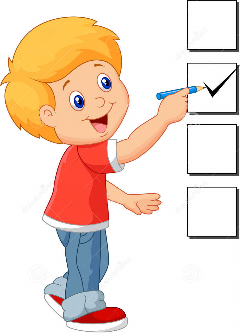
| **Group** 13 | *Spring 2024 Design Challenge* |
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| **Major:** | **Team members:** |
| *ITC* | *David Kajuna* |
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**Design Requirements**

Objective 1: The wireless transmission system must transmit 10 1024x1024 pixel images and their hashes. This process must be without data loss and should take under 10 minutes.

Objective 2: Create a wireless transmission system that is end-to-end encrypted

Objective 3: Create a Python application that can evaluate 10 correct images of the Death Star out of a possible 100 images.

Objective 4: Create a transmission system where the md5 hashes of the images before and after transmission are exact binary matches.

Objective 5: Create a mobile application that evaluates the weaknesses of the 10 Death Star images and uploads them to an online server.

| Req No. | Obj No. | Requirement |
| --- | --- | --- |
| 10 | 1 | A VLC system utilizing Li-Fi must be built and provided using parts specified in the customer's budget. |
| 10.1 | 1 | Data shall be transmitted and received using a VLC, Li-Fi system. |
| 10.2 | 1 | No data shall be lost during the transmission process. |
| 10.3 | 1 | The Li-Fi system shall be set up using two Raspberry Pi’s. |
| 10.4 | 1 | Both Raspberry Pi’s implemented must have transmission and reception capabilities. |
| 10.5 | 1 | Image transmission software application for the transceiver system must be programmed using C++, C, or Python. |
| 10.6 | 1 | Empire Raspberry Pi must be able to download files from a USB drive. |
| 10.7 | 1 | Transmitted images must keep the original format after transmission. |
| 10.8 | 1 | There shall be no obstructions between the transmitter and receiver during image transmission. |
| 10.9 | 1 | The transceiving system must be low-power |
| 10.10 | 1 | The Empire and Rebel transceiving systems will take 5V±5% from their respective Raspberry Pi. |
| 20 | 2 | Wireless transmission must be encrypted and decrypted using AES-256 symmetric encryption. |
| 20.1 | 2 | The transmitted data before encryption and after decryption must be exact binary matches. |
| 20.2 | 2 | A password shall be used as a key for encryption and decryption verification. |
| 20.3 | 2 | A password shall be shared with only group members for encryption and decryption verification. |
| 20.4 | 2 | The Rebel Raspberry Pi must be able to decrypt the encrypted messages from the Empire Raspberry Pi. |
| 30 | 3 | An image evaluation software application must be created using an image processing library. |
| 30.1 | 3 | The image evaluation software application must identify the 10 correct images out of 100 and prepare them for data transmission. |
| 30.2 | 3 | All 100 images for the image evaluation application must be uploaded to the Empire Raspberry Pi. |
| 30.3 | 3 | The image evaluation application developed to evaluate Death Star pictures must be run on the Empire Raspberry Pi |
| 40 | 4 | A Linux script must be created to convert data to md5 sums. |
| 40.1 | 4 | A Linux data verification script must be used to compare the md5 sums for accurate data transmission confirmation. |
| 40.2 | 4 | A comparison of the md5 sums must be performed on the Empire Raspberry Pi after the transmission is completed. |
| 40.3 | 4 | The md5 sum of the transmitted data must be sent back to the Empire Raspberry Pi by the Rebel Raspberry Pi. |
| 50 | 5 | A mobile weakness evaluation software application shall be created to find weaknesses in the downloaded Death Star images. |
| 50.1 | 5 | The mobile weakness evaluation software application shall display a scrollable table with the Death Star weaknesses. |
| 50.2 | 5 | The mobile weakness evaluation software application must analyze the Death Star images to find the weaknesses depicted as separate red circles for each image. |
| 50.3 | 5 | The mobile weakness evaluation software application must depict each separate red circle once in a scrollable table. |
| 50.4 | 5 | A website hosted on the Rebel Server must be created and online during the mobile download. |
| 50.5 | 5 | Rebel Server must be able to be publicly connected to and allow users to download images if authenticated. |
| 50.6 | 5 | Rebel server must send a Youtube URL for the first video to any user connected to the public website. |
| 50.7 | 5 | User must login with the correct SSH key pair to view the second video on the public website once connected |
| 50.8 | 5 | Rebel server must send a secondary YouTube URL once the user is logged in to the public website |

Definitions:

VLC (Visible Light Communication): The use of visible light frequencies as a transmission medium.

Li-Fi (Light-Fidelity): A wireless communication technology that uses visible light for data transmission between devices.

Raspberry Pi: A small single-board microcontroller that allows programming for multiple uses.

USB (Universal Serial Bus): Industry standard interface for electronic data transmission and power supply.

AES-256 (Advanced Encryption Standard): A symmetric encryption algorithm that uses block sizes of 256 bits.

Script: An executable miniature program that can execute multiple Linux commands automatically.

Transmission Raspberry Pi: Raspberry Pi utilized to transmit the evaluated 10 images of the Death Star outside of the Empire Lab.

Receiver Raspberry Pi: Raspberry Pi utilized to receive the evaluated 10 images of the Death Star and transmit the md5 of the images back to the Empire Lab.

SSH (Secure Shell Protocol): Protocol for secure data transmission over an unsecured network.

URL (Uniform Resource Locator): Address for a given resource on the web.