**Professional Self-Assessment**

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# Introduction:

Greetings, I am Justin Byrd, currently on the brink of completing my Bachelor's Degree in Computer Science, a significant milestone in a journey that began with an Associate's Degree in Electrical Engineering Technology. My professional voyage spans nine years at BAE Systems, where I've served as an electrical technician. Over the years, I've immersed myself in various domains of the defense industry, starting with production testing of intricate radio and optical systems.

As I progressed, my journey led me into the dynamic realm of research and development, providing invaluable experiences within the integrated circuit design team. This phase involved diverse responsibilities, from circuit card schematic and layout design, integrated circuit schematic and layout design, embedded systems, and eventually culminating in the development of automated test software. Notably, I had the privilege of designing a full-stack application aimed at meticulously tracking materials entering and leaving dry box storage in our labs, a project that ignited my passion for software development.

These pivotal assignments, particularly in full-stack application development and the integration of hardware and software in the automated test software, inspired the creation of the RGB LED Cube Control Software. This project stands as a testament to my commitment to marrying software and hardware, echoing the fulfillment I find in the convergence of these two worlds. As I reflect on this journey, I am excited to present this ePortfolio, a compilation of artifacts that showcase my skills, growth, and readiness to make meaningful contributions to the field of computer science.

# Collaborating in a Team Environment:

In my tenure in the computer science program, I've had the privilege of collaborating with exceptional professors and fellow students. Throughout my courses, interactive discussion assignments were a norm, fostering an environment where peers could exchange ideas and establish connections. However, it was the version control class, specifically focusing on git, that left a lasting impression on collaborative endeavors. This class introduced several projects where the entire cohort collaborated within the same remote repository on Bitbucket. We collectively contributed updates to the codebase, engaging in thorough code reviews. These reviews were instrumental in cultivating a standardized software package, ensuring uniformity in naming conventions, commenting standards, and, most importantly, seamless integration of everyone's contributions.

My experience at BAE Systems, particularly in the research and development sector, provided additional insights into effective teamwork. The teams I've been part of boast diverse skill sets, each member contributing unique expertise. Given this diversity, duplicative efforts are rare, and successful project completion hinges on robust communication. The necessity to bridge gaps between various skill domains underscores the significance of clear and consistent communication in achieving project objectives.

# Communicating to Stakeholders:

Communicating to stakeholders has been a crucial aspect of my journey, both in academia and the professional sphere. In my academic pursuits, professors served as primary stakeholders for my assignments. To ensure alignment with guidelines and rubrics, I proactively sought clarification via email, providing supporting details for a comprehensive understanding of assignment expectations.

In the professional realm, I've engaged with stakeholders in diverse capacities. When working on internal projects, the lead engineer or project manager took on the role of primary stakeholders. Conversely, external customers assumed this position for projects tailored to their needs. My communication strategy emphasized clarity and proactive clarification of uncertainties, regardless of the project's nature.

A pivotal lesson in stakeholder communication was the importance of transparency when faced with unforeseen challenges. Rather than attempting to resolve issues independently, I recognized the value of promptly informing stakeholders about any obstacles and involving them in decision-making. While minor issues could be addressed swiftly, challenges of unknown scope demanded collaborative problem-solving, ensuring stakeholders had a voice in navigating the complexities.

Moreover, understanding the busy schedules of stakeholders underscored the significance of concise communication. Striking a balance between providing sufficient, relevant information for informed decision-making and avoiding unnecessary details became paramount. This approach aimed to keep stakeholders well-informed without overwhelming them with extraneous information.

# Data Structures and Algorithms:

Data Structures and Algorithms have been integral components of all three enhancements within the RGB LED Cube Control Software project, showcasing my proficiency in these foundational aspects of computer science. The creation of classes such as RGBLEDCCS, cubeControl, led, userCredentials, and sqliteCRUDModule reflects my commitment to crafting a modular and interconnected architecture.

Embedded within these classes are algorithms designed to facilitate seamless communication among different components of the RGB LED Cube Control Software. These algorithms extend their influence beyond the software, interfacing with the Arduino Uno and LED cube hardware, as well as the SQLite database. An essential aspect of my approach is not only creating functional algorithms but also ensuring their efficiency. The evaluation of time complexity for critical algorithms underscores my dedication to developing algorithms that not only work but work optimally. A notable example is the timing algorithm crafted for lighting the cube, enabling the illusion of the entire cube consistently appearing lit despite only four LEDs being illuminated at any given moment. This commitment to efficient and effective algorithm design is a hallmark of my approach to problem-solving in software development.

# Software Engineering and Database:

In the realm of Software Engineering and Database Management, my proficiency is prominently showcased throughout all three enhancements, stemming from the comprehensive nature of the RGB LED Cube Control Software project, which entails the development of a full-stack application. Leveraging various QT libraries, including their User Interface (UI) framework, Serial Port library for communication with an Arduino Uno, and SQL library for interaction with the SQLite database, I crafted a sophisticated yet user-friendly UI.

Noteworthy is the journey with databases, epitomized by the strategic pivot from MongoDB, initially planned as the back-end solution, to SQLite, an entirely new database solution for me. This shift exemplifies my dedication to acquiring proficiency in diverse database solutions, driven by the pursuit of finding the most suitable tool for a given problem. The implementation of CRUD (Create, Read, Update, Delete) functionality, orchestrated through the sqliteCRUDModule class, underscores my capability to exert comprehensive control over databases directly from an application. This ability, coupled with the adept handling of various database solutions, emphasizes my adaptability and problem-solving skills in the dynamic field of software engineering.

# Security:

My commitment to creating security-centric software is prominently demonstrated in Enhancement One of the RGB LED Cube Control Software project. A key facet of this endeavor involves the creation of the userCredentials class, a dedicated module designed to prioritize the safeguarding of sensitive login information. The instantiation of this class during program startup, with username and password variables initialized from static const QString variables, systemUserName and systemPassword, establishes a secure foundation for user authentication.

Notably, the UI design reflects a security-conscious strategy by limiting access exclusively to the login tab at startup. Successful authentication becomes a prerequisite for progression within the system. A systematic control mechanism, triggered upon successful login, secures the login button and grants access to subsequent tabs.

This approach ensures that the software not only fulfills functional objectives but also embodies a proactive stance in addressing potential security vulnerabilities. The emphasis on a secure user authentication process and controlled system progression underscores my commitment to robust software architecture and data security.

# Professional Goals:

As I approach the conclusion of my bachelor's degree program in Computer Science, marked by the completion of this Capstone Project and ePortfolio, I am poised to channel the extensive skills I've cultivated through both academic learning and professional experiences into propelling my career forward. The integration of hardware and software has been a source of immense satisfaction for me, particularly in the creation of user-friendly software solutions through the development of full-stack applications. This involves tackling the intricacies of a problem and providing users with seamless interfaces for executing complex tasks effortlessly.

My enthusiasm lies in utilizing these acquired skills to secure a role that not only allows me to further refine my expertise in the integration of hardware and software through full-stack application development but also provides insights into potential areas of specialization for a master's degree. This transition marks the beginning of a new chapter in my career, where I am eager to contribute to innovative projects and continue my journey of lifelong learning in the dynamic field of computer science.

# Tying it All Together:

Throughout the three enhancement phases of the project, my focus was on transforming the initial 'RGB LED Cube Control Software' from a simple tool into a comprehensive full-stack application. This choice not only allowed me to showcase my proficiency in software engineering and design, data structures and algorithms, and databases but also aligned seamlessly with my professional aspirations. Specifically, I aimed to delve deeper into full-stack application development with a keen emphasis on seamlessly integrating hardware and software solutions into a unified system.

In the following sections of my ePortfolio, I will commence by providing an overview of the initial artifact that served as the focal point for enhancement throughout this project. This will be followed by a detailed video code review that I conducted, shedding light on the foundational state of the RGB LED Cube Control Software. Subsequently, I’ll delve into the key modifications implemented during each enhancement phase, providing links to the corresponding code files and YouTube video demonstrations. This will allow you to witness the live operation and evolution of the RGB LED Cube Control Software at each phase of its development. Additionally, you'll find links to comprehensive narratives offering in-depth insights into each enhancement phase's work, with detailed descriptions of the modifications and improvements made during development. These narratives are accessible both as stand-alone Word documents and on the web for easy viewing.