ÉCOLE NATIONALE SUPÉRIEURE D'ARTS ET MÉTIERS
UNIVERSITÉ HASSAN II DE CASABLANCA

Master's Degree - 2nd Year
Big Data and Internet of Things
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Progress Report #3

Optimization of IoT Communications through Compression and Lightweight Post-Quantum Cryptography

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1 Introduction

This is the third progress report for my research project on **"Optimization of IoT Communications through Compression and Lightweight Post-Quantum Cryptography"**. This report covers the period from December 27, 2025 to January 3, 2026.

This report marks the final phase before submission. The thesis is due on **January 5, 2026**, with the oral presentation scheduled for **January 8, 2026**.

2 Work Completed

2.1 Reference Document: Compression Algorithms

I created a comprehensive 26-page reference document on **compression algorithms** covering:

- **Fundamentals**: Information theory, entropy, and compression principles
- **Lossless algorithms**: Run-Length Encoding (RLE), Huffman coding, LZ77/LZ78, LZW, DEFLATE
- **Dictionary-based methods**: Detailed analysis of sliding window and hash table techniques
- **Modern algorithms**: Brotli, Zstandard (zstd), LZ4 with performance comparisons
- **IoT-specific considerations**: Lightweight compression for resource-constrained devices

This document includes TikZ diagrams, comparison tables, and algorithm pseudocode to facilitate understanding.

2.2 Main Thesis Progress

Building on these reference documents, I made progress on the main thesis:

Chapter	Status	Progress
Introduction	Completed	100%
Post-Quantum Cryptography	Completed	100%
Compression Algorithms	In progress	70%
Implementation & Benchmarks	In progress	40%
Conclusion	Not started	0%

Table 1: Thesis chapter completion status

3 Challenges Encountered

1. **Time constraints**: With only 2 days remaining before thesis submission, time management is critical
2. **Scope management**: Balancing depth of coverage with available time
3. **Integration**: Synthesizing compression and PQC topics into a coherent IoT optimization narrative

4 Remaining Tasks

4.1 Before January 5 (Thesis Submission)

1. **Complete Compression chapter**: Finalize the compression algorithms section in the main thesis
2. **Complete Benchmark section**: Include performance data from literature (pqm4 project, academic papers)
3. **Write Conclusion**: Synthesize findings and propose future work
4. **Final review**: Proofread and format the complete thesis

4.2 Before January 8 (Presentation)

1. **Create PowerPoint presentation**: 15-minute presentation covering:
   - Project motivation and objectives
   - PQC overview and NIST standards
   - Compression techniques for IoT
   - Benchmark results and analysis
   - Conclusions and future work
2. **Rehearse presentation**: Practice timing and flow

5 Conclusion

During this reporting period, I created a comprehensive reference document of 26 pages, covering multiple compression algorithms. This document provide solid technical foundations for the final thesis chapters.

The project is now in its final phase. The remaining tasks focus on completing the thesis chapters (Compression, Benchmarks, Conclusion) and preparing the oral presentation. Despite the tight deadline, the substantial groundwork completed during this period positions the project well for successful completion.

Submitted by: Abdessamad JAOUAD
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