

Attacks on Database Systems and Their Prevention

Mitat Uysal

Dogus University, Istanbul, Turkey

Aynur Uysal

Dogus University, Istanbul, Turkey

Abstract:

Database systems are critical components of modern information systems because they store sensitive operational, financial, medical, and personal data. For this reason, they are frequent targets of cyberattacks such as SQL injection, privilege escalation, insider misuse, ransomware, denial-of-service, and data exfiltration. The protection of database systems therefore requires a multi-layered security architecture including secure coding, strong authentication, access control, encryption, auditing, and backup resilience. This article reviews the most important attacks against database systems and explains their prevention mechanisms in a scientific framework. In addition, an educational Python simulation is presented to visualize attack behavior and the effects of different defense strategies. The study emphasizes that database security is not achieved through a single control, but through defense in depth, where prevention, detection, and recovery work together.

Keywords:

Database security, SQL injection, data exfiltration, access control, anomaly detection, insider threat, encryption, intrusion detection, cyber defense.