（別紙 1）

確　認　欄	
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業　務　来　歴　表

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年月～年月	業　務　内　容	知り得た機密情報（＊）	技術情報資料・営業(経営)情報資料・教育資料及びその複製物、その電子情報の所持・保存状況
2021-2022	• Study on Command Query Responsibility and Segregation design pattern	- Prototype on assisting in development using Domain Driven Design in a internet banking application - Patent on assisting in development using Domain Driven Design - Evaluation report on assisting in development using Domain Driven Design - Meeting to identify the issue in the implementation of CQRS system in Ringo Pass client - Kenpo on Examination of non-functional requirement fulfillment technology for	- I do not possess the copy of any material of the following documents and prototypes - Written one patent that describes the system and method to model the application in such a way that will help the SEs in designing right aggregates for implementing the DDD in their software application. An Internet Banking has been developed as an example where the solution is being implemented for testing purpose and an evaluation report has been submitted with the results - In the hearing we have identified the issue of dual write, making the event store idempotent in storing the events, and processing the aggregate for which the new event has not stored yet. Few solutions are proposed to address this issue - Evaluated the performance of Axon framework with Axon Server of a complex internet banking application. The results showed that in case of high throughput use cases where the number of events are in millions, the throughput did not degraded significantly, and there is not significant increase in the response time

		the development of CQRS and Event Sourcing frameworks - Kenpo on Proposal and Evaluation of Modeling Support Based on Domain Driven Design	- Proposed and evaluated a method to assist SEs in modelling their application based on DDD principles by using the source code and historical data analysis. The method shows a significant reduction in the overall application development time
2022-2023	• Improving the performance of Command Query Responsibility Segregation solution • Study on Event Sourcing Design Pattern	- Kenpo on Reliable event handling for atomic operations in distributed systems - Kenpo on Evaluating Generic Databases as Event Stores in Event Sourcing Systems	- Proposed and evaluated a method for atomic processing of events in CQRS design pattern which is crucial for mission critical systems. We have developed and evaluated a prototype of customer transaction management application by implementing CQRS design pattern using the method we proposed. The results showed satisfactory performance of the prototype with ~500ms of latency in updating the read database, high availability and reliably handling the events in case of duplicate messages to avoid data inconsistency. - We have compared the distributed data management framework available in the market and identified different issues. We found that the event store plays a significant role in implementing CQRS and ES design pattern because of which purpose built event stores are developed. In this research, we have evaluated general purpose databases like PostgreSQL and CockroachDB performance against the AxonServer, a purpose built database. We have tuned these two databases to improve its performance as an event store.

			We have found that the performance of these tuned general purpose databases are comparable to the purpose built database in terms of throughput and replay performance. We have achieved a 20-30% increase in the throughput and 5-10% reduction in latency after fine tuning the general purpose databases.
		- Patent on System and method to improve the performance of eventual consistent system - Prototype on Atomic and Highly Available CQRS system - Design Document of Atomic and Highly Available CQRS system - Evaluation report on Atomic and Highly Available CQRS system	- We have proposed a method to improve the performance of an eventual consistent system that could minimize the chances of stale data read and provide high availability at the same time. The invention provides a method to asynchronously update the replicas in an eventual consistent system with choosing the closest/fastest replica and avoiding stale data read. We have incorporated a metadata nodes cluster that will only forward the request to the most recent updated and closest replicas and avoid reading stale data by the users of the system - A prototype to evaluate atomic update of the event store and provide high availability to the implementation of the CQRS system has been developed. The design document organize all the details of the design required to achieve atomic processing of the messages in the proposed CQRS framework. The evaluation report details the components used, the environment setup, with the failure scenarios of components, along with the monitoring stack for evaluating the architecture proposed. The result showed the atomic and high availability of the architecture - A design document documented by the Taguchi-san that details the architecture of Hitachi

		- Evaluation report on Fine Tuning General Purpose Database as an Event Store - Design document on organizing the functionality required for the CQRS/EventSourcing framework and defining an API I/F that is compatible with Global Logic MSA	Microservice Platform (HMP) and functionality of CQRS/ES to be implemented in the platform. Hitachi is developing a Hitachi Microservice Platform (HMP) to facilitate system development under microservice architecture by middleware technology. The framework will comprise the APIs for SEs and customers to implement microservice pattern like CQRS, Event Sourcing, and Saga.
2023 - Present	• Implementing the functionalities for CQRS and Event Sourcing system	Meeting on Cloud Native system	Future study will include the CRUD + CQRS implementation, not Event Sourcing

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