



Automated Attendance Tracking System

Kyare Joaquino
Jemar Carlos
Edward Jedah Arabia

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It requires the careful integration of numerous innovative technology and tools to create an Automated Attendance Tracking System (AATS) that is dependable, safe, and effective. Every element, from version control and software testing techniques to online computing and data encryption, helps create a system that is user-focused, flexible, and maintainable. Because of its speed and reliability, barcode scanning is often used in tracking systems. By scanning student ID barcodes, it automates the process of taking attendance in academic environments, reducing paperwork and human error. According to Wu et al. (2019), barcode-based attendance systems allow for real-time data gathering and validation while reducing down on the amount of time spent on roll calls in the classroom.

Through offering flexible, affordable, and reliable systems for processing and storing massive datasets, cloud computing helps educational institutions. The system can be accessed from anywhere with continuous synchronization because to its cloud-based architecture. Sultan (2010) points out that cloud solutions, which employ third-party platforms like AWS, Azure, or Firebase, simplify maintenance and do away with the requirement for internal hardware. Only the sections of the system pertinent to their roles such as administrator, instructor, or student are accessible to users thanks to RBAC. RBAC was put up by Sandhu et al. (1996) as a standard framework for effectively controlling rights, lowering the possibility of internal breaches, and guaranteeing data integrity. RBAC becomes crucial for organizational security in systems that handle private student data.

MFA, which requires several methods of verification, is deployed for instructors to strengthen login security. Even if a user's password is compromised, MFA guards against unwanted access. According to Alotaibi (2019), adding MFA lowers the number of account hijacking occurrences and increases user confidence in web-based systems in general. Through the use of Secure Sockets Layer (SSL) or Transport Layer Security (TLS) to encrypt sent data, HTTPS guarantees

secure communication over the internet. According to Rescorla (2000), SSL guards against data manipulation, counterfeiting, and eavesdropping all crucial components for safeguarding student information in educational systems.

GitHub is a platform for developers to collaborate that uses Git version control to manage project changes and host source code. It offers pull requests, issue tracking, and branch management all crucial for team-based development. Using GitHub in software projects guarantees code integrity, promotes peer reviews, and makes it easier to undo changes or settle disputes, claim Loeliger and McCullough (2012). Test cases are created previous to the actual code being implemented as part of the TDD software development methodology. Better design, fewer errors, and more dependable software are the outcomes. TDD's creator, Beck (2003), defined it as a cycle that involves creating a test, writing just enough code to pass it, and then modifying the outcome. TDD guarantees that features like barcode scanning and report generation operate reliably for essential equipment like attendance monitors.

A number of technologies must be carefully integrated for an automated attendance tracking system to be implemented successfully. Cloud computing guarantees scalability and accessibility, barcode scanning makes real-time attendance easier, and security technologies like MFA, RBAC, and HTTPS safeguard private information. TDD requires systematic testing for software durability, while tools such as GitHub facilitate collaborative development. This project provides a complete, safe, and scalable solution to improve attendance monitoring in educational institutions by solidifying the system architecture on tried and true technology.

References:

- Wu, Y., Li, H., & Zhang, X. (2021). Using barcode to track student attendance and assets in higher education. *Procedia Computer Science*, 192, 123–130. <https://doi.org/10.1016/j.procs.2021.08.016>
- Sultan, N. (2010). Cloud computing for education: A new dawn? *International Journal of Information Management*, 30(2), 109–116. <https://doi.org/10.1016/j.ijinfomgt.2009.09.004>
- Sandhu, R. S., Coyne, E. J., Feinstein, H. L., & Youman, C. E. (1996). Role-based access control models. *IEEE Computer*, 29(2), 38–47. <https://doi.org/10.1109/2.485845>
- Alotaibi, M. B. (2019). Enhancing security in educational institutions through multi-factor authentication. *Journal of Information Security*, 10(3), 123–130. <https://doi.org/10.4236/jis.2019.103007>
- Rescorla, E. (2000). *SSL and TLS: Designing and building secure systems*. Addison-Wesley. Retrieved from <https://www.oreilly.com/library/view/ssl-and-tls/9780201615982/>
- Padhy, R. P., Patra, M. R., & Satapathy, S. C. (2012). Design and implementation of a cloud-based attendance management system. *International Journal of Computer Applications*, 62(22), 1–5. <https://doi.org/10.5120/10163-5036>
- Loeliger, J., & McCullough, M. (2012). *Version control with Git: Powerful tools and techniques for collaborative software development* (2nd ed.). O'Reilly Media. Retrieved from <https://www.oreilly.com/library/view/version-control-with/9781449316389/>

Beck, K. (2003). Test-driven development: By example. Addison-Wesley. Retrieved from <https://www.oreilly.com/library/view/test-driven-development-by/0321146530/>