Cybersecurity in Intelligent Transportation Systems (ITS): OTP for Multilayer Authentication from Cyber Attack

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Abstract

In the realm of contemporary transportation infrastructure, Intelligent Transportation Systems (ITS) play a pivotal role in optimizing traffic flow and ensuring enhanced safety. However, their increasing reliance on networked communication exposes them to significant cybersecurity risks. This master's thesis undertakes a comprehensive exploration of multilayer authentication as a robust defense mechanism against cyber threats within the realm of ITS, with a specific emphasis on the integration of one-time passwords (OTPs). The discussion traverses through the potential advantages and limitations associated with OTP usage, providing a nuanced overview of the current cybersecurity landscape in ITS and addressing pertinent challenges. The primary objective of this research is to advocate for the adoption of OTP as an integral component within a holistic cybersecurity strategy tailored for all car companies and smart transport systems.

To practically demonstrate the efficacy of OTP in multilayer authentication for ITS, this thesis proposes an interactive simulation that involves user participation and practical scenarios. The simulation unfolds in distinct stages, beginning with user interaction, where participants assume the roles of authenticated users attempting access to the ITS system. A comparative analysis is conducted between traditional username-password authentication and OTP-based authentication. The subsequent stage involves a demonstration of OTP generation and delivery methods, including mobile applications, SMS, email, or hardware tokens. Special emphasis is placed on elucidating the dynamic nature of OTPs, which change at regular intervals to counteract brute force attacks.

Furthermore, the research explores the implementation of OTP in multifactor authentication (MFA), detailing the combination of OTPs with biometric authentication or traditional passwords for comprehensive security. The impact of OTP implementation on the simulated ITS system is then discussed, highlighting how OTPs effectively mitigate the risk of unauthorized access and credential theft. In the concluding section, a summary of the simulated experience underscores the significance of OTP technology for securing ITS systems. The thesis concludes with an encouragement for users to adopt OTP-based authentication to bolster the overall security of their systems.

Keywords: Cybersecurity, Intelligent Transportation Systems (ITS), Multilayer Authentication,