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Securing .Net Microservices Through Conditional Access and Zero Trust Principles using Azure AD and OAUTH2

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Abstract: *The increasing adoption of distributed microservices in enterprise applications has amplified the need for robust, identity-centric security frameworks. This thesis presents a policy-driven Zero Trust architecture for securing .NET-based microservices using Azure Active Directory (Azure AD), OAuth 2.0, and Conditional Access. The proposed approach leverages Microsoft Entra ID for centralized identity governance and employs Conditional Access policies to enforce real-time, risk-based access decisions. Fine-grained authorization is achieved through integration with OAuth 2.0 token scopes and claims, ensuring contextual access based on user identity, device compliance, location, and session risk signals.*
The framework is implemented within a cloud-native .NET Core microservices environment, utilizing Azure API Management for secure exposure and traffic mediation. Telemetry from Microsoft Defender for Cloud and Azure Monitor is integrated to dynamically adapt authorization rules, aligning access decisions with real-time threat intelligence. The system is validated through a series of controlled simulations, demonstrating its effectiveness in minimizing unauthorized access, preventing lateral movement, and reducing the attack surface. This research provides a practical and scalable methodology for implementing Zero Trust principles across modern .NET applications using Microsoft's identity and cloud security ecosystem..

Keywords: Zero Trust Architecture, .NET Microservices, Azure Active Directory, Microsoft Entra ID, Conditional Access, OAuth 2.0, Identity and Access Management (IAM), Role-Based Access Control (RBAC), Cloud Security, Azure API Management