

# Design and Analysis of Taxpayer's Bank Account Blocking System using Microservices Architecture with Command and Query Responsibility Segregation and Event Sourcing Pattern at the Directorate General of Taxes

Ridwan Siagian<sup>1</sup>

<sup>1</sup>Magister of Information System Management, Gunadarma University, West Java, Indonesia

**Abstract**— *The Directorate General of Taxes (DGT) uses data access right to seize the assets of taxpayers stored in Financial Services Institutions. Bank accounts blocking is one of the mechanisms for seizing taxpayer assets. However, an unintegrated system with Financial Services Institutions becomes an obstacle in the process of blocking taxpayer accounts. Adjusting the system to new regulation is difficult because it employs a complex system with a monolithic architecture. The aim of this research is to suggest a system design using microservices architecture with Command and Query Responsibility Segregation (CQRS) and Event Sourcing (ES) patterns for blocking taxpayer bank accounts. Observation techniques, interviews, and document studies serve as the basis for qualitative analysis to obtain the design system of blocking taxpayer bank accounts. System analysis and design using Unified Modeling Language (UML) modeling deliver use case diagrams, activity diagrams, class diagrams, and physical architecture designs. The results of the system design and analysis make the process more efficient and effective. This research is expected to contribute to similar future research.*

**Keywords**— *Analysis, Design, Blocking, DGT, UML, CQRS, ES, Microservices.*

## I. INTRODUCTION

Directorate General of Taxes (DGT) using data and information access rights for the purpose of seizing taxpayer assets in the form of deposits, savings, account balances, checks, or equivalent forms held by Financial Services Institutions in the banking sector, insurance sector, and other sectors. Seizure of taxpayer assets is carried out by the mechanism of blocking taxpayer bank account according to the Minister of Finance Regulation number 61 of 2023 about the procedures for tax collection on the amount of tax that is still payable.

In today's modern technology, both government institutions and private companies use information systems to support their business processes and operations. Similarly, in the process of blocking taxpayer bank accounts, DGT and Financial Services Institutions have been using information systems to carry out the process in accordance with applicable procedures. However, the administrative process still relies on manual method. Existing systems are used to generate mail and send it to the Financial Services Institutions via post

office. The manual processing of mail and unintegrated systems pose challenges for both DGT and Financial Services Institutions in executing the account blocking process for taxpayers.

The system utilized by DGT to support the process of tax collection and the blocking of taxpayer accounts still relies on an information system with a monolithic architecture. The current architecture of the information system makes the applications complex, leading to challenges in adapting the system to rule changes. Additionally, the existing system does not implement system integration with Financial Services Institutions.

This research focussed on the business processes of tax collecting and blocking taxpayer bank accounts. The design of information systems included stages of analysis that resulted use case diagrams, activity diagrams, and class diagrams, and physical architecture design.

The objective of this research is to provide a system design for the mechanism of blocking taxpayer bank accounts. This system design aims to integrate the process for both the DGT and Financial Services Institutions, facilitating the collection of tax debts while establishing a robust system integration scheme between the DGT and Financial Services Institutions. Additionally, this study aims to apply cutting-edge technology by implementing a Microservices architecture with Command and Query Responsibility Segregation and Event Sourcing patterns. The insights gained from this research can serve as a valuable reference for the development of similar information systems.

## II. RESEARCH METHODS

This research uses a case study research methodology, focusing on the taxpayer account blocking system as the case under study. The method used in this research is qualitative. According to Benbasat, Goldstein, and Mead (1987), case studies in the field of information systems are considered suitable for gaining insights from practitioners and for generating or developing theories based on their experiences.



Fig. 1. Fishbone Problem Diagram.

Based on figure 1, the problems seen from an environmental perspective are the manual blocking process and the manual sending of mail. From an organizational perspective, the root cause of the problem lies in frequently changing regulations, which lead to system changes. Making changes to the system also involves a complicated organization. From a technological perspective, the current taxpayer bank blocking system still uses a monolithic architecture, and there is no integration between the DGT and Financial Services Institutions. Heavy administrative burdens and frequent employee transfer are among the root causes from the people's perspective.

From the issues identified in the four domains in figure 1, a research phase was developed using the SDLC stages consist of planning, analysis, design, as shown in figure 2.



Fig. 2. Research Phase.

Based on the steps outlined in Figure 2, the stages conducted in this research are as follows:

1. Problem Identification, this stage is carried out through interviews and document studies. The arising issues and research questions are obtained during this stage.
2. Literature Study, this stage conducted by understanding relevant books or journals and searching for appropriate theories for this research. By reviewing similar research, comparisons can be made to determine which methods are suitable for this study. The literature review is used to develop the research framework.
3. Analysis, this stage is carried out using coding techniques. The results of interviews and document studies

are then analysed by grouping the data to give them meaning. Subsequently, the analysis results are represented in UML notations such as use case and class diagrams.

4. Planning and Design, models resulting from the analysis stage are used to guide the design process. In this research, the design includes data management design and physical architecture design.
5. Drafting Conclusions and Suggestions, after completing all the steps, the final stage of this research involves drawing conclusions and providing recommendations based on the research findings.

### III. RESULT AND DISCUSSION

#### A. Result of Determining Business Process to be

In the process of requesting the blocking of taxpayer bank accounts and obtaining details of the taxpayer bank account, officials convey the blocking request to Financial Services Institutions by attaching a copy of the demand letter (SP) and a copy of the execution order for seizure (SPMT). The nominal value to be blocked, as stated in the SP, is the amount of tax debt and collection costs. The identity information used to make the blocking request includes the identity card, articles of association or equivalent documents, Taxpayer Identification Number (TIN), or passport, or other documents showing the identity of foreign nationals. The blocking request is made in writing, and the request also serves as a request for information on all taxpayer accounts and the balance of each account.

When Financial Services Institutions receive the account blocking request letter from the official's tax office, they proceed with the blocking immediately. The amount of assets blocked corresponds to the information stated in the blocking request. In addition to immediate blocking, Financial Services Institutions are obligated to create a report and provide in writing all taxpayer account numbers and balances within one month of receiving the account information request letter. The tax office will issue a receipt for the information on taxpayer account numbers and balances received from the Financial Services Institutions. Officials can reapply for the account balance notification request when the taxpayer's balance is less than the tax debt and collection costs. Financial Services Institutions must provide balanced information upon reapplication for the account balance notification within one month from the date of receiving the blocking request. The blocking report is presented to the official's tax office and the taxpayer after the blocking has been executed.

Requests for detailed transaction information on taxpayer accounts are made if there are indications of discrepancies in the information received by the tax office or a significant time gap between the blocking request and the actual blocking execution. Requests for detailed transaction information on taxpayer accounts can also be made when their accuracy is doubted. Financial Services Institutions are obliged to provide a response within one month of receiving the request for detailed transaction information notification.



Fig. 3. Flow Process Account blocking request, information, Balance, and Details.

The seizure of taxpayer assets stored in banks is carried out once the asset balance held is determined. Tax bailiffs execute the seizure and create a seizure execution report, which is then delivered to the taxpayer and relevant Financial Services Institutions. The official tax office may request the lifting of the blocking from the bank and provide a copy to the taxpayer after the taxpayer settles the tax debt and collection costs. Tax debts and collection costs can be settled using the book transfer mechanism against the blocked balance. Financial services institutions, upon receiving a request letter from the tax office, will transfer the balance and simultaneously lift the block on the taxpayer's bank account.

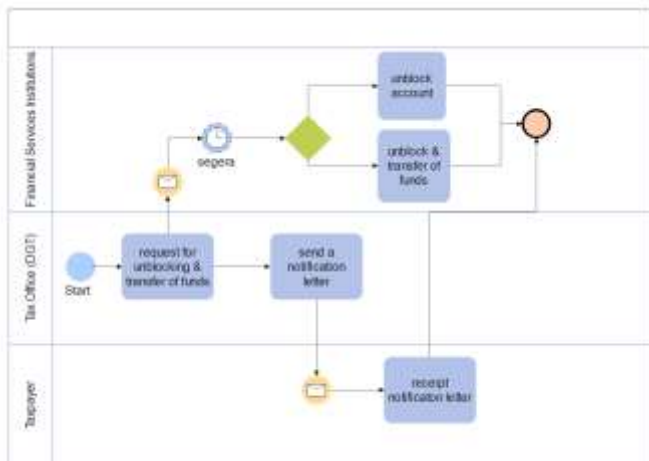


Fig. 4. Flow process of requesting unblocking and book transfer.

Based on the data from observations, interviews, regulations, and business processes, several issues with the current system were identified as follows:

1. The process of blocking taxpayer bank accounts still involves manual activities such as sending blocking requests and blocking reports via post mail.
2. Monitoring of blocking requests is suboptimal due to a lack of data integration between the DGT and relevant Financial Services Institutions.
3. The process of searching for taxpayer bank accounts by tax bailiffs is still a manual process, including through information reported on annual tax returns and through networking processes.
4. The broadcast mail process involves sending blocking requests to all central and branch Financial Services Institutions within the jurisdiction of the registered

taxpayer tax office to obtain taxpayer bank account information. This broadcasting process is not efficient, leading to heavy administrative burdens for tax bailiffs and less efficient collection actions due to longer wait times for responses from relevant Financial Services Institutions.

5. Database related to taxpayer bank account administration is inadequate to support the process of blocking taxpayer bank accounts.
6. The system does not allow the transfer of tasks between employees due to staff transfer. When turnover occurs, especially among tax bailiffs, collection and seizure actions, including blocking taxpayer bank accounts, must be manually transferred by the technical system service team.
7. The current infrastructure uses a monolithic architecture that is difficult to develop to meet the needs of system integration with external parties, including Financial Services Institutions.

With the discussion of these issues, DGT requires the development of a taxpayer bank account blocking system and business processes that accommodate system integration between the DGT and Financial Services Institutions. The results of the business process that become system requirements are described in the following table 1.

TABLE I. Results of the Analysis of Taxpayer Bank Account Blocking Problems.

No	Problems	Solution
1	The delivery of request mail and reports is still manual	The delivery of mail request and reports between the DGT and Financial Services Institutions can be done automatically.
2	Monitoring of blocking requests is not optimal	Provide integration of the blocking system with the Financial Services Institutions and allows users to interact within the DGT system.
3	The process of broadcasting mail to obtain taxpayer account information is not effective	Provide master data of taxpayer bank accounts to reduce the mail broadcasting process.
4	Heavy administrative burden for tax bailiffs in the mail broadcast process	Requesting account information and delivering it to the Financial Services Institutions can be done automatically.
5	Database is inadequate	The formation of taxpayer bank account database and taxpayer detail information.
6	Employees transfer	Jobs exchanges can be done automatically while employee's transfer.
7	DGT is uses a monolithic architecture for existing system	The system development using microservices architecture within the internal infrastructure or cloud environment to provide a cutting-edge system.

### B. Modeling Use Case Diagram

After getting required processes and drawing them into a use case like figure 5, then modeled the process into the activity diagram. An activity diagram can be an overview of several use cases. Here are some activity diagrams that can be described on this system.



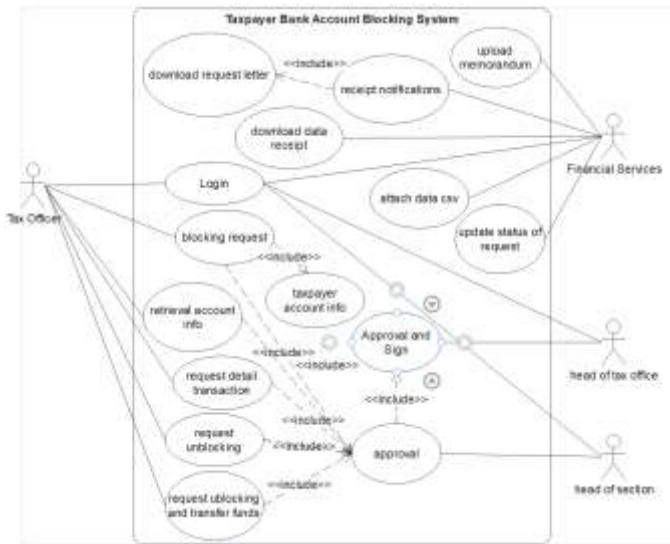


Fig. 5. Use case diagram result.

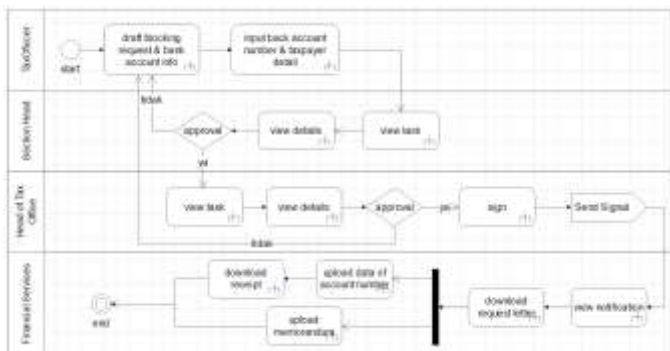


Fig. 6. Result of activity diagram creating blocking request and account information.

Figure 6 describes the process of creating blocking request and account information letters. The request will be reviewed and approved by the section head, then forwarded to the office head for approval and signature. The approved letter by the office head will enter the system queue for delivery to the relevant Financial Services Institution. The activities of blocking request and account information will be recorded as a sequence of events stored in the database. After the letter is approved by the head office, the system will send a notification email to the designated Financial Services Institution email address. Upon receiving the email notification, the Financial Services Institution user can proceed by accessing the application to download the request letter. During the process, the system automatically changes the progress status to "in process". The user at the relevant Financial Services Institution can then respond to the request by uploading the blocking report and attaching account information details. After attaching the response, the system will automatically change the request status to "completed". For each completed request process, user can download the acknowledgment letter from the application.

Figure 7 describes the process of creating a request letter for account transaction details. The request will be reviewed and approved by the section head, then forwarded to the head of tax office for approval and signature.

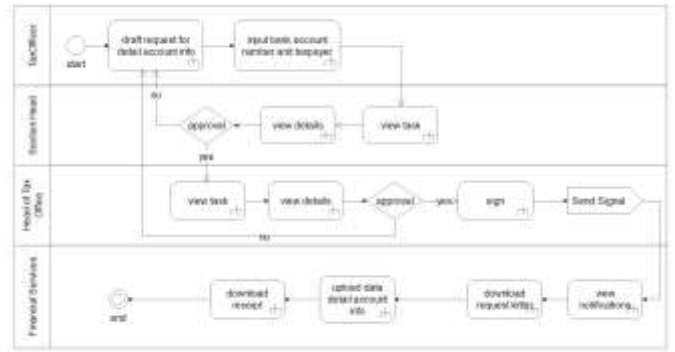


Fig. 7. Result of activity diagram creating request account detail information.

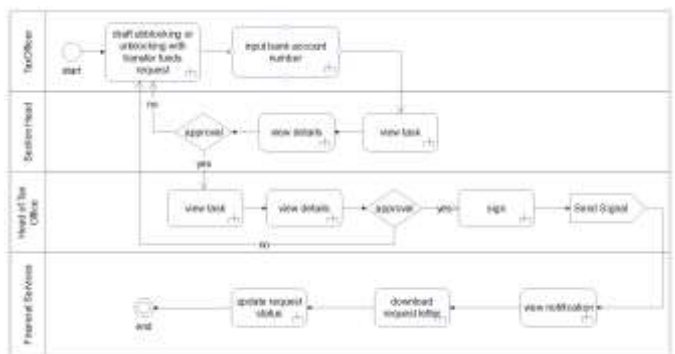


Fig. 8. Result of activity diagram creating request for unblocking taxpayer bank accounts.

Figure 8 describes the process of creating a request letter to unblocking taxpayer bank account and simultaneously transfer the blocked balance to settle tax debts. The request will be reviewed and approved by the section head, then forwarded to the office head for approval and signature.

C. Modeling Class Diagram

Figure 9 describes a class diagram illustrating the proposed system condition in this study. The class diagram is developed based on the previously designed use cases.

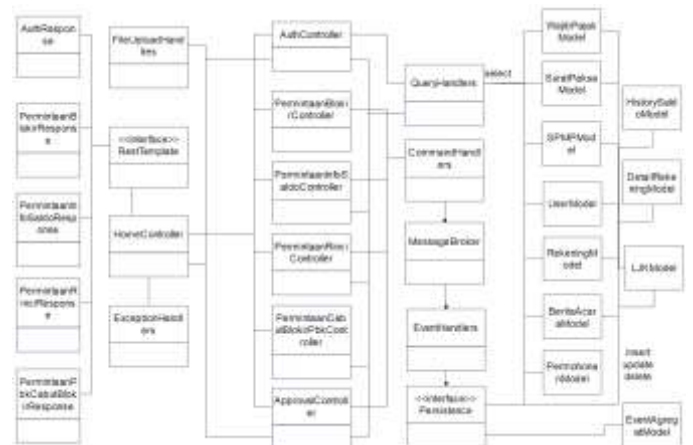


Fig. 9. Class diagram result

D. Modeling Physical Architecture Design

The proposed architecture design in this study implements a microservices architecture. User access is divided into two

categories: tax bailiffs, section heads, and office heads use the internal access, while Financial Services Institutions users use internet access. The proposed technology for managing and running applications uses Kubernetes as an open-source platform. The proposed design application is divided into two main components consist of frontend and backend application. Kafka is used as a data streaming platform to store executed events.

the taxpayer bank account blocking system using microservices architecture with the CQRS and Event Sourcing patterns can be considered as a reference for system development at DGT. The integrated system design between DGT and Financial Services Institutions, along with several automated processes, enhances the system more efficient and effective. System development with the CQRS and Event Sourcing patterns can be implemented using microservices architecture.

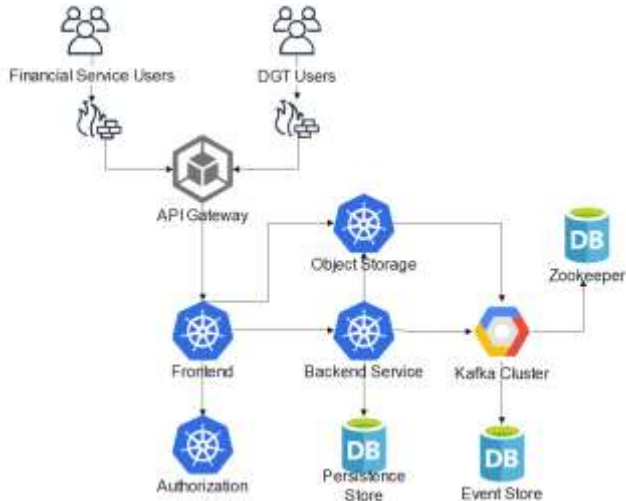


Fig. 10. Physical architecture design with microservices architecture.

The proposed implementation of CQRS in this study is designed for backend services. Event Sourcing is commonly paired with CQRS, which ES serves as service to record the event log for each command and query. The architecture design of the taxpayer bank account blocking system using the CQRS and ES patterns can be seen in the following figure 11.

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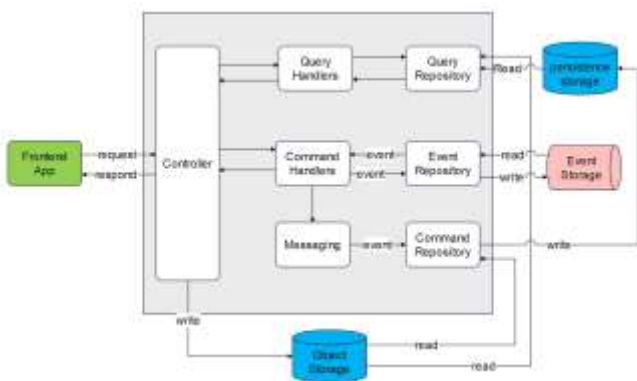


Fig. 11. Proposed architecture design with CQRS and event sourcing.

IV. CONCLUSION

Conclusions drawn from this research include the design of