

## THESIS INFORMATION

Title: **Building a Blockchain-based SLA Framework for Monitoring and Enforcing Penalty Rules in Service Provision.**

Major: **Computer Science**

Major code: **62480101**

Ph.D. Candidate: **NGUYEN TRUNG VIET**

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### MAJOR CONTRIBUTION OF THIS THESIS

Today, the trend toward service provision is rapidly evolving and aimed at a world of integrated services and a global ecosystem. The concept of a service-level agreement (SLA) has been widely studied in various scientific fields. It establishes obligations on the part of the provider with the rights of the user. However, assessment and monitoring of service delivery supported by SLAs still face many challenges. First, the lack of transparency and fairness of service evaluation criteria causes difficulties and leads to results influenced by the interests of the parties involved. Secondly, although the terms of compensation are laid down in the contracts, close monitoring, and automated execution are often subject to restrictions. Thirdly, interpreting compensation conditions in business language may sometimes be ambiguous, complicating its application in automated systems. In recent years, much research has focused on SLAs and compensation regulations, including their descriptions, monitoring, negotiation, and enforcement. However, enforcement automation focuses mainly on cloud services, leaving SLA research that contains human-centered penalty rules that need to be explored.

Therefore, this thesis evaluates services based on service-level agreements to ensure that services meet users' needs accurately. The author shows that these agreements can be represented by mathematical formulas, processed, and enforced by computers. The author proposes to use Blockchain technology to address the problems of transparency and data interference in the evaluation process. This technology allows smart contracts to enforce penalty rules and monitor services automatically.

The contribution of this thesis can be summarized in three main points:

- The description of concepts and mathematical modeling of statutory obligations, including penalties, rule-abiding rates, satisfaction, and costs.
- The provision of metrics monitoring algorithms to ensure objectivity in service evaluation and classification.

- The proposal of a distributed application architecture towards Web3 to implement penalties and to objectively calculate service delivery processes, using blockchain technology to improve transparency and automate penalties for violations.

The thesis studied the framework proposed in detail in two different areas (smart agriculture and automobile manufacturing) and assessed its effectiveness as a solution to specific challenges. In addition, the thesis examines the scalability of this framework by proposing a technology acceptance model, which outlines future research directions.

**Academic advisors**

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