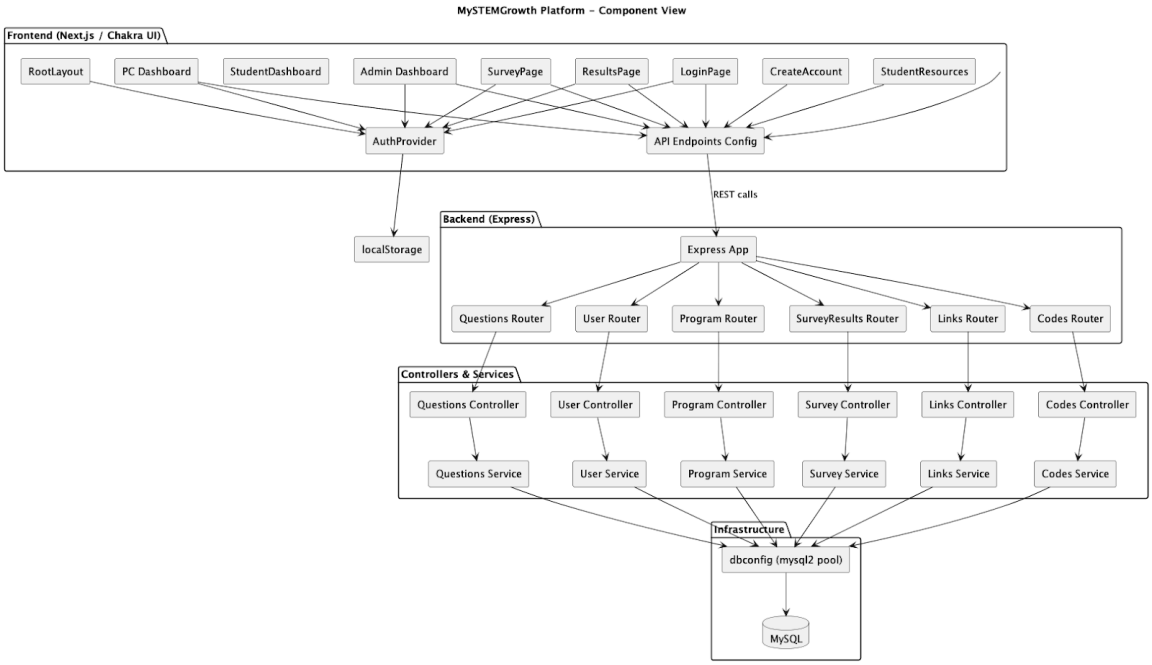
2. Requirements, Constraints, And Standards

2.1. Requirements & Constraints



2.1.1. Functional Requirements

- Students should be able to take/view results from surveys (appointed to them by administrators)
- All users (administrators, program coordinators and students) will be able to create an account, login to their account, delete their account, change their passwords and view survey results
    - Students should only be able to view their own survey results (from any time period)
    - Program Coordinator should have access to view any/all results from students within groups they have assigned
    - Administrators should be able to view all survey results (any student from any program)
- Administrators will be able to modify the survey (add, edit or delete questions), have access to all results and enable program coordinators to create and distribute surveys to approved groups

2.1.2. Resource requirements

- Frontend
    - React.js
    - Next.js
    - Chakra UI

- Backend
    - Node.js
    - Express Framework
    - Next Auth
    - MySQL
    - PGAdmin
    - Jest
- Cloud
    - Digital Ocean
        - Managed Database
        - SPaces
        - App Platform encrypted env vars
        - DNS

2.1.3. UI requirements

- Each user type page should have different options based on granted permissions
- A universal Navbar should be present on every page (regardless of user type or specific page)
    - Navbar can have different options/buttons based on user access
- Login page will enable user to login or create a new account
- Each user type will have a manage account page allowing them to change their information (new feature)
- Change in theme (colors, images/icons, displayed text/information)
- Innovation to actual survey
- Add authentication for administrators
    - Fix typos/question duplication(s)
    - Possibly change the scale used to answer questions
    - If slider bar is used to answer questions, set default to 50%
    - After completing a page, ensure next page starts user at the beginning of the next page
- Allow program coordinators to view what students (in their groups) have completed the survey
- Allow tool to be viewed and taken on mobile devices (add modularity)

2.2. Engineering Standards

Engineering standards are important for two primary reasons. First is that they uphold safety and privacy standards for the general public. Secondly, they uphold a standard for both software and hardware to be compatible with other devices of different manufacturers, and uphold quality standards while doing so. Engineering standards allow engineers to design systems that are interoperable between different devices, are safe for the consumer, and can be trusted by the general public.

IEEE 1448a - 1996: Standard for Information Technology: Software Life Cycle Processes

This standard ensures that our team has a specific plan to execute. It defines clear steps and guidelines for understanding, planning, developing and executing when innovating the MySTEMGrowth Survey tool. IEEE 1448a adds compliance methods and clarifications in order to make the cyclical process more adoptable to company practices which provides guidelines on development and software practices. The overarching goal is to provide stability, flow, consistency and organization in software projects.

IEEE 828-2012: Standard for Configuration Management in Systems and Software Engineering

The IEEE 828-2012 Standard defines processes and requirements for configuration management over the life cycles of a software application. It is a set of processes that provide guidelines for tracking and documenting changes to different parts of the program, such as source code, documentation, and databases. The guidelines set out a particular set of rules that require that changes are properly documented and implemented in a controlled manner. This standard helps to support practices such as version control and change tracking.

IEEE 1012-2016: Standard for System, Software, and Hardware Verification and Validation

This standard was created to provide guidelines for the verification and testing of different system applications. It helps to define what product verification looks like, and how to verify that it meets the intended purpose of development. The standard promotes performing multiple levels of testing to ensure that the system meets its intended requirements. It also promotes documentation and risk management to ensure that the application meets its pre-defined requirements and is reliable.

Project Relevance to IEEE Requirements

IEEE 1448a - 1996 (Standard for Information Technology: Software Life Cycle Processes) is very relevant to our project. Working in cycles will allow us to focus on a common goal and ensure everyone is on the same page about the plan moving forward. It ensures that one member won't rush ahead or fall behind, allowing everyone to participate in teamwork more effectively. It also will help us stay more organized and allows us to better retrace our steps in case of any issues.

IEEE 828-2012 is relevant to our project because it helps us to create a set of guidelines for our transition of cloud hosting from Amazon Web Services to Digital Ocean. We currently have a function application to begin with, but we are switching providers due to cost and simplicity of the hosting services. However, we want to have little to no data loss during the transition period with as little downtime as possible. Using this standard to create a set of guidelines, our team will be able to make the transition smoothly and document our progress along the way.

IEEE 1012-2016 will be used by our team to perform additional verification on the existing portion of the application, as well as the new features we implement throughout the next two semesters. While we won't be able to test for all possible scenarios, we will be able to place the

application through a wide variety of tests in order to ensure that our product meets the expectations and intended usage as determined by our senior design team along with our advisor.

Additional IEEE Standards

Another IEEE standard our group thought about incorporating was IEEE 29148-2018. This standard is all about requirements engineering, which is relevant to our project due to our goal of adding additional features to the application. While this is a relevant standard, we felt that the previous three standards better incorporated our goals going forward with this project.

Project Modifications for Adherence

In order to adhere to standards that are demonstrated by IEEE 1448a - 1996 (Standard for Information Technology: Software Life Cycle Processes), our team will be completing this project in phases. These phases (currently) include: analysis, requirements, brainstorming/design, development, testing/maintenance and deployment. Stepping through this structure allows us to have a common understanding of the phase/stage we are currently working on. Although everyone will have their own responsibilities, we will be working on the same concept, so we can discuss, help each other and test features on a “scheduled timeline”.

Adherence to the IEEE 828-2012 standard will not require many changes to the project, but more importantly the documentation and creation of guidelines for our transition of cloud hosting services. In order to adhere to the IEEE 1012-2016 standard, our group will be administering more forms of testing for the application, including both tests by our team and by actual undergraduate students. It is through adherence to this standard that we aim to develop a ready-to-release application by the end of our project timeline.