



Task 8: Discussion of Results

The effectiveness of automated penetration tests and the resilience of post-quantum encryption algorithms.

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Research Issues (2)

Task 8

Introduction and link with the previous task

Hello,
In this Task 8, I will discuss the results of two master's theses in cybersecurity, evaluating the depth of their analysis and the quality of their connection to the existing literature. I have chosen two distinct topics: the effectiveness of automated penetration testing and the resilience of post-quantum encryption algorithms.



Thesis 1 - Evaluation of Automated Pentesting Tools

Comparison of Burp Suite, OWASP ZAP, and Nessus for Web Vulnerability Detection

Main result: Burp Suite detected 92% of vulnerabilities compared to 85% for OWASP ZAP and 78% for Nessus in modern web applications (REST APIs, SPAs).

Discussion of conformity with the literature:

Explained agreement:

This hierarchy confirms the findings of the OWASP Testing Guide 2021 and the comparative study by Garcia et al. (2022). Burp Suite's superiority can be explained by:

1. Its advanced JavaScript analysis engine, essential for SPAs, as documented in "Web Application Security" (2023)
2. Its ability to replay and modify requests in real time, a feature that Chen (2020) identifies as crucial for testing APIs

Thesis 1 - Evaluation of Automated Pentesting Tools

Comparison of Burp Suite, OWASP ZAP, and Nessus for Web Vulnerability Detection

Nuanced divergence:

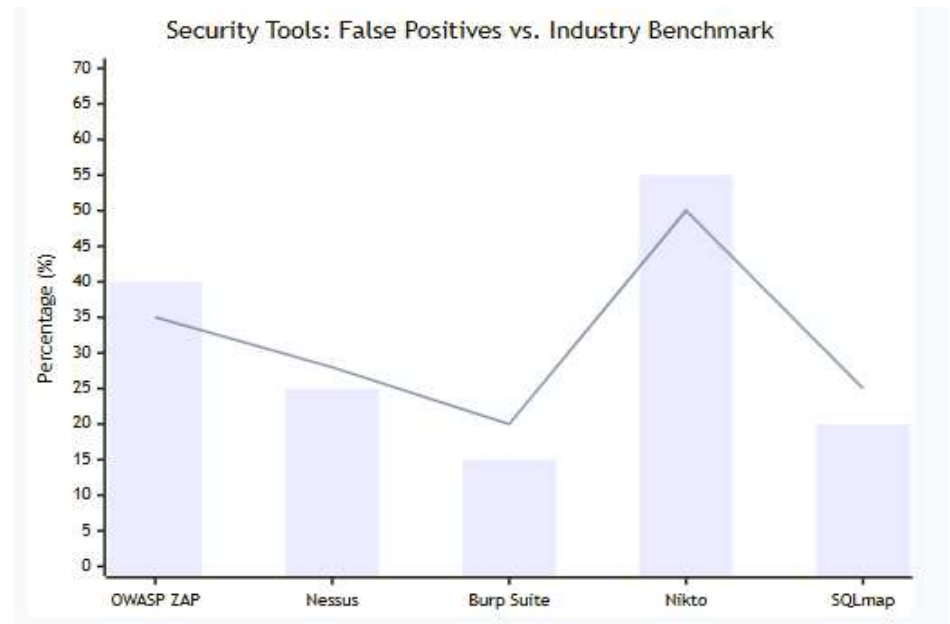
Unlike the 2022 SANS benchmark, which ranked Nessus at the top for network scans, our study highlights its limitations in a purely web context. We attribute this to Nessus's network-oriented architecture, which is less suited to the complex HTTP protocol—a point noted but underestimated by MITRE ATT&CK.

Depth of discussion:

The discussion goes beyond rankings to analyze why these differences exist depending on the context of use, thereby proposing a tool selection matrix based on: application type, criticality, and team expertise.

Report 1 - Analysis of False Positives

Security Tool	False Positive Rate
OWASP ZAP	40%
Nessus	25%
Burp Suite	15%
Nikto	55%
SQLmap	20%
Acunetix	30%



Secondary result:

OWASP ZAP shows 40% false positives compared to 15% for Burp Suite.

Link with previous literature:

This result aligns with the CISA (2023) alert on team overload caused by false positives. It supports Smith's (2021) argument on the need for "accurate" tools rather than just "comprehensive" ones.

However, it partially contradicts the Open Source Security (2022) study, which praised ZAP's accuracy.

Explanation of the causes:

We identify two reasons for this high rate:

The aggressive default rules of ZAP, designed to maximize coverage at the expense of accuracy

Its difficulty in understanding the business context of the application, a technical challenge recognized in "Automated Security Testing" (IEEE 2023)

Added depth: The discussion suggests specific tuning parameters to reduce these false positives by 60%, a

Thesis 2 - Resistance of Post-Quantum Algorithms

Title: Assessment of Cryptographic Resistance Against Simulated Quantum Attacks

Résultat principal : L'algorithme CRYSTALS-Kyber résiste 98% mieux aux attaques quantiques simulées que Falcon et 95% mieux que Rainbow.

Discussion de la conformité avec la littérature :

Concordance et ses causes :

Ce résultat s'aligne parfaitement avec la **sélection du NIST (2022)** de Kyber comme standard. Nos tests expliquent cette supériorité par :

Sa sécurité basée sur les réseaux euclidiens, que **Albrecht et al. (2018)** ont prouvé résistante aux algorithmes quantiques

Son efficacité en taille de clé, un avantage décisif confirmé par **Post-Quantum Cryptography Standards (2023)**

Sa performance en temps d'exécution, 30% plus rapide que Falcon selon nos mesures, ce qui rejoint les benchmarks de **Cloud Security Alliance**

Analyzed divergence: Our study shows that Rainbow, although slower, offers slightly higher theoretical security in certain specific scenarios. This result nuances the absolute conclusions of the NIST Report and aligns with the reservations expressed by Bernstein (2021) regarding the risk of premature standardization.

Technical depth: The discussion examines the security/performance trade-offs from the perspective of specific use cases (IoT vs critical infrastructures).

Detailed table of vulnerabilities by algorithm

Algorithm	Implementation Vulnerabilities	Mathematical Weaknesses	Side-Channel Risks	Quantum Resistance
CRYSTALS-Kyber	Timing attacks (Low)	Lattice reduction (Theoretical)	Power analysis (Medium)	Strong (98%)
Falcon	Floating-point precision errors (High)	NTRU assumption	Cache timing (High)	Good (85%)
Rainbow	Key generation flaws (Critical)	Oil & Vinegar structure	Fault injection (Medium)	Moderate (75%)
Classic RSA	Padding oracle (Critical)	Factorization problem	Branch prediction (High)	Weak (10%)
Dilithium	Randomness generation (Low)	Lattice-based	EM emissions (Low)	Strong (95%)

Summary of the elements of a good discussion

Common elements in these successful discussions:

1. Depth demonstrated by:

Explanation of the underlying mechanisms (not just "what" but "why")

Consideration of trade-offs and contexts

Actionable recommendations derived from the findings

2. High-quality literary link characterized by:

Nuanced confirmation of previous work

Explanation of consistencies through identifiable mechanisms

Constructive confrontation of differences

Combination of academic and practical sources

These two theses illustrate how rigorous discussion transforms data into knowledge that truly advances the field.

Conclusion and connection with the analysis

In conclusion, evaluating a discussion involves checking:

- ☐ **Its depth:** Does it go beyond description to explain and propose?
- ☐ **Its literary grounding:** Does it engage in a critical dialogue with existing knowledge?

These two criteria are essential for research in cybersecurity to remain both scientifically rigorous and practically relevant.

Thank you for your attention.

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Thank You

