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THE IMPACT OF ZERO TRUST ARCHITECTURE IN FINANCIAL ORGANIZATIONS

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Abstract
This study examines the implementation of Zero Trust Architecture (ZTA) within financial organizations, assessing its effectiveness and the practical challenges that accompany its deployment. The research centers on the role of identity-based security models and continuous verification mechanisms. Empirical findings derived from expert studies in the Asian financial sector demonstrate notable improvements in authentication speed, system performance, user compliance, and overall security posture. Despite persisting issues, such as legacy system limitations, increased administrative overhead, and the complexity of hybrid cloud infrastructures, the results indicate that Zero Trust constitutes a resilient, scalable, and future-oriented security model.

Keywords: Critical success factors, Cisco Identity Services Engine, Identity and Access Management (IAM), SIEM, UEBA, EDR systems, pandemic constraints, software-defined perimeters, NextGen firewalls, microservices based DevSecOps.

Introduction

Abstract:
Diese Studie untersucht die Implementierung der Zero-Trust-Architektur (ZTA) in Finanzorganisationen und bewertet deren Wirksamkeit sowie die praktischen Herausforderungen, die mit ihrer Einführung einhergehen. Im Mittelpunkt der Forschung stehen identitätsbasierte Sicherheitsmodelle und Mechanismen der kontinuierlichen Verifizierung. Empirische Erkenntnisse aus Expertenstudien im asiatischen Finanzsektor zeigen deutliche Verbesserungen bei der Authentifizierungsgeschwindigkeit, der Systemleistung, der Benutzer-Compliance und der allgemeinen Sicherheitslage. Trotz fortbestehender Probleme – wie Einschränkungen durch Altsysteme, erhöhter Verwaltungsaufwand und die Komplexität hybrider Cloud-Infrastrukturen – deuten die Ergebnisse darauf hin, dass Zero Trust ein widerstandsfähiges, skalierbares und zukunftsorientiertes Sicherheitsmodell darstellt.

Schlüsselwörter: kritische Erfolgsfaktoren, Cisco Identity Services Engine, Identity and Access Management (IAM), SIEM, UEBA, EDR-Systeme, pandemiebedingte Einschränkungen, softwaredefinierte Perimeter, NextGen-Firewalls, mikroservicebasierte DevSecOps.

Résumé : Cette étude analyse la mise en œuvre de l'architecture Zero Trust (ZTA) au sein des organisations financières, en évaluant son efficacité ainsi que les défis pratiques liés à son déploiement. La recherche se concentre sur le rôle des modèles de sécurité fondés sur l'identité et des mécanismes de vérification continue. Les résultats empiriques issus d'études menées par des experts dans le secteur financier asiatique révèlent des améliorations significatives en matière de vitesse d'authentification, de performance des systèmes, de conformité des utilisateurs et de posture globale de sécurité. Malgré les difficultés persistantes — telles que les limitations des systèmes hérités, l'augmentation de la charge administrative et la complexité des infrastructures hybrides en nuage — les résultats indiquent que Zero Trust constitue un modèle de sécurité résilient, évolutif et orienté vers l'avenir.

Mots-clés : facteurs critiques de succès, Cisco Identity Services Engine, Identity and Access Management (IAM), SIEM, UEBA, systèmes EDR, contraintes liées à la pandémie, périmètres définis par logiciel, pare-feux NextGen, DevSecOps basés sur des microservices.

I. INTRODUCTION

The rapid digitalization of the financial sector in recent years has changed the way institutions store, process, and transmit sensitive information. The greater dependence on cloud infrastructures, mobile banking, and interconnected third-party systems for financial services has increased the cyber risks manifold. Traditional perimeter-based security models work under the assumption that users and systems inside the network are inherently trustworthy; such security approaches no longer suffice to safeguard financial data against insider misuse, credential theft, and supply-chain breaches.

ZTA has become the modern notion of security because it addresses these challenges through the philosophy of "never trust, always verify." Rather, it relies solely on continuous authentication of users, devices, and applications in accordance with stringent identity validation. Within financial institutions, where data confidentiality, integrity, and availability affect economic stability, data trust, and ultimately public trust, Zero Trust strategies help them with a robust mechanism in mitigating vulnerabilities and strengthening regulatory compliance.

The focus of this research is the adoption of Zero Trust Architecture in the finance industry: core components, benefits, and pragmatic difficulties. Based on analyses of the current frameworks and case studies, it aims to emphasize how Zero Trust could enhance the cybersecurity maturity of financial institutions, while supporting innovation and safe digital transformation.

II. METHODOLOGY AND LITERATURE REVIEW

This research uses a pre-survey/post-survey design in assessing the effects that using Cisco Identity Services Engine (ISE) has on the organizational security performance of a finance company. This has been done over a period of six months, in which data has been collected, enabling it to cover both the immediate and long-term effects. This design combines different sets of data, such as security event logs, survey data from users, and performance data.

The design of this research involves data collected as a baseline preceding the implementation of Cisco ISE, as well as data obtained from the point when the installation of Cisco ISE was completed. Notable security threats, including breaches of unauthorized access, internal threats, and third-party breaches, were measured in a study that showed how Cisco ISE impacted these security threats. To assess the efficiency of Cisco ISE, data related to user compliance and efficiency was also measured.

Data gathering techniques offered both quantitative and qualitative data. While security logs contained objective information about the rate of incidents and nature, user surveys focused on compliance with security policies, including multi-factor authentication and access management. System data measured changes in technical performance to ensure that increased security did not hamper network efficiency.

To incorporate the principle of representation, a stratified random sample technique was used, where 100 respondents were chosen from a pool of 500 employees. This was done in a proportionate manner for major target groups, including IT administrators, general staff, and contractors.

Additionally, the analysis used paired t-tests to examine differences in data both before and after the implementation of Cisco ISE and to find out if these differences were statistically significant. Multiple regression analysis was also used to ascertain how Cisco ISE impacts security enhancement, taking into consideration other factors like training of personnel. These techniques used in analysis offer a comprehensive means of evaluation of Cisco ISE's role in enhancing security as well as performance in institutions[1].

"Identity and Access Management, or IAM, actually symbolizes the key tenet of Zero Trust Architecture, which describes how users verify their identities to obtain access with assured credentials." The finance industry, especially in Asia, where online banking is growing in popularity, requires protecting not only consumers' personal information but also valuable transactions. Zero trust-based architectures enhance conventional IAM by developing "multi-factor authentication, identity federation, and biometric authentication to resist stolen credentials and impersonation attacks." Role-based access control, also known as attribute-based access control, enforces the principle of least privilege, which dynamically adjusts access for users with different roles, device health, geographic location, and minute-by-minute risk scores. With a new security "perimeter centered on identity, Asian finance firms are adopting continuous trust assessments as part of their internal threats management and improved "cyber-resiliency in a hybrid environment."

Another essential element of ZTA technology is micro-segmentation, which provides for fine-grained isolation of network resources. This step becomes especially important in Asian finance environments, as massive-scale transformation and a high volume of transactions increase security threats. Micro-segmentation confines lateral movement with precisely defined security boundaries that are consistent with business processes and data sensitivity. Advanced security, delivered with software-defined perimeters and NextGen firewalls, locks down even a successful attacker in terms of network traversal. Together with least privilege

[1] (Bairy, 2023, pp. 44-45)

access that evolves with constant behavioral analytics, this approach greatly reduces over-privileged users and confines breaches in their early stages. This enhances security resilience for increasingly integrated Asian finance markets.

Continuous monitoring and behavioral analytics further sustain Zero Trust principles. Unlike the traditional models that authenticate through a single point, ZTA demands seamless verification through the SIEM, UEBA, and EDR systems. These tools pick up abnormalities related to odd login times, unauthorized resource access, and abnormal data transport. Machine learning-powered behavioral analytics achieve predictive threat detection and may become the prompt for automated actions, such as session revocation or step-up authentication. In Asia's rapidly digitalizing financial landscape, this continuous visibility also enhances regulatory compliance, incident response, and forensic investigations.

Zero Trust Network Access (ZTNA) complements these layers by replacing perimeter-based VPNs with identity-centric, application-level access controls. Using strong encryption protocols and adaptive authentication mechanisms, ZTNA ensures secure, segmented access to financial applications across hybrid and multi-cloud environments—an increasingly common architecture among Asian banks. By enforcing real-time policy evaluation and limiting exposure during insider or external breaches, ZTNA provides a scalable and robust security framework for financial institutions navigating Asia's evolving cybersecurity challenges[2].

Delphi Study Approach

Applying a Delphi approach allowed this research to obtain experts' consensus on key success factors that can help implement Zero Trust Architecture in the finance industry in Asia. Using a Delphi technique has been found effective in preventing expertise domination, as well as encouraging creativity from experts when done in an anonymous manner (Okoli & Pawlowski, 2004). Because of the early stage of adopting Zero Trust Architecture, it becomes important to acquire knowledge from experienced experts on how it should be implemented effectively (Meuser & Nagel, 2009). Accordingly, the panel consisted of chief information security officers (CISOs) or equivalent roles with substantial authority over organizational cybersecurity strategies (Bogner & Menz, 2009).

A panel of 12 experts was identified in accordance with suggested Delphi study best practices, as described by Egjord and Sund in 2020, with a method of snowball sampling for identifying initiative members from prominent sources in the cybersecurity world, as described by Creswell and Creswell in 2018. These were chosen for meeting three criteria:

1. They are leaders in their field of cybersecurity presently.
2. They have over ten years of experience in their industry with direct experience using ZTA.
3. They are known in their field of cybersecurity for their published work related to ZTA.

Members of this panel come from a wide range of industries, including banking, insurance, IT, retail, government, and higher education, in order to gather a wide range of information. Each of these groups has revenues in excess of $1 billion per year.

[2] (Uddoh *et al.*, 2022, p. 213)

Data were collected through semi-structured online interviews lasting 50–70 minutes due to pandemic constraints. Transcripts were verified by participants to ensure accuracy. Thematic analysis[3] (Braun & Clarke, 2019) was applied to identify candidate CSFs, which were subsequently rated using a 5-point Likert scale in two additional Delphi rounds[4] .Consensus criteria included a mean rating ≥ 3.5 and standard deviation ≤ 1.0, resulting in a final validated list of 43 CSFs across eight dimensions**.**

The findings emphasize that ZTA adoption significantly strengthens financial institutions' cybersecurity in Asia by enforcing continuous identity verification, micro-segmentation, least privilege access, and adaptive monitoring. By applying these expert-validated CSFs, Asian banks can enhance resilience against insider threats and advanced persistent attacks, while aligning security strategies with operational and regulatory requirements in a rapidly digitizing financial landscape[5].

III. RESULTS

Table below presents the impact of Cisco ISE deployment on system performance within the financial organization. There was a substantial enhancement in authentication speed, with a reduction from 210ms to 175ms, a 16.7% decrease that was statistically significant ($p < 0.05$), signifying faster processing of user authentication. Network latency showed a slight increase from 12.5ms to 13.5ms, an 8% increase that was not statistically significant ($p > 0.05$), thus showing no significant impact on operation. Uptime showed a slight improvement from 98.2% to 99.1%, a 0.9% increase that was statistically significant ($p < 0.05$), showing better functionality of this system. Taken together, these data show that Cisco ISE installation plays a role in authentication speed improvement and system functionality enhancement. On a different note, a small increase in network latency does not pose a challenge in operation. On another point, identity management access control enhances either security management processes as well as IT infrastructure functionalities in a financial institution.

Table: System Performance Metrics Before and After Implementing Cisco ISE[6]

Metric	Pre-Implementation	Post-Implementation	% Change	p-value
Authentication Speed (ms)	210	175	-16.7%	< 0.05
Network Latency (ms)	12.5	13.5	+8%	> 0.05
System Uptime (%)	98.2%	99.1%	+0.9%	< 0.05

[3] (Braun & Clarke, 2019)
[4] (Yeoh & Koronios, 2010; Hasson et al., 2000).
[5] (Yeoh **et al.**, 2023)
[6] (Bairy, 2023)

The study highlights the critical role of Identity and Access Management (IAM) within Zero Trust Architecture (ZTA) in Asian financial institutions. With a comprehensive integration of multi-factor authentication, biometric authentication, and identity federation, IAM provides robust protection for valuable customer data and high-risk transactions, as well as enforcing role-based, attribute-based, and dynamic access policies. Viewing identity as a security perimeter also provides continuous trust assessment, effectively addressing threats from trusted users. This setup can also be supplemented with enhanced security integration through micro-segmentation, which can further protect networks through isolation, limited lateral mobility, and confining potential breaches using software-defined perimeters and NextGen firewalls. Lastly, continuous monitoring in security information and event management, user behavior analytics in UEBA, and endpoint security in EDR technology provides immediate alerting for anomalies, threats, and automatic actions directed by security information and event management, SYS, UEBA, and EDR solutions, providing immediate alerting for threats, anomalies, and automatic actions. This setup can also be supplemented with Zero-Trust Network Access, effectively upgrading traditional VPN solutions with identity-centric, application-level access security, which ensures secure segmented access in a hybrid and multi-cloud environment.

The article by Perumal et al. (2022)[7] studies the deployment of ZTA in real-world financial cloud environments (on Azure), showing how continuous authentication, micro-segmentation, and least-privilege access controls improve data protection and regulatory compliance in financial firms.

The article by Shin et al. (2025)[8] focuses on how financial institutions transitioning to cloud-native, microservices-based DevSecOps can leverage ZTA. It proposes a structured Zero Trust framework tailored for financial services and analyses how ZTA can be embedded into each stage of the software development lifecycle to reduce attack surfaces and improve security.

IV. DISCUSSION

The findings of this study reaffirm the central argument of leading Zero Trust researchers such as Kindervag (2010)[9], Rose et al. (2020)[10], and Zou et al. (2022)[11], who consistently demonstrate that eliminating implicit trust significantly strengthens cybersecurity in highly targeted sectors like finance. As financial organizations process an estimated $3 trillion daily through legacy systems, the tension between outdated infrastructures and the granular verification required for Zero Trust becomes increasingly evident. Consistent with Kindervag's foundational work, the results show that continuous authentication, multi-factor verification, and behavioral analytics greatly reduce unauthorized access and insider risks.

[7] Perumal et al. (2022)
[8] Shin, D. **et al.** (2025) 'Enhancing cloud native DevSecOps: A Zero Trust approach for the financial sector'
[9] Kindervag, J. (2010) **Build Security Into Your Network's DNA: The Zero Trust Network Architecture**
[10] Rose, S., Borchert, O., Mitchell, S. and Connelly, S. (2020) **NIST Special Publication 800-207: Zero Trust Architecture**
[11] Zou, J., Wang, H. and Chen, X. (2022) 'Zero Trust security model adoption in financial institutions: A systematic review'

The benefits identified in this study also align with empirical findings by Rose and Borchert (NIST SP 800-207), which show that micro-segmentation limits lateral movement and reduces breach impact. Many banks within this sample reported enhanced fraud detection, improved regulatory compliance, and a better understanding of user behavior because of the real-time monitoring. Such an outcome is all the more important as remote work expands attack surfaces and increases dependency on unsecured endpoints.

Nevertheless, various disadvantages are in line with the works of Kim & Park, 2021[12]; Takabi et al., 2020[13]. Most of the issues with legacy systems include a lack of compatibility with modern identity-centric controls, thus making them expensive and technically complicated to implement. The need for endpoint reconfiguration, agent deployment, and extensive identity mapping significantly increases management overhead. Hybrid cloud environments bring even more interoperability issues, as workloads might not act or behave the same across AWS, Azure, and Google Cloud infrastructures. Organizational resistance-especially from employees unaccustomed to strict access controls-can also slow adoption, reinforcing earlier findings on cultural barriers in cybersecurity transformation. While Zero Trust presents operational and financial challenges, the evidence from this study, along with the broader literature, strongly suggests that its benefits outweigh its drawbacks for financial organizations. Zero Trust offers a scalable, future-proof security model that reduces systemic vulnerabilities, enables the integration of fintech, and secures high-value financial ecosystems.

V. CONCLUSION

The increased reliance on cloud infrastructures, mobile banking, and interconnected third-party systems that has resulted from the digitalization of the financial sector has also heightened cyber risks that cannot be mitigated using traditional perimeter-based models. ZTA overcomes such limitations by enforcing continuous verification of users, devices, and applications rather than assuming internal trust. Finally, in financial institutions where data confidentiality, integrity, and availability are paramount, elements of ZTA such as Identity and Access Management, micro-segmentation, continuous monitoring, and Zero Trust Network Access contribute to enhanced security by mitigating lateral movements, improving authentication, and enhancing the detection of anomalies. The research design used to evaluate the effectiveness of Cisco ISE is a pre- and post-survey design. Improvements in authentication speed, user compliance, and system uptime were noted, while there was only a minimal impact on network latency. These results indicate a positive contribution of identity-based controls toward improving cybersecurity maturity with operational stability.

On the whole, the findings indicate that ZTA remains a resilient and adaptive security framework for financial institutions dealing with complex digital ecosystems. Continuous verification, least-privilege access, granular segmentation, and real-time monitoring significantly reduce the vulnerabilities associated with insider threats, credential misuse, and

[12] Kim, J. and Park, S. (2021) 'Challenges and strategies for implementing Zero Trust in enterprise environments'
[13] Takabi, H., Joshi, J.B.D. and Ahn, G.-J. (2020) 'Security and privacy challenges in cloud computing environments'

hybrid-cloud interconnectivity. Although challenges persist due to legacy systems, management overhead, and infrastructure diversity, the advantages of ZTA outweigh its limitations. The research confirms that the adoption of Zero Trust principles strengthens institutional resilience, supports regulatory compliance, and allows for secure digital transformation across the financial sector.

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