EVOLUTION OF CLOUD SYSTEMS AND DATA PLATFORMS

Preliminary Topic Description

Thesis in Computer Engineering

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1. Introduction

This document will serve as a **Preliminary Explanation** of what we are going to do for our undergraduate thesis. It provides an overview of the topic, the objectives we aim to achieve, the approach we plan to take, and the expected outcomes.
The purpose is to demonstrate our understanding of the assignment and outline our initial plan, and its phases, for carrying out the work.

2. Objective

The objective of this thesis is to analyze the **current challenges and future perspectives** of modern **Cloud Systems and Data Platforms**, from both a technological and business standpoint. The research will specifically investigate critical issues concerning: security, performance, cost optimization, vendor lock-in mitigation, and regulatory compliance. Furthermore, we aim to prototype a specific functionality of a Cloud System to practically illustrate its operation in addressing an identified challenge.

3. Background and Context

In the past decade, with the unprecedented technological developments, *cloud computing* is one of those branches that has transformed the way organizations store, process, and analyze data. **Cloud Systems and Data Platforms** have evolved from simple storage solutions to sophisticated, scalable ecosystems that support complex applications and big data analytics. Understanding this evolution is crucial for both academic research and practical applications. **However, despite these significant advancements, companies continue to face notable technical and organizational barriers in the effective adoption and strategic management of modern cloud environments.**

4. Proposed Work and Approach

To accomplish our objective, we structured the work into distinct phases:

- **Phase 1 - Knowledge and Information:** In this first phase, we aim to gather knowledge about the topic at hand. This will allow us to develop a clear understanding of the broader context and gain a global view of what the evolution of *Cloud Systems* represents. Websites, academic articles, and other online resources will serve as our main tools during this phase.
- **Phase 2 - Questionnaire Design:** Using the knowledge and information acquired in the previous phase, we will design a structured questionnaire to be submitted to CTOs and CEOs. The **goal is to identify specific critical issues and friction points** encountered by companies in adopting and

scaling **Cloud Systems and Data Platforms** and their impact on operational strategies.

- **Phase 3 - Data Collection and Processing:** The *data* collected through the questionnaire will be processed and analyzed. This step **will help** us identify relevant patterns and insights, which will serve as the foundation for creating case studies focused on specific applications or organizational contexts.
- **Phase 4 - Analysis of the results and Prototype Development:** Based on the analysis of critical issues, specifically regarding cost optimization, we will develop a code-based functional prototype. We intend to implement a **serverless function** (e.g., using AWS Lambda or Google Cloud Functions) designed to demonstrate the automated shutdown of unused cloud resources, thereby practically addressing resource wastage.

5. Expected Outcomes

At the end of the project, we expect to achieve the following outcomes:

- A **comprehensive understanding** of how *Cloud Systems and Data Platforms* have evolved over time, including key technological and architectural changes.
- A **structured analysis** of the impact that *Cloud technologies* have had on companies and their operational models, based on the questionnaire responses.
- **Several case studies** illustrating how organizations have adopted or benefited from modern *Cloud and Data Platforms*.
- A **functional prototype** based on serverless architecture that automates the shutdown of unused resources to demonstrate effective cost optimization.
- A **final report** *summarizing* our findings, conclusions, and potential future directions in the evolution of Cloud Systems**.**

6. References and Resources

For the first phases that concerns Knowledge acquisition and Questionnaire Design we will make the use of the following resources, as suggested:

- **Google Scholar**
- **Semantic Scholar**
- **Openalex**
- **Web of Science**
- **ACM Digital Library**
- **IEEE Xplore Digital Library**
- **arXiv**

Additional materials, such as academic papers and online reports, will also be consulted throughout the development of the thesis.