Category:Cyberattacks_on_energy_sector
    - **IT network guide:** https://www.itjones.com/blogs/2020/3/15/how-to-build-a-computer-network-for-your-small-business-part-1-the-basics
- **Pending issues:**

- Team Member 3:
- Jason encountered a challenge while researching AI models for our project. Microsoft Azure offers an anomaly detection AI that aligns with our use case; however, it is being decommissioned, and new provisioning is no longer allowed. While we cannot use this model for our prototype, the existing documentation serves as a valuable resource and reference for our research.
- Anthony encountered a challenge with determining what VM to use. Due to Iowa States University's switch from VMware -> Proxmox there is some uncertainty that could be help cleared up by talking to ISU faculty.

- **Individual contributions:**

NAME	Individual Contributions	Hours this week	HOURS cumulative
Nellie Leaverton	• Research Small Scale City Models • Reach out to ISEAGE to get funding • Researched lighting for Small Scale Models • Meet with co-lead to work on the project • Make weekly meeting notes	14	14
Brant Gicante	• Research on resources/equipment for prints • Planning for design of the model	2	2
Evan Booze	• Research Small Scale City Models	2	2
Jason Di Giovanni	• Research AI Anomaly Detector models and power plant attacks/infrastructure • Meet with co-lead to work on project	9	9
Kyle Maloney	• Research AI models	3	3
Anthony Nehring	• Researched Real-world attack techniques • Researched IT networks • Researched OT networks • Researched which VM is the best to use for our project	4	4

- **Comments and extended discussion:**

One issue the team discussed is how to potentially distribute this project to other educational systems beyond our own institution. Since the primary goal of the project is to serve as an educational tool, we are considering ways to make it accessible and adaptable for use in other schools or teaching environments.

- **Plans for the upcoming week:**

  - **Brant Gicante:** Research better ways to store data in a Bucket and explore cost-effective options for clients, including budget-friendly solutions.
  - **Evan Booze:** Assist in researching how to build the mock city in CAD.
  - **Nellie Leaverton:** Design and mockup a city, including drawings and research on how to build it in CAD, as well as determining the appropriate CAD software to use.
  - **Kyle Maloney:** Continue evaluating AI models to determine the best fit for our use case and investigate the logs we need and how to generate them.
  - **Jason Di Giovanni:** Continue researching AI models to identify the best resources for our project and investigate the structure and content of logs that can or should be generated.
  - **Anthony Nehring:** Work with his unit with senior individuals who have set up IT and OT networks to better understand what all is needed and what scale exactly should be made in our project. Talk with faculty on what VMs are available / the details i.e how many VMs needed, how to set them up, etc.

- **Summary of weekly advisor meeting:**

  This week, we discussed each team member's roles within the project, established a meeting frequency, and identified potential issues we may encounter. We also reviewed current work progress, discussed what our prototype will look like, and outlined the areas where we have already started development.

Grading criteria

Each weekly report is worth 10 points. Scores will be awarded as follows:

- **8 – 10**: Progress for your project seems to be suitable. Documentation and hours reported by team members are adequate.
- **6 – 8**: There is scope of improvement both in your report and your project progress. Can consult with instructor/TA after class for further inputs.
- **< 6**: Please talk to instructors/TA after class hours about any difficulties that you/your team is facing.

Each weekly report should be unique in that they have a unique set of supporting details for your contributions. So please do not just copy your reports from the previous week. In addition, please avoid any personal pronouns (he, she, I, you). Try to keep your reports as neat as possible.