

**INTEGRATING NAS AND LDAP FOR SECURE AI-ASSISTED
KNOWLEDGE SHARING IN PROJECT TEAMS**

By

Wilbert Dietrich Sutardja

12202031

BACHELOR'S DEGREE

in

INFORMATION TECHNOLOGY

FACULTY OF ENGINEERING AND INFORMATION TECHNOLOGY



Jalan Jalur Sutera Barat No. 15, Alam

Sutera Tangerang, Banten 15143 – Indonesia

June 2026

STATEMENT BY THE AUTHOR

I hereby declare that this submission is my own work and to the best of my knowledge, it contains no material previously published or written by another person, nor material which to a substantial extent has been accepted for the award of any other degree or diploma at any educational institution, except where due acknowledgement is made in the thesis.

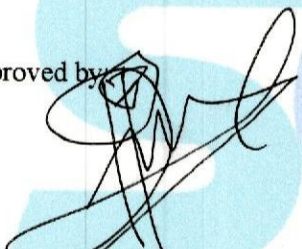


Wilbert Dietrich Sutardja

Student

22 June 26
Date

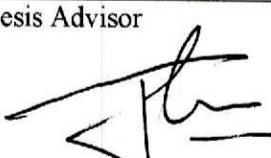
Approved by



Dr. Heru Parnomo Ipung, M.Eng.

Thesis Advisor

26 June 26
Date



Leonardo Theoson, S.Kom., B.Eng.

Thesis Co-Advisor

22 June 26
Date

Dr. Maulahikmah Galinium, S.Kom., M.Sc.

Dean

Date

Wilbert Dietrich Sutardja

ABSTRACT

INTEGRATING NAS AND LDAP FOR SECURE AI-ASSISTED KNOWLEDGE SHARING IN PROJECT TEAMS

By

Wilbert Dietrich Sutardja
Dr. Ir. Heru Purnomo Ipung, M.Eng*
Leonardo Bahar, S.TI., B.I.T**

SWISS GERMAN UNIVERSITY*
CODEDOC INDONESIA**

The increase in unstructured enterprise data has created a demand for intelligent, secure document retrieval systems. This research aims to design, implement and evaluate a knowledge sharing framework that is integrated to a Network-Attached Storage, LDAP for role-based authentication and a Large Language Model to perform semantic searching to retrieve and summarize documents within a simulated enterprise environment.

The system used TrueNAS Scale as storage, OpenLDAP as the access control mechanism, BGE-M3 embedding model for semantic indexing and Qwen 3 8B model for processing natural language and summarization. The proposed system was evaluated through a User Acceptance Test where ten IT professionals put the system through a simulation, measuring retrieval time, summarization time, accuracy and access control. A post-test questionnaire utilizing a Likert scale, aligned with the COBIT 2019 framework was used to measure user satisfaction.

The proposed system successfully reduced document retrieval and summarization time by an approximate of 97% when compared to manual methods whilst maintaining a comparable accuracy. All unauthorized access attempts and prompt injection were successfully blocked. Survey results showed strong satisfaction towards the system;

thus, demonstrating the viability of an LLM-integrated NAS system as a secure and efficient alternative to traditional enterprise knowledge systems.

Keywords: Retrieval-Augmented Generation, Role-Based Access Control, Large Language Model, Enterprise Knowledge Management, Semantic Search





DEDICATION

I dedicate this work to my family, friends, mentors and co-workers, for their
unwavering support and invaluable advice throughout my life.



ACKNOWLEDGEMENTS

I wish to start off by thanking my family for their unwavering support in all of my endeavors offering a helping hand at every fall and stumble. I would amount to nothing if not for their support and guidance throughout my life.

Next, I would like to thank Leonardo Theoson, S.Kom.,B.Eng. for taking a chance at me and giving me the opportunity to work at Codedoc where I now have a place where I feel at home and have a workplace that supports each other endlessly just like a family. I would also like to extend my utmost gratitude towards Gregorius Ferdinand and Dylan Tirta Kurniawan whom I cannot thank enough as both of them have given me invaluable guidance and advice especially throughout the thesis period where they guided me the whole way making sure I was always on the right path at all times.

Next, I would also like to thank all of my friends that I have met and grew alongside my academic journey at Swiss German University as part of the 2022 IT batch. Pushing each other relentlessly to make each other better as professionals and most importantly as better people.

Lastly, I would like to thank 2 special people who have pushed me the hardest throughout my time in campus and work. Lidya Aurelcia has always pushed me academically whilst being the best person to work with at all times with her meticulous attention to detail pushing me to get up to her level. Last but not least, my partner since Semester 1, Stanislaus Steven Kurniawan, who you can always count on to create the most complex lines of code whilst simultaneously cheering up the whole room with his infectious laughter. I cannot be prouder to call you guys my friends.

TABLE OF CONTENTS

STATEMENT BY THE AUTHOR	2
ABSTRACT	3
DEDICATION	6
ACKNOWLEDGEMENTS	7
TABLE OF CONTENTS	8
LIST OF FIGURES	12
LIST OF TABLES	13
CHAPTER 1 – INTRODUCTION	14
1.1 Background.....	14
1.2 Research Problem	14
1.3 Research Objective	15
1.4 Research Questions and Hypothesis	15
1.5 Significance of Study / Contribution	16
1.6 Scope.....	16
1.7 Research Limitation	16
CHAPTER 2 – LITERATURE REVIEW	18
2.1 General Knowledge	18
2.1.1 Network Attached Storage (NAS)	18
2.1.2 Lightweight Directory Access Protocol (LDAP).....	18
2.1.3 Large Language Model (LLM).....	18
2.1.4 Retrieval-Augmented Generation (RAG)	18
2.1.5 Project Management System.....	19
2.1.6 Knowledge Management	19
2.1 Related Works.....	19
2.1.7 Title: Artificial Intelligence and Knowledge Management: A Partnership Between Human and AI (2022).....	19
2.1.8 Title: Artificial Intelligence and Knowledge Sharing: Contributing factors to Organisational Performance (2022).....	20

2.1.9	Title: Artificial Intelligence Capability and Organisational Creativity: The Role of Knowledge Sharing and Organisational Cohesion (2022)	21
2.1.10	Title: Scaling NAS Storage for High-Concurrency Environments: From SMB Workgroups to Enterprise Applications (2024)	23
2.1.11	Title: Modernizing Enterprise File Storage: Leveraging NAS for Scalable, High-Performance Data Access (2020).....	24
2.1.12	Title: Retrieval-Augmented Generation (RAG) and Large Language Models (LLMs) for Enterprise Knowledge Management and Document Automation: A Systematic Literature Review	25
2.1.13	Title: Assessing Information Security Using COBIT 2019 and ISO 27001:2013 for Developing a Mitigation Plan	26
2.2	Comparison Table	27
CHAPTER 3 – RESEARCH METHODS		29
3.1	Research Design.....	29
3.2	Time frame of Study	29
3.3	Spiral Methodology	30
3.4	Data Preparation and Privacy Consideration	32
3.5	Requirements	33
3.5.1	Functional Requirements:	33
3.5.2	Non-Functional Requirements:.....	34
3.5.3	Minimum System Requirements:	35
3.5.4	Recommended System Requirements:	36
3.5.5	Security Requirements:.....	36
3.6	Experimental Setup.....	37
3.6.1	System Development:	37
3.6.2	Integration and Testing:	37
3.7	Evaluation Metrics	38
3.8	Data Analysis Techniques.....	38
3.8.1	Quantitative Analysis:.....	39
3.8.2	Qualitative Analysis:.....	39
3.9	User Acceptance Testing	39
3.9.1	Testing Environment.....	40

3.9.2	Testing Procedure	40
3.9.3	Post Testing Questionnaire	42
3.10	Implementation Tools	44
3.10.1	Programming Languages:	44
3.10.2	LLM Model.....	45
3.11	Use case Diagram	46
3.12	Workflow Diagram	47
3.13	System Architecture.....	48
3.14	System Prompt Architecture	51
CHAPTER 4 – RESULTS AND DISCUSSIONS.....		53
4.1	NAS Integration	53
4.2	Software Testing Result	54
4.2.1	Scenario One: Login Success.....	55
4.2.2	Scenario Two: Login Failed.....	55
4.2.3	Scenario Three: Document Retrieval.....	56
4.2.4	Scenario Four: Restricted Document Retrieval	56
4.2.5	Scenario Five: Document Summary	57
4.2.6	Scenario Six: Restricted Document Summary.....	58
4.2.7	Scenario Seven: Multiple Document Summary (1 valid & 1 restricted) 59	
4.2.8	Scenario Eight: Multiple Document Summary (all valid)	60
4.2.9	Scenario Nine: Prompt Injection Handling4.6.....	61
4.3	Testing Results.....	61
4.3.1	Manual vs AI-Assisted Document Retrieval	62
4.3.2	Summary Accuracy.....	65
4.3.3	Role-Based Access Control Validation	66
4.3.4	Post Testing Questionnaire Results	66
4.4	Discussion.....	70
CHAPTER 5 – CONCLUSIONS AND RECOMMENDATIONS.....		72
5.1	Conclusion	72
5.1.1	Future Recommendations	72

Appendix A: UAT Results.....	74
A.1 Task 1 – Engineering Department	74
A.2 Task 2 – Finance Department	74
A.3 Task 3 – IT Operations Department.....	74
A.4 Task 4 – Security Administration Department	75
A.5 Task 5 – Human Resources Department.....	75
A.6 Calculated Results.....	76
A.7 Post-Test Survey Responses	76
References.....	78
Curriculum Vitae	80



LIST OF FIGURES

Figures	Page
Figure 3.1: Research Design for Comparative Evaluation of Traditional and LLM-Assisted Knowledge Access	29
Figure 3.2: Use case Diagram	47
Figure 3.3: Workflow Diagram	48
Figure 3.4: Overall System Architecture	49
Figure 3.5: System Architecture Focus for the research	50
Figure 3.6: Conceptual Architecture of the System Prompt within the RAG Pipeline	52
Figure 4.1: Virtual Machine instance with TrueNAS installed	53
Figure 4.2: TrueNAS Dashboard	54
Figure 4.3: Scenario One	55
Figure 4.4: Scenario Two	55
Figure 4.5: Scenario Three	56
Figure 4.6: Scenario Four	56
Figure 4.7: Scenario Five	57
Figure 4.8: Scenario Six	58
Figure 4.9: Scenario Seven	59
Figure 4.10: Scenario Eight	60
Figure 4.11: Scenario Nine	61
Figure 4.12: Bar chart Visualization of Average manual vs AI retrieval time by task	62
Figure 4.13: Bar chart Visualization of Average manual vs AI summary time by task	63
Figure 4.14: Bar Chart Visualization of Average end-to-end time	64
Figure 4.15: Bar chart Visualization of Average Accuracy by Task	65
Figure 4.16: Bar chart Visualization of RBAC Validation Attempts	66

LIST OF TABLES

Tables	Page
Table 2.1: Comparison of Previous Studies and the Proposed Research	27
Table 3.1: Thesis work timeline	29
Table 3.2: Comparison of SDLC Models and Justification for Selecting the Spiral Methodology	31
Table 3.3: Functional Requirements for the system	33
Table 3.4: Non-functional Requirements of the system	34
Table 3.5: Minimum Hardware Requirements of the system	35
Table 3.6: Minimum System Requirements of the system	35
Table 3.7: Recommended Hardware Requirements of the system	36
Table 3.8: Recommended System Requirements of the system	36
Table 3.9: Security Requirements of the system	36
Table 3.10: Post Testing Questionnaire	42
Table 3.11: LLM Model Comparison	46
Table 4.1: Testing Scenarios	54
Table 4.2: Table of Results for Retrieval Accuracy DSS01	67
Table 4.3: Table of Results for Query Response Time DSS01	67
Table 4.4: Results for Semantic Relevance BAI03	68
Table 4.5: Results for Access Control Compliance DSS05	68
Table 4.6: Results for User Satisfaction MEA01	69
Table A.1: UAT Results for Task 1 (Engineering Department)	74
Table A.2: UAT Results for Task 2 – Finance Department	74
Table A.3: UAT Results for Task 3 – IT Operations Department	75
Table A.4: UAT Results for Task 4 – Security Administration Department	75
Table A.5: UAT Results for Task 5 – Human Resources Department	75
Table A.6: Calculated Results	76
Table A.7: Post-testing Responses	76