

Simulated **FLEXIBAC** System Architecture

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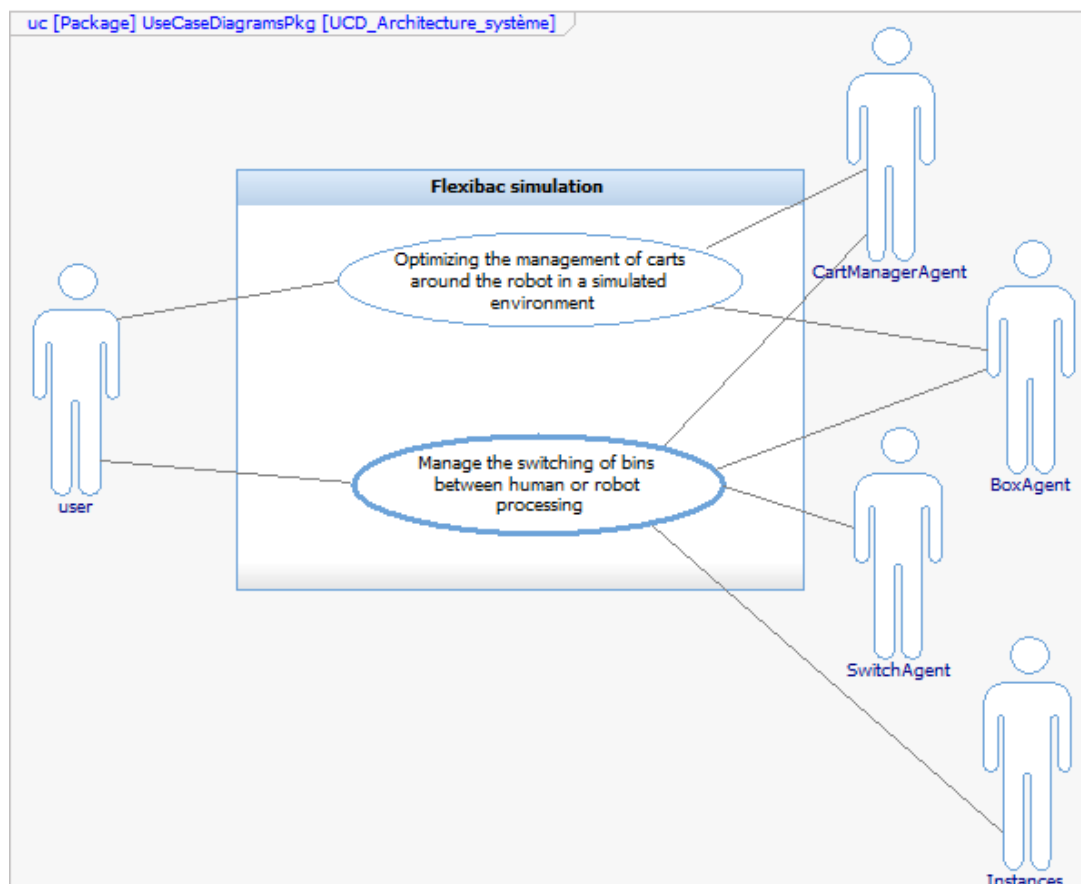
Introduction to the Flexibac Simulation Rhapsody Model

This document outlines the Rhapsody model for the "Flexibac simulation" project, which focuses on optimizing the management of bins and carts in a robotic processing environment. The project is decomposed into two main use cases: "Manage the switching of bins between human or robot processing" and "Optimizing the management of carts around the robot in a simulated environment."

The following diagrams provide a detailed view of the system's architecture, behavior, and interactions between its components. We utilize Use Case Diagrams to define system scope and actors, Activity Diagrams to illustrate the flow of control and decisions, and Sequence Diagrams to depict the interactions between objects in a time-ordered manner. This comprehensive modeling approach in Rhapsody ensures a clear understanding of the system's functionality, facilitates design, and supports the implementation and verification phases of the project.

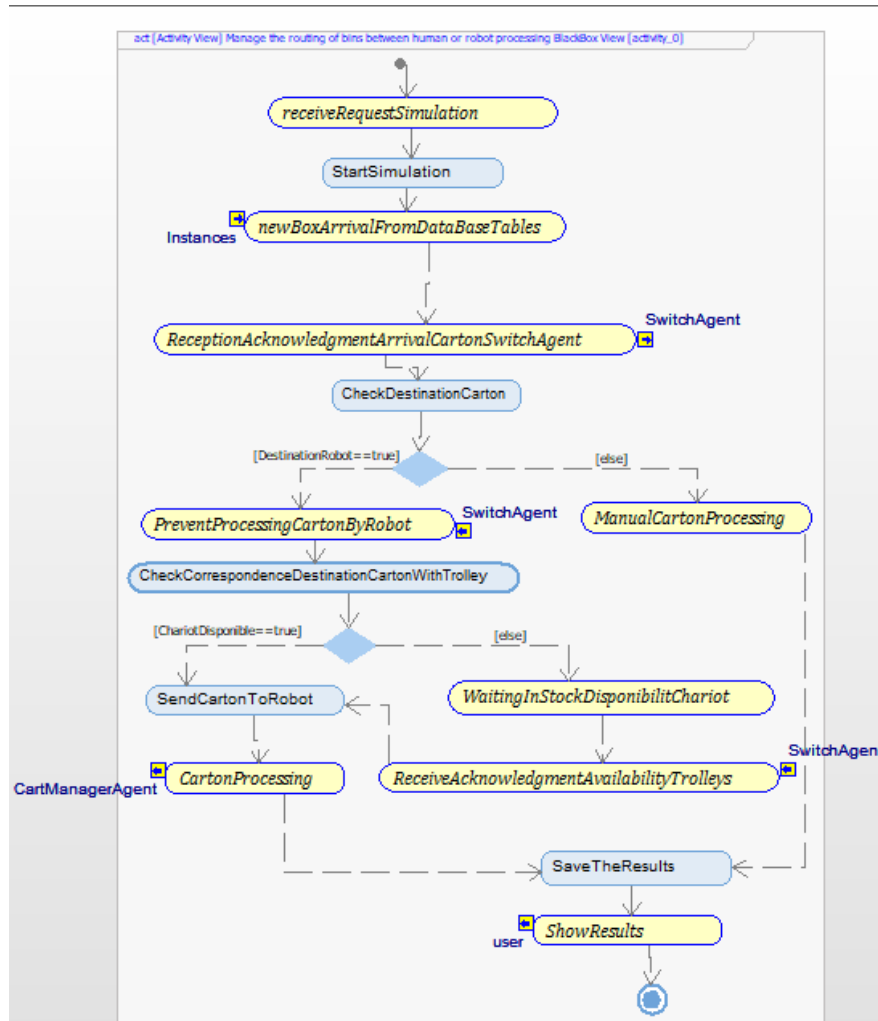
Use Case Diagram

This Use Case Diagram, named UCD_Architecture_système, provides a high-level overview of the "Flexibac simulation" system. It identifies the two primary use cases: "Optimizing the management of carts around the robot in a simulated environment" and "Manage the switching of bins between human or robot processing." It also depicts the main actors interacting with the system: user, CartManagerAgent, BoxAgent, SwitchAgent, and Instances, illustrating their relationships with the various use cases. This diagram serves as the starting point for understanding the system's functional requirements and its boundaries.



Activity Diagram Manage the routing of bins between human or robot processing BlackBox View

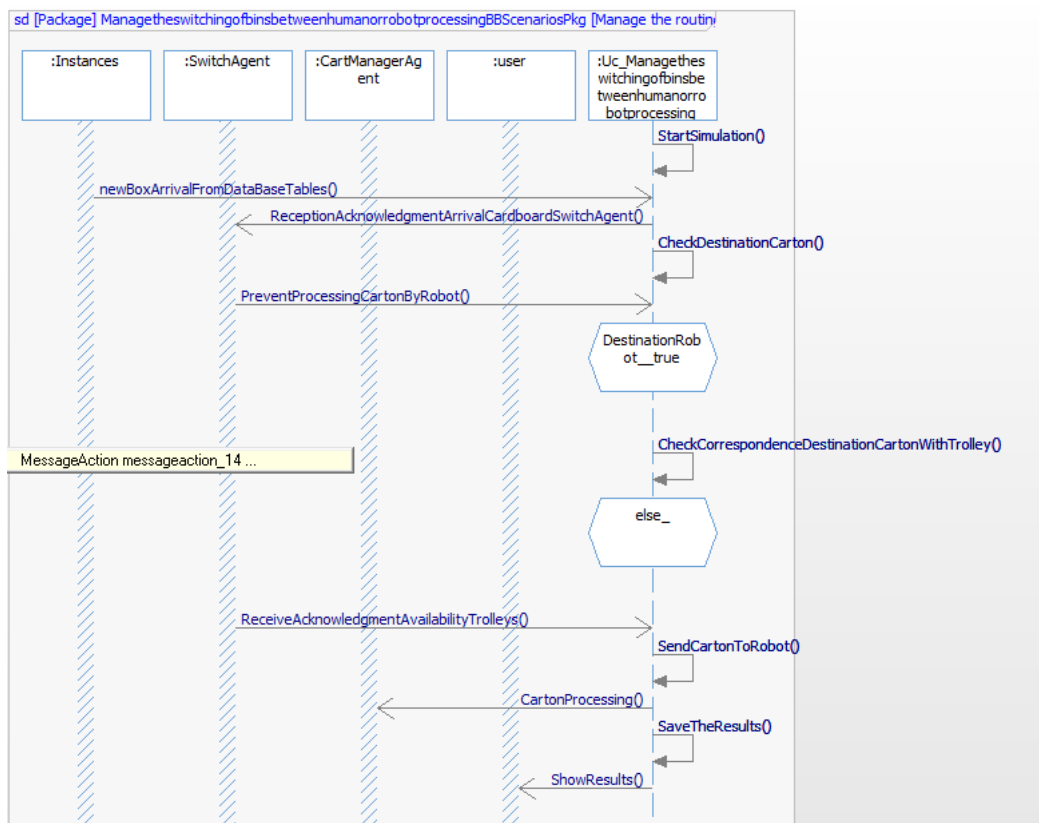
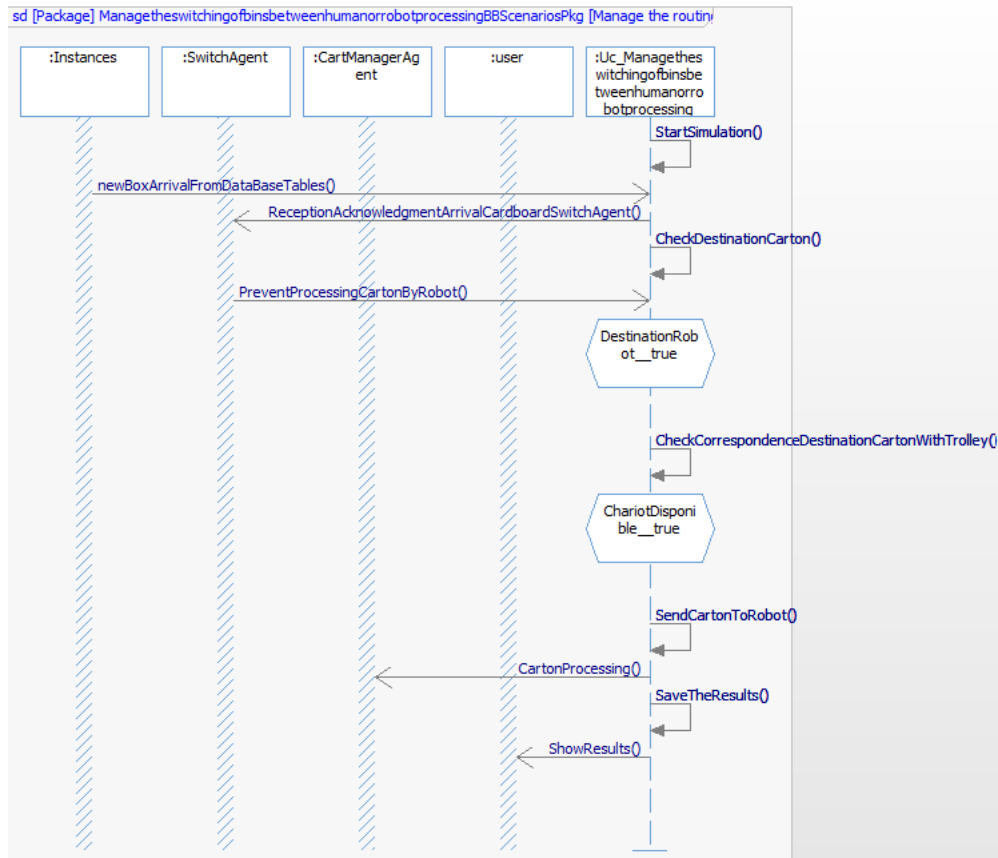
This Activity Diagram, presented from a Black Box perspective, models the "Manage the routing of bins between human or robot processing" use case. It shows the flow of activities starting with `receiveRequestSimulation` and `StartSimulation`. Key decision points include `CheckDestinationCarton` (leading to either `PreventProcessingCartonByRobot` via `SwitchAgent` or `ManualCartonProcessing`) and `ChariotDisponible` (determining if a carton is `SendCartonToRobot` or `WaitingInStockDisponibilitChariot`). The diagram concludes with `SaveTheResults` and `ShowResults` for the user. This diagram outlines the logical sequence of operations for routing bins.

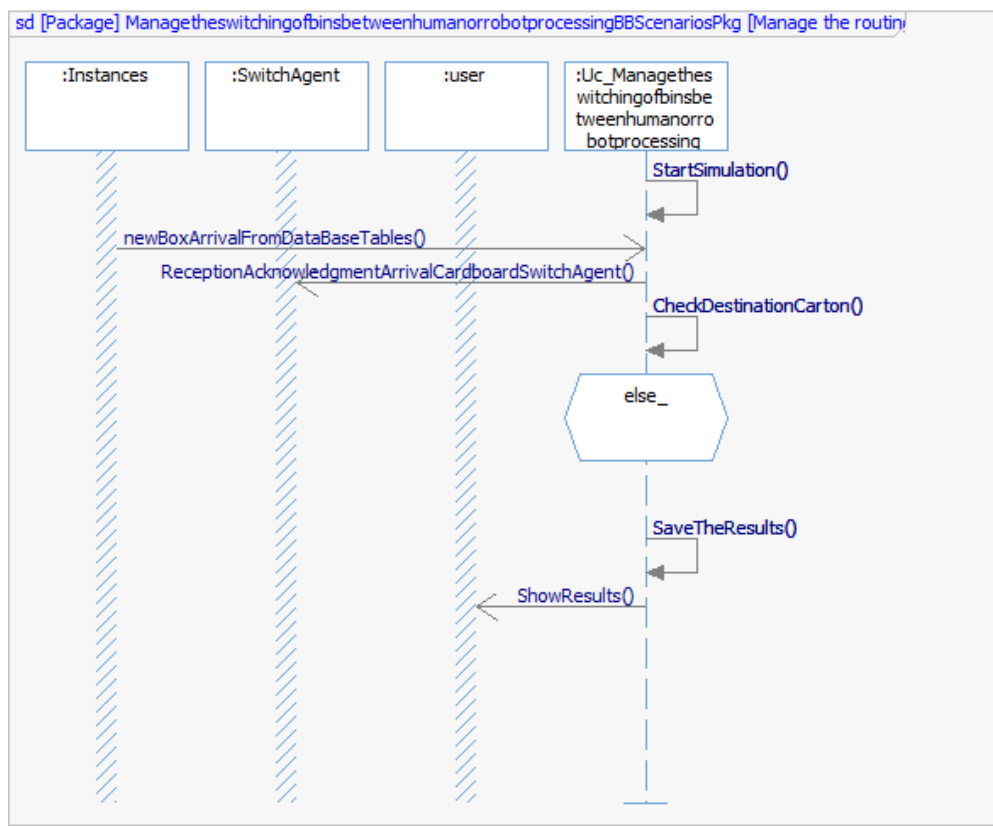


Sequences Diagrams

This Sequences Diagrams illustrates a specific scenario within the "Manage the switching of bins between human or robot processing" use case. It shows the interaction among Instances, `SwitchAgent`, `CartManagerAgent`, `user`, and the `Uc_Managetheswitchingofbinsbetweenhumanorrobotprocessing` system, leading to `SaveTheResults` and `ShowResults`. This diagram highlights a successful path for robot processing.

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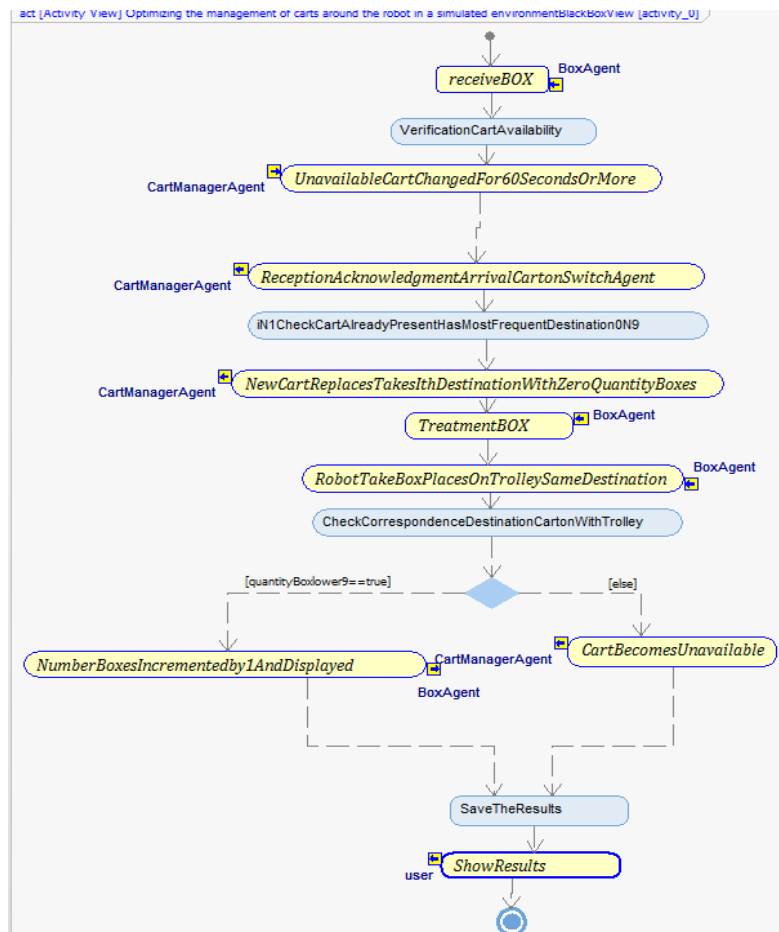




Activity Diagram Optimizing the management of carts around the robot in a simulated environmentBlackBox View

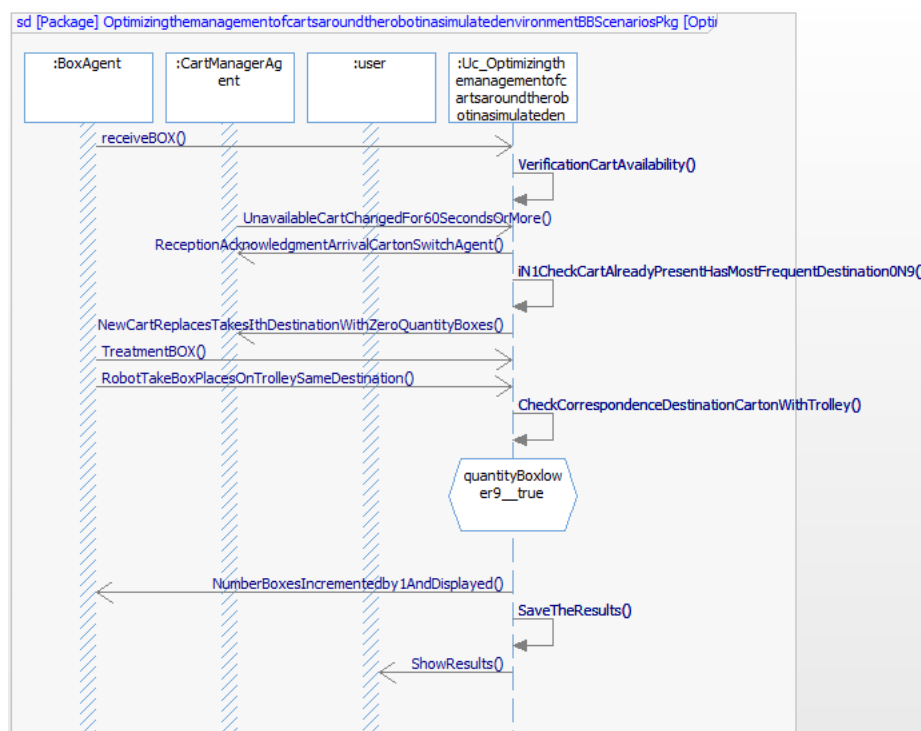
This Activity Diagram, from a Black Box perspective, details the "Optimizing the management of carts around the robot in a simulated environment" use case. It starts with receiveBOX by BoxAgent and proceeds to VerificationCartAvailability. Key activities include handling UnavailableCartChangedFor60SecondsOrMore, ReceptionAcknowledgmentArrivalCartonSwitchAgent, and IN1CheckCartAlreadyPresentHasMostFrequentDestinationON9. It then moves to NewCartReplacesTakesithDestinationWithZeroQuantityBoxes and TreatmentBOX by BoxAgent. A conditional flow based on [quantityBoxlower9==true] leads to NumberBoxesIncrementedBy1AndDisplayed or CartBecomesUnavailable. The flow concludes with SaveTheResults and ShowResults. This diagram illustrates the complex logic of cart optimization.

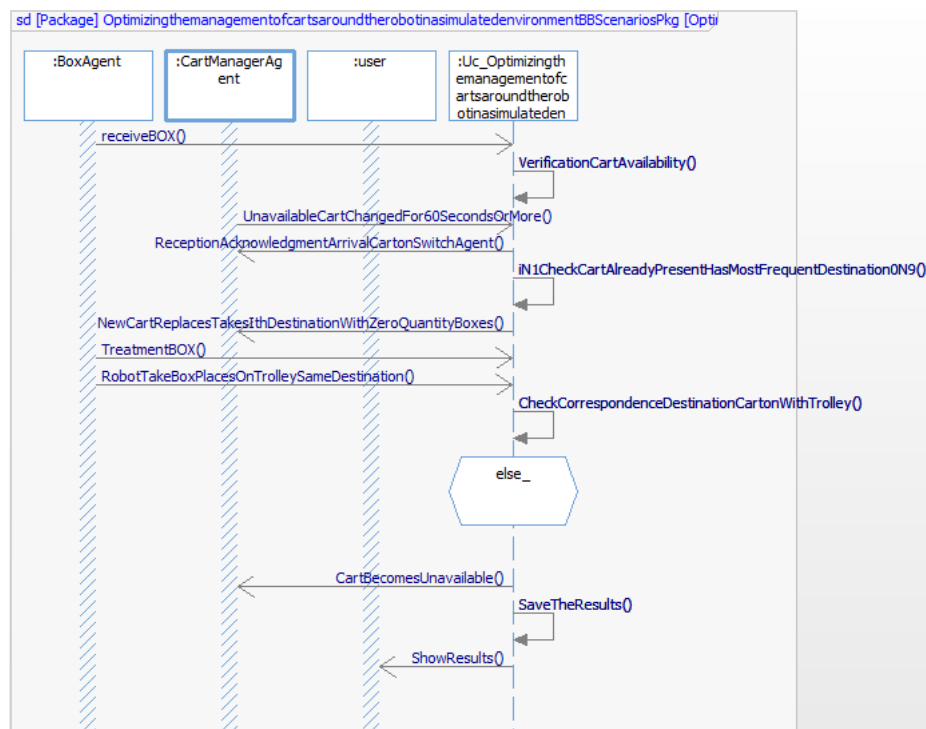
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Sequence Diagram

This Sequence Diagram represents a successful scenario within the "Optimizing the management of carts around the robot in a simulated environment" use case. It depicts interactions between BoxAgent, CartManagerAgent, user, and the Uc_Optimizingthemanagementofcartsaroundtherobotinasimulatedenvironment system. The process begins with receiveBOX and VerificationCartAvailability.





Conclusion

This Rhapsody modeling exercise has provided a comprehensive and structured approach to understanding and designing the "Flexibac simulation" system. Through the creation and analysis of Use Case, Activity, and Sequence Diagrams, we have successfully:

- **Clearly defined the system's scope and boundaries** by identifying the primary use cases: "Manage the switching of bins between human or robot processing" and "Optimizing the management of carts around the robot in a simulated environment," along with their interacting actors.
- **Detailed the operational flows and decision logic** for both core functionalities, allowing for a clear visualization of how bins are routed and how carts are managed in various scenarios. The Activity Diagrams effectively illustrated the step-by-step processes and conditional paths.
- **Illustrated the dynamic interactions between system components** (agents, users, and system functions) over time. The Sequence Diagrams provided invaluable insights into the message exchanges and the order of operations for successful and alternative scenarios, such as robot processing versus manual processing, and the different outcomes based on box quantities.

The detailed diagrams not only serve as a robust blueprint for implementation but also facilitate communication among stakeholders, aiding in identifying potential issues early in the development cycle. This model, built within Rhapsody, lays a solid foundation for further development, testing, and ultimately, the successful deployment of the Flexibac simulation system, ensuring efficient and optimized bin and cart management in a simulated robotic environment.