3D Printer CyberSecurity Project

Team Members
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Faculty Advisor:
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Client:
- ❖ Mike C Newton : Director - Strategic Technology Sciperio

Meeting Dates:
- ❖ Bi-Weekly Thursdays at 3:30 p.m.
- ❖ Additionally on Tuesdays when needed

Goal & Motivation:
- ❖ The overall goal is to ensure that users are getting the exact model that they request to be printed by the 3D printer.
- ❖ Users can use the web application to send 3D project files to a 3D printer remotely.
- ❖ Currently the 3D printer can be attacked causing the printer to stray from the original design and create injected modifications.
  - ➢ This could lead to wasting materials, the destruction of important projects, or the printing of undesired modifications which may change the functionality of a model.

Approach:
- ❖ (Remote printing capabilities) The web application will allow users to print remotely. This allows users to start their projects while being off property thus being more convenient. The remote connection will be structured in a way in which a user can easily leave and return to the application as desired to check on the status of a printing job.
- ❖ (Simplistic UI) Our application streamlines the process of uploading a 3D model and requesting work from a specified 3D printer for a user.
- ❖ (Real-time status updates) By communicating with the 3D printer our application will give the user real-time data on the status of a printing job and where their job is in the printer's queue. By providing users with an estimate for time of completion they will waste less time checking on progress and be able to plan picking up their model accordingly.

Novel Features/functionalities:
- ❖ Ensuring that no outside factors will affect printing is a novel feature because it allows the user to only focus on hardware failing and not software.
  - ➢ If a hardware issue occurs the printer will stop as to not waste more materials and it will notify the user so they can determine the next best action.

Technical Challenges:
- ❖ We plan to use the Django web framework for the application. This will be challenging as the framework as well as web development is new to most members of our team.
    - ➢ Handling user input and network issues.
        - ■ How should we deal with internet connectivity issues?
        - ■ In the case of a user disconnecting should the printer have a timeout period or continue from where it left off until project completion?
        - ■ How do we deal with multiple incoming tasks as often many printers are used by multiple users throughout the day?
- ❖ Interfacing with octoprint will be a challenge as we don't know how octoprint will transfer and communicate with the 3D printer.
    - ➢ Will octoprint have enough built-in functionality for communicating with the 3D printer to satisfy our goals for real-time status updates from the printer?
- ❖ Working with the Ender-3, limited knowledge of G-code and 3D modeling.
    - ➢ Replicating the discussed man-in-the-middle attack on the 3D printer will be difficult as there is limited information online as to how it is performed. Many of the methods will have to be developed by our team alongside vigorous testing.

Milestone 1 (Oct 4):
- ❖ Compare and select technical tools for the web application, 3D modelling, and cyber infiltration.
- ❖ Provide small ("hello world") demo(s) to evaluate the tools for creating the web application and 3D models.
- ❖ Resolve technical challenges:
    - ➢ Django framework/ Web development.
    - ➢ Interfacing with octoprint api.
    - ➢ Working with the Ender-3, limited knowledge of G-code and 3D modeling.
    - ➢ Identify any hardware and software needs
- ❖ Compare and select collaboration tools for software development, documents/presentations, communication, task calendar
- ❖ Create Requirement Document
- ❖ Create Design Document
- ❖ Create Test Plan

Milestone 2 (Nov 1):
- ❖ Implement, test, and demo front-end of the web application.
- ❖ Implement, test, and demo interfacing with octoprint to successfully print a model.
- ❖ Implement, test, and demo the ability to upload a 3D model to the web application.

Milestone 3 (Nov 29):
- ❖ Implement, test, and demo the remote printing of an uploaded 3D model through the web application.
- ❖ Implement, test, and demo edge cases for web application usage and printing.

❖ Ensure that the web application and octoprint are recording the same project status as printing continues.

Task matrix for Milestone 1 (teams with more than one person)

Task	Carl	Nick	Tiffanie	Isaiah
Compare and select Technical Tools	Django	Python, G, Testing Octoprint	Octoprint, Django	Django
"hello world" demos	Present Demo, create presentation	Present Demo, work on presentation	Head for creating Presentation, Present Demo`s	Present Demo, create presentation
Resolve Technical Challenges	Work on challenges 1,2	Work on challenge 3	Work on challenges 1,2	Work on challenges 1, 2
Compare and select Collaboration Tools	Programs, Communication	Presentations	Documents, Task Calendar	Programs, Documents
Requirement Document	25%	25%	25%	25%
Design Document	25%	25%	25%	25%
Test Plan	25%	25%	25%	25%

Approval from Faculty Advisor

- ❖ "I have discussed with the team and approve this project plan. I will evaluate the progress and assign a grade for each of the three milestones."
- ❖ Signature: _____ Date: _____