

MAMS SISO

Whitepaper 1.0 (Oct 2023)

The MAMS SISO Group

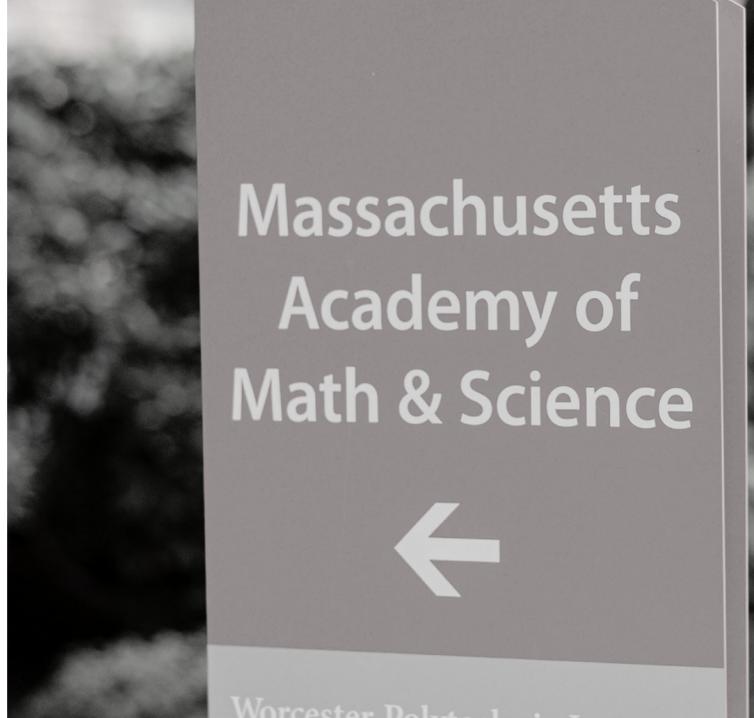
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About Us

Founded by three high school students in 2023 at the Massachusetts Academy of Math and Science, MAMS SISO is now a full enterprise application serving hundreds of students and administrators throughout Massachusetts. We envision a future where we can bridge the gap between technology and education, one school at a time.



Massachusetts
Academy of
Math & Science

Our journey began with a shared vision: to revolutionize the education industry through digitization. Since our inception in November 2022, we've been fortunate to cross paths with many individuals who share our passion and see the immense potential that digital transformation holds for education.

Our team of dedicated developers and partners have been instrumental in bringing this vision to life. Together, we've delved into the realm of cutting-edge technology, pushing boundaries and challenging norms. We are excited about the future and remain committed to our mission of digitizing education. This is our story, a story of innovation, passion, and relentless pursuit of excellence.

Introduction

A transformation began in the heart of Mass Academy, a public co-educational partnership between WPI and the Commonwealth of Massachusetts. A transformation that promises to redefine how we perceive and manage student attendance.

For years, the academy has relied on a paper-based sign-in system, a method that has served its purpose but is not without its flaws. The manual transcription of data, the time-consuming nature of the process, and the potential for inaccuracies are challenges that have long needed a solution.

Our mission is to usher in a new era of efficiency and accuracy with an electronic sign-in and sign-out system. This system is designed to expedite the process for students and streamline data transfer for administrators, thereby eliminating the bottlenecks associated with the current system. Furthermore, we provide them with the tools necessary to manage attendance effectively and efficiently.

We introduce this first edition of the MAMS SISO Whitepaper as an invitation to join us on this exciting journey. As we delve deeper into our system's purpose and technical aspects, we hope to inspire you with our story and demonstrate how we are turning our vision of digitization into reality.

Welcome to the future of attendance management at Mass Academy and beyond.

We're excited about the transformative potential of our electronic sign-in and sign-out system, and we'd love to share more about it with you. If you're interested in learning more about how this system can revolutionize attendance management at your institution, we invite you to reach out to us. Let's explore the future of attendance management together.



Problem

1

Current paper-based sign-in systems at Mass Academy and other institutions are **time-consuming, prone to inaccuracies, and lacks electronic verification**. There exists a need for an efficient, accurate, and verifiable electronic system that **streamlines attendance management**.

[1] NASSP: 10 High-Yield Actions to Improve Student Attendance



Why SISO?

1

Allow students to sign in and sign out using an easily accessible **personal identifier** for each student.

2

Accurately tracks **sign-in/out times**, attendance data, and references student schedules.

3

An **online, secure user interface** that allows admins to access daily reports and query attendance data.

Digitization: The Future

Why digitization?

We believe digitization in the education industry will enable the following:

Automating mundane educational tasks.

“Signing into school has become easier than it was in the past!”

— Ashwina Bangari (Alpha Tester)

Improving accuracy, security, and student attendance.

“Digitization and SISO has significantly improved the accuracy of student attendance.”

— Tarun Eswar (Developer)

Making life easier.

“This system made signing in and out very easy and allowed me to get about my day quickly.”

— Shreya Venkayala (Beta Tester)



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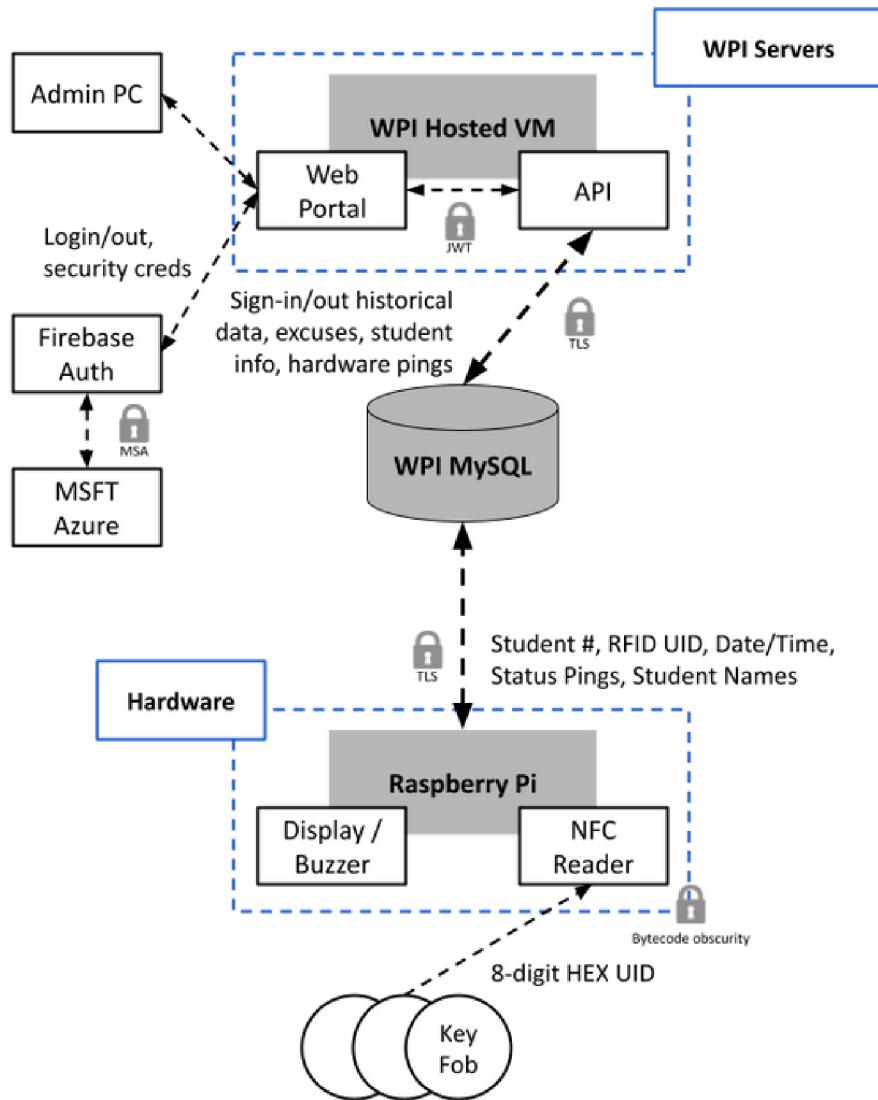
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Technicals

How does SISO work?

MAMS SISO provides an end-to-end system utilizing RFID tags to identify students uniquely. Our system was constructed with a ReactJS front-end, ExpressJS API, Raspberry Pi hardware console, MySQL database, and MSFT Azure for authentication. The figure below displays our initial system architecture for our first production use case at Mass Academy.

Initial System Architecture



Data Flow

In the innovative landscape of our system, a user's interaction with their RFID tag initiates a seamless chain of events. Upon tapping their tag to the hardware console, the system swiftly translates their unique 8-digit HEX into their corresponding student ID. This action triggers an immediate recording of the sign-in/out time in our secure database.

Simultaneously, these updates are reflected on our web portal, which retrieves fresh data through our safeguarded API. This real-time synchronization ensures that administrators have access to the most current information at all times.

Our web portal serves as a comprehensive dashboard for administrators, providing an overview of student attendance data, key metrics, and more. It offers administrators the flexibility to edit, update, and export this data as needed, thereby providing a holistic and customizable solution for managing attendance data effectively.

Security

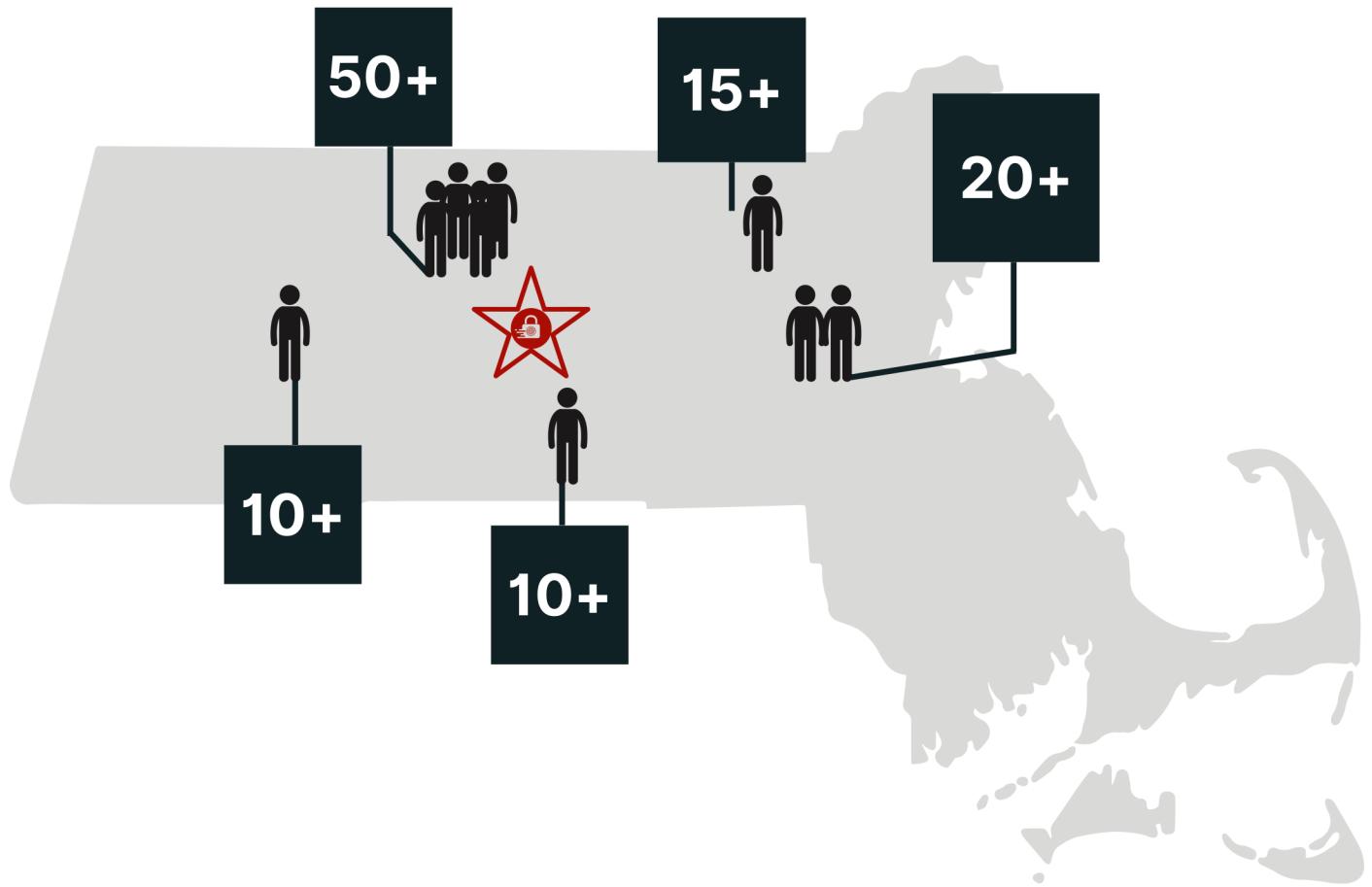
Our system has been meticulously designed with a strong emphasis on security, having successfully completed a comprehensive external security audit. It is adept at managing data that is often categorized as Restricted Use and FERPA protected.

The server-side applications, built using industry-standard technology, are safeguarded by a robust firewall. We employ encryption for our databases both at-rest and during connections to ensure data integrity and confidentiality.

The hardware components are engineered to be tamper-evident with custom CAD designs as well as offer resilience against cyberattacks such as SQL Injections and SSH Attacks.

Furthermore, access to the web portal is secured using Microsoft's MSA authentication, reinforcing our commitment to data security.

This is educational software at its finest — **intuitive, accurate, efficient, and tailored** to meet the evolving needs of educational institutions.



Our Impact

The MAMS SISO system has been alpha and beta-tested in a real-world setting at Mass Academy, where it has successfully served over 150 students. This year-long hands-on testing phase has provided valuable insights and learnings, reinforcing the system's efficiency and reliability.

Our vision is to see SISO implemented across various institutions in Massachusetts, transforming attendance management with its innovative approach. We believe in the potential of SISO to redefine attendance systems and are committed to making this vision a reality.

Summary

The Sign-In Sign-Out (SISO) system is an innovative **electronic attendance management solution** designed to *streamline and enhance the sign-in and sign-out process* in educational institutions.

Each user's interaction with their SISO system triggers a seamless chain of events. Each student sign-in/out is recorded in a secure database, and updates are reflected on a web portal, ensuring administrators real-time access to student attendance data and offering them a comprehensive solution for attendance management.

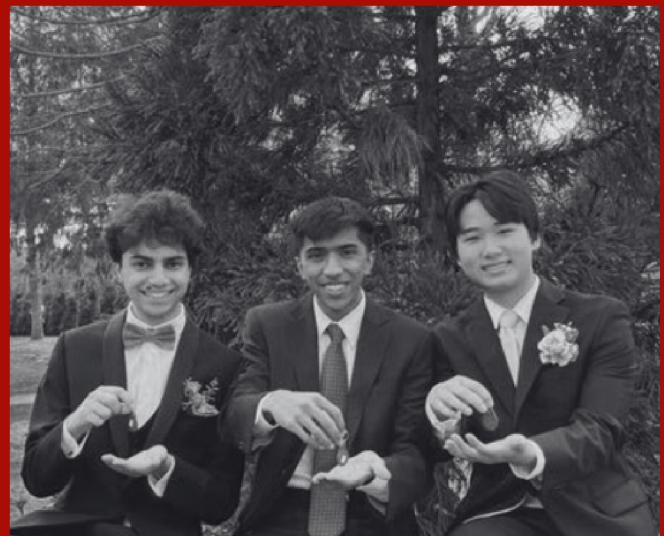
Our system prioritizes security and handles Restricted Use and FERPA-protected data by employing robust security measures, including firewalls, encryption for data at rest and in transit, and tamper-evident hardware with defenses against cyberattacks. Access to the web portal is also secured through Microsoft's MSA authentication.

What Next?

With a proven record of over 150 students of successful testing at Mass Academy, SISO has demonstrated its efficiency and reliability and is poised for broader implementation across institutions in Massachusetts.

We intend to target higher education institutions to support accurate class attendance tracking.

We hope you join us in this journey.



Additional Technical Resources

Hardware Tools



Raspberry Pi 4B+



Python 3

))) Radio Frequency Identification (RFID)

Database Tools



MySQL

Supported By

A special thanks to Mrs. Taricco, the Mass Academy admin, and the WPI ARC team for making MAMS SISO possible.

Web App Tools



ReactJS



React-Bootstrap



Ant-D



Firebase



Microsoft Azure

Server-Side Tools



NodeJS



ExpressJS



Apache HTTP Server



WPI