Abstract

The increasing complexity and critical nature of Air Traffic Control (ATC) systems demand robust and scalable security mechanisms to ensure the safe and efficient management of airspace. This research proposes a novel approach that integrates multi-agent systems with Zero Trust Architecture (ZTA) to provide dynamic and adaptive access control for ATC environments. The framework incorporates real-time risk assessment, past behavior analysis, and current air traffic context to compute an agent's risk profile before granting access to sensitive ATC data. This ensures that agents with higher risk are granted restricted access to critical resources. Additionally, security features such as non-persistent connections, two-factor authentication, and micro-segmentation are incorporated to further enhance the system's resilience against cyber threats. The proposed framework was evaluated through simulated scenarios, demonstrating that it significantly enhances the security of ATC systems compared to traditional approaches. By ensuring that access decisions are dynamically adjusted based on the agent's behavior and current air traffic conditions, the system mitigates potential risks while maintaining operational efficiency.