ROUTED – DYNAMIC BUS SCHEDULING

Under the guidance of

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Submitted By:

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INTRODUCTION

- Importance of bus transportation in public transport
- Shortcomings of bus transportation
- Reasons for the shortcomings
- Solution: Dynamic scheduling

PROBLEM STATEMENT

- Public transit - a mix of private business and government
- Current BEST bus services are static
- Inefficient as well as underutilization of resources

EXISTING SOLUTION

- Human schedulers.
- Demographics of regions(residential,commercial areas) are considered.
- Manual travelling by Schedulers.
- Large workforce required.
- Lengthy period of research.
- Benefits few compared to the effort required.

OUR PROPOSAL

- Predict number of buses required on each route based on ticket records.
- Dynamic Schedule generation every week or so.
- Reusable buses(ie. Buses not fixed to a single route).
- Schedules and allocation based records for each route in both direction

LITERATURE SURVEY

- Our prime focus has been to find out research papers that can be realized or cited in our solution.
- Literature survey has been mainly focused in the fields of:
  - Cluster Algorithms
  - Bus Scheduling algorithms
  - Optimal resource allocation
- Primary hurdle has been finding relevant research in alignment with our project objectives .
- Another aspect has been identifying the trade-offs between different attributes/features that can affect the creation of Dynamic Bus Schedules.
- Papers on data cleaning have been considered during the review.

CLUSTERING ALGORITHMS

- Prime focus has been on identifying suitable clustering algorithms that can be adapted for the given problem.
- Some of the important research papers surveyed in this regard are:
  - Modified K-means Clustering by Rudra Pratap Deb Nath, Hyunjo Lee, Nihad Karim Chowdhury, Jae-Woo Chang
  - Clustering And Aggregating Clues Of Trajectories For Mining Trajectory Patterns And Routes by Chih-Chieh Hung, Wen-Chih Peng, Wang-Chien Lee
- Most of the papers surveyed provide a base for identifying the useful clustering techniques to be used for the given problem.

BUS SCHEDULING ALGORITHMS

- Approaches considered within the survey vary widely from statistical methods to data mining models and linear programming.
- Some of the important research papers surveyed in this regard are:
  - Bus Scheduling Model: A Literature Review by Mohammad HesamHafezi, Amiruddin Ismail and Ramez A. Al-Mansob
  - Optimal Multi-vehicle Type Transit Timetabling And Vehicle Scheduling by Avishai (Avi) Ceder
- Our main focus in this survey was to identify methods suitable for our solution.

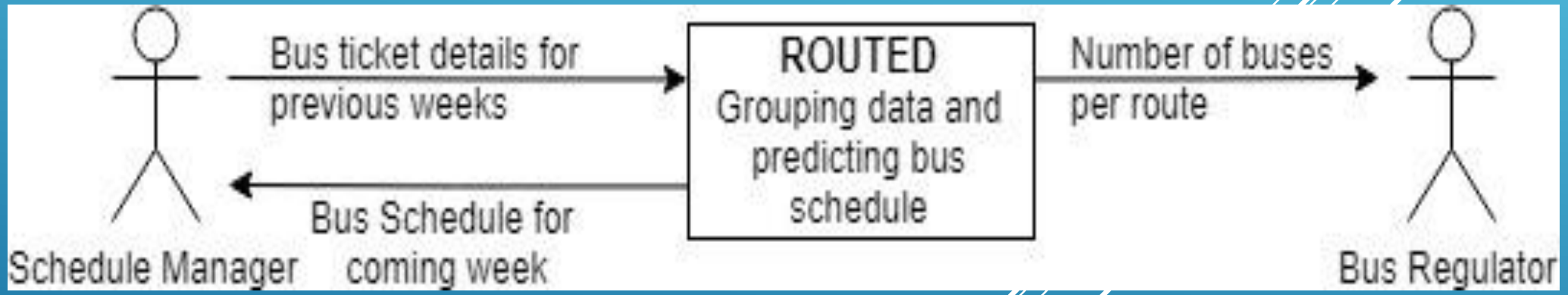
BUS ALLOCATION ALGORITHMS

- Primary aim has been to
  - Identify papers proposing mathematical models for Bus Allocation
  - Papers defining various angles to approach the problem of Bus Allocation
  - Papers focusing on the identification of different useful attributes/features in the data
- Some of the important research papers surveyed in this regard are:
  - Optimal Resource Allocation For Projects by Carbno Collin
  - The Allocation Of Buses In Heavily Utilized Networks With Overlapping Routes by Anthony F. Han and Nigel Wilson
- Our main focus in this survey was to understand different existing approaches.

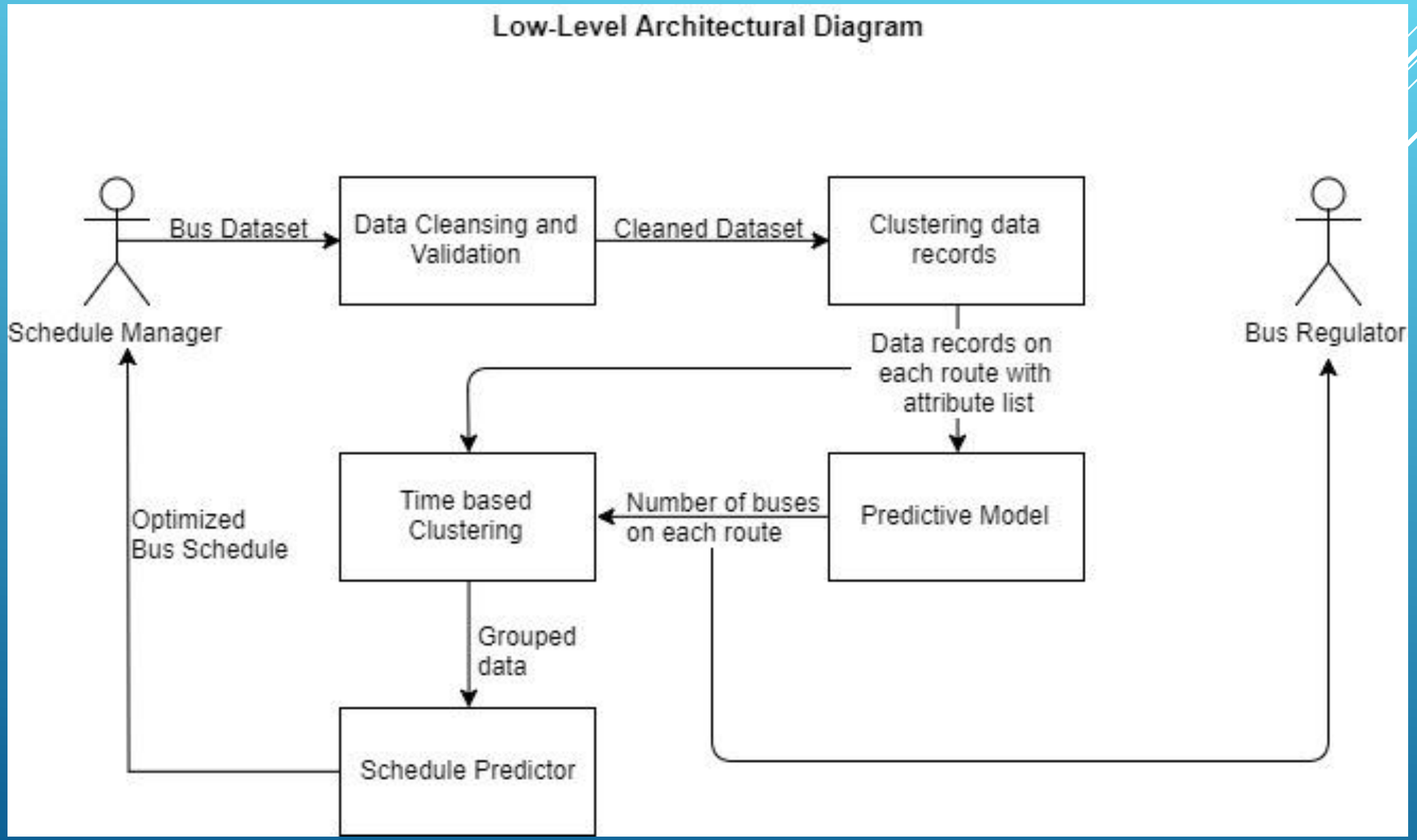
LITERATURE SURVEY OVERVIEW

- The literature available on the topics of our interest lack
  - Research papers that consider only ticket records for Bus scheduling and Allocation
  - Research papers that provide a complete model of Bus Scheduling and Allocation simultaneously
  - Clear distinction between the importance of different attributes that are used for clustering, scheduling and allocation
- As part of the review, we considered 18 research papers from relevant fields
- The research papers have been viewed as a guiding direction and not as a solution to be implemented and compared with the theoretical results

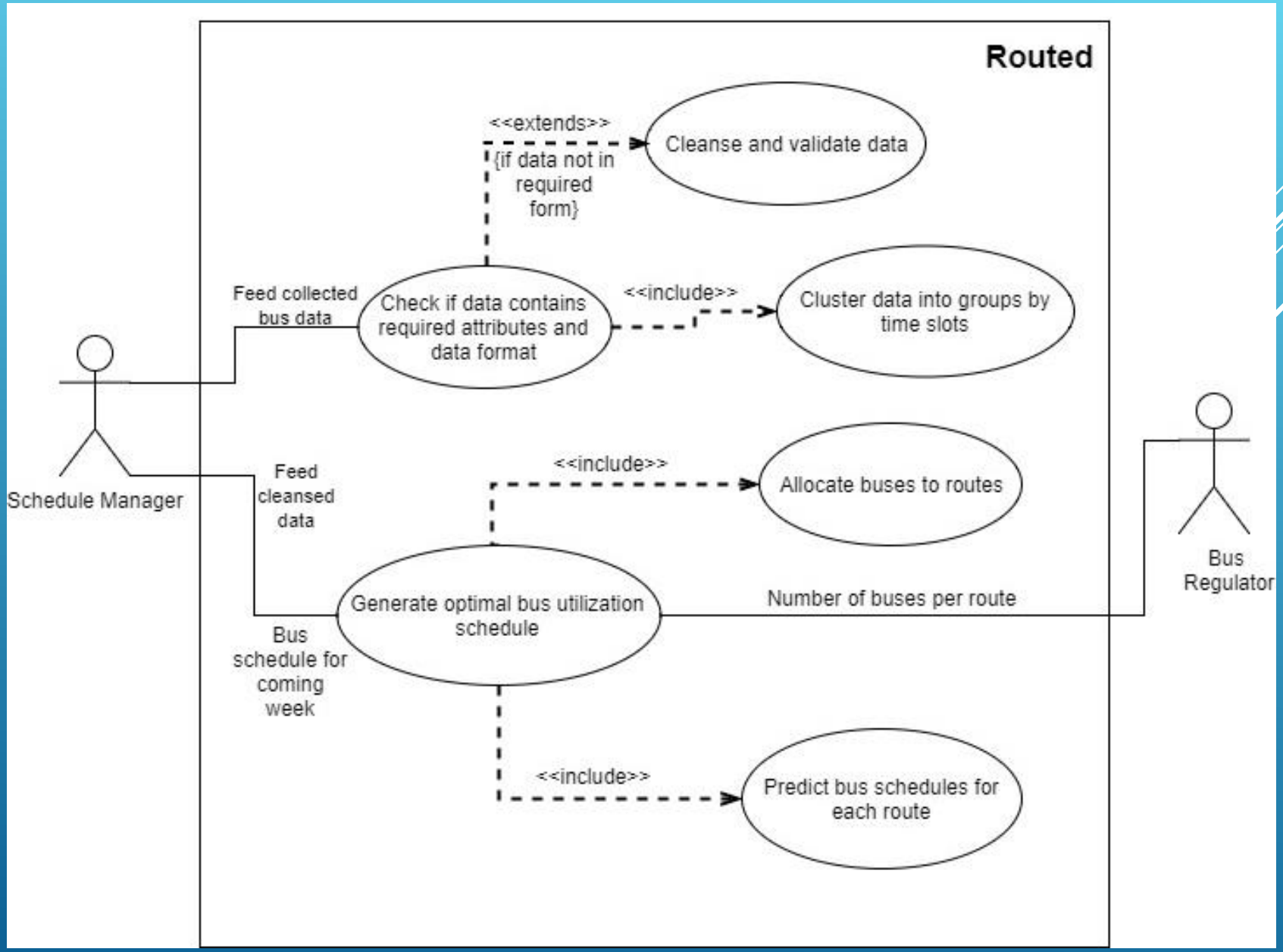
HIGH LEVEL ARCHITECTURAL DIAGRAM



LOW LEVEL ARCHITECTURAL DIAGRAM

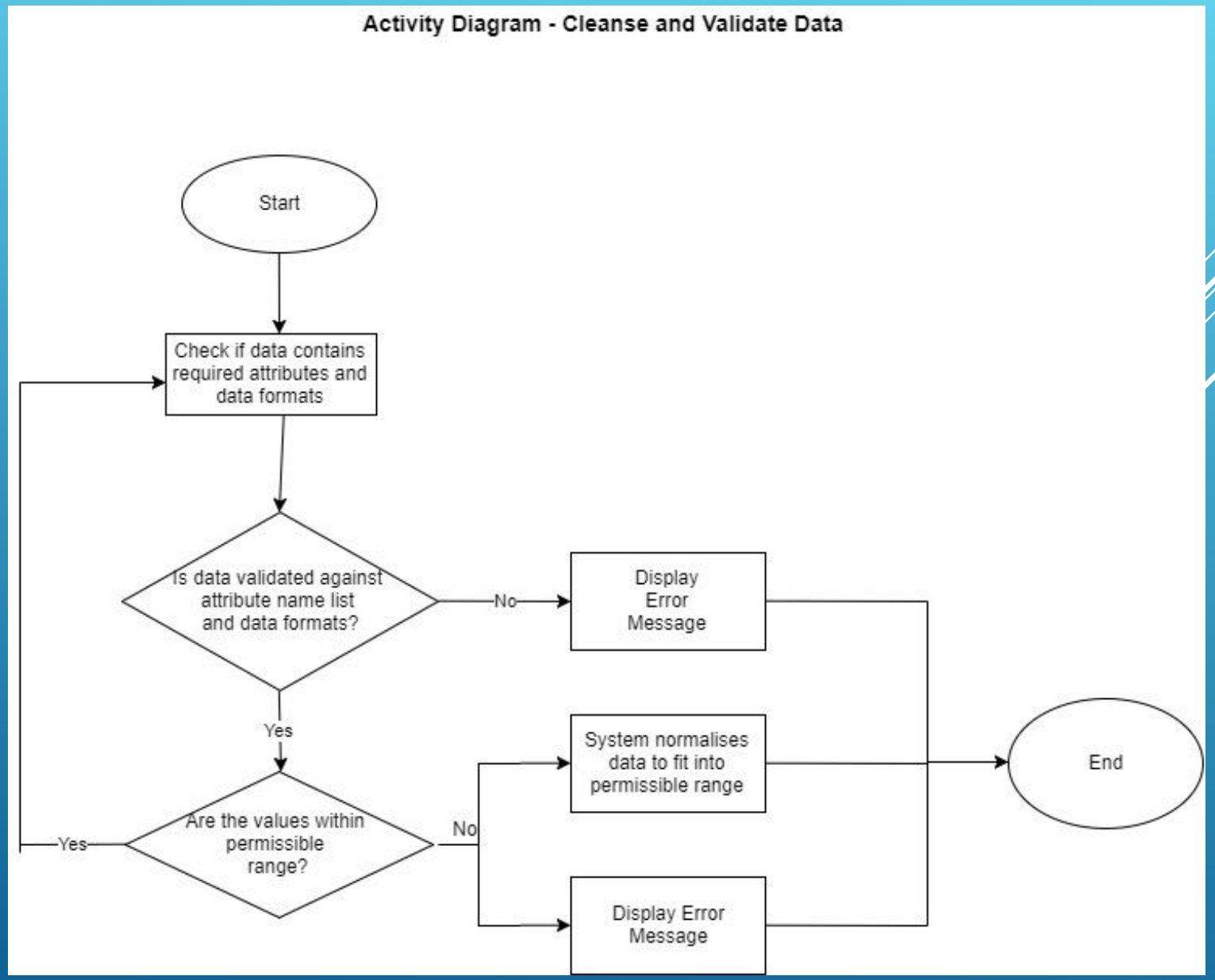


USE CASE DIAGRAM



USE CASES

CLEANSE AND VALIDATE DATA



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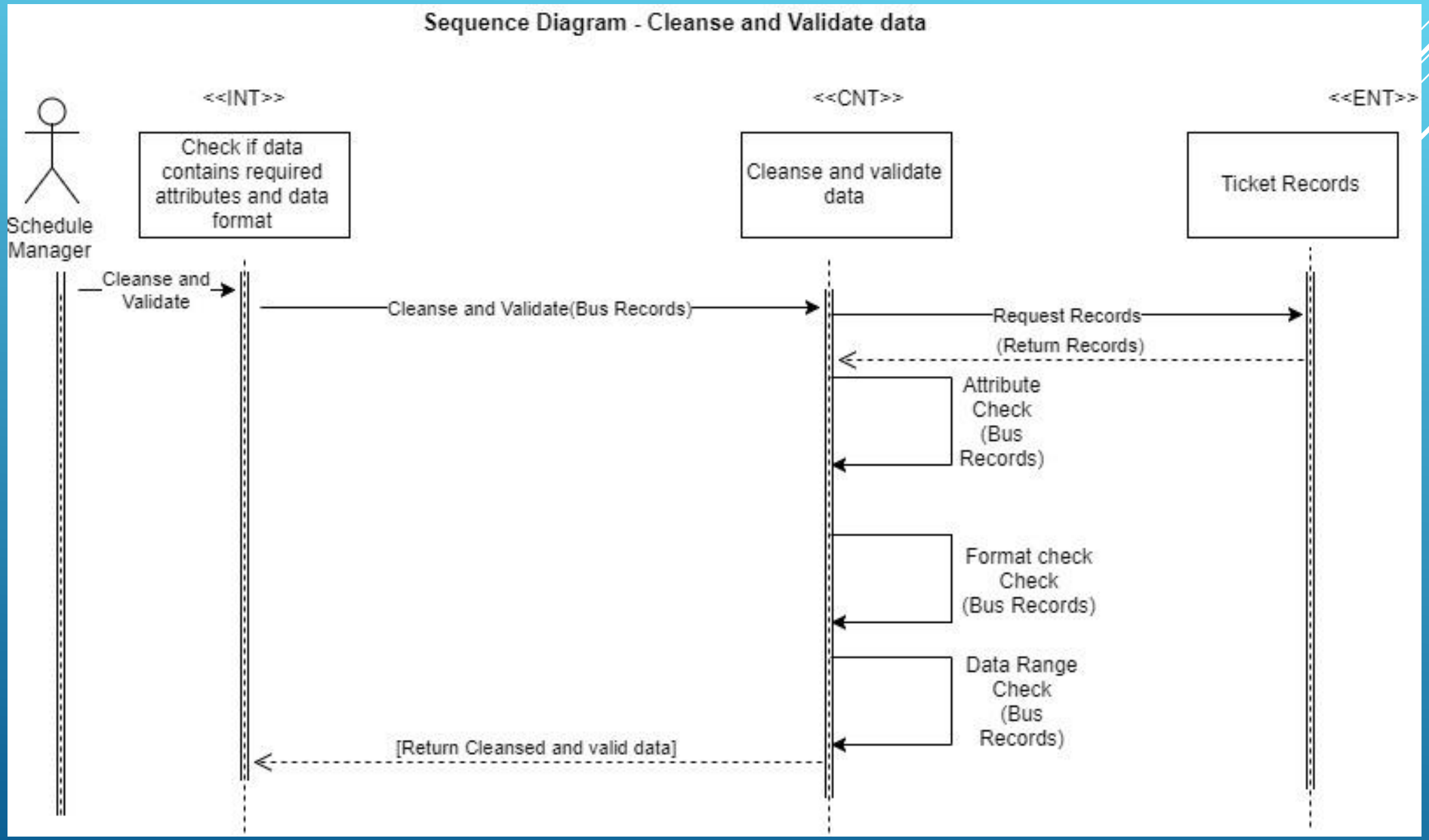
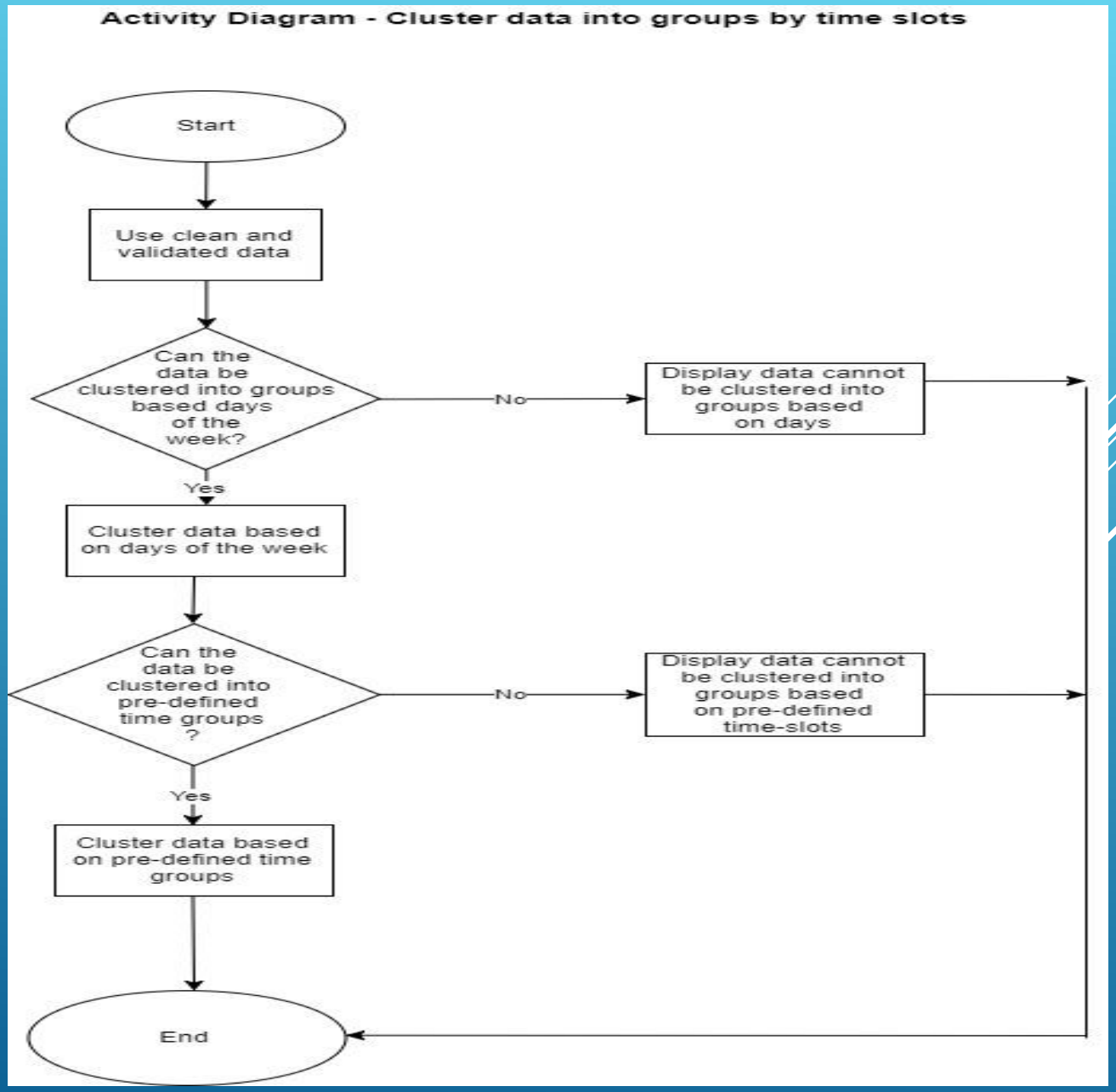


CLUSTER DATA INTO GROUPS BY TIME SLOTS



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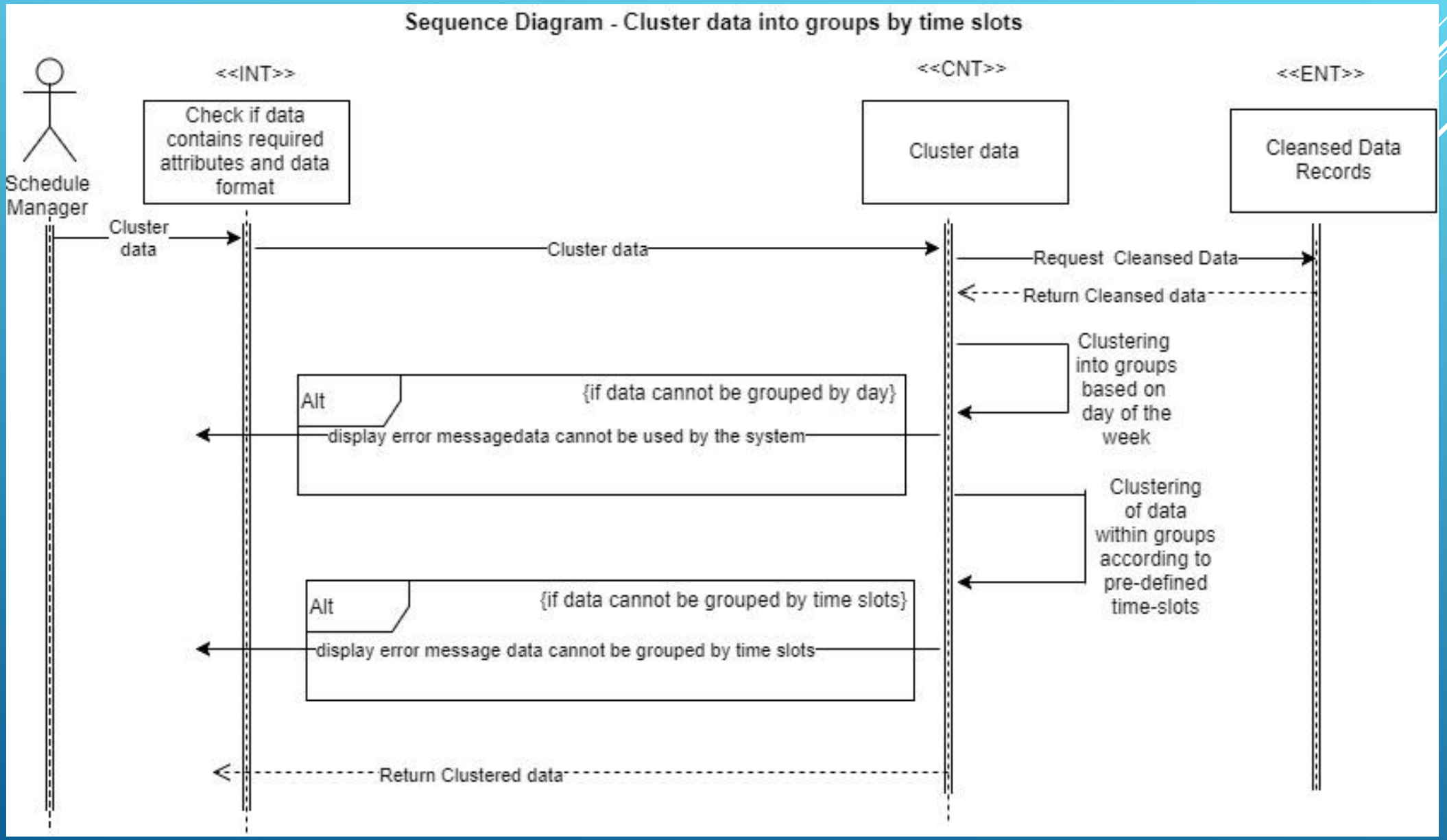
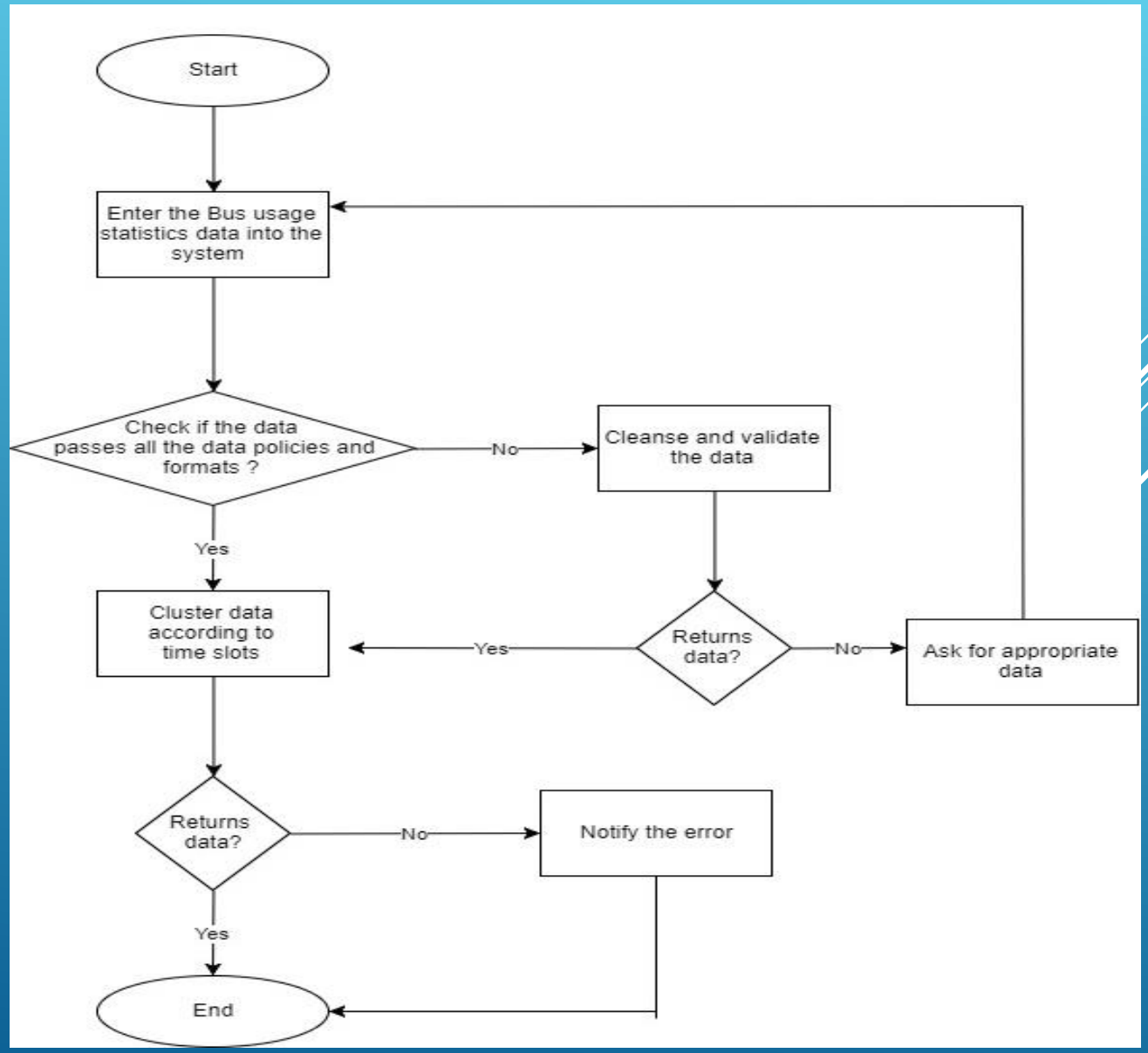


CHECK IF DATA CONTAINS REQUIRED ATTRIBUTES AND DATA FORMATS



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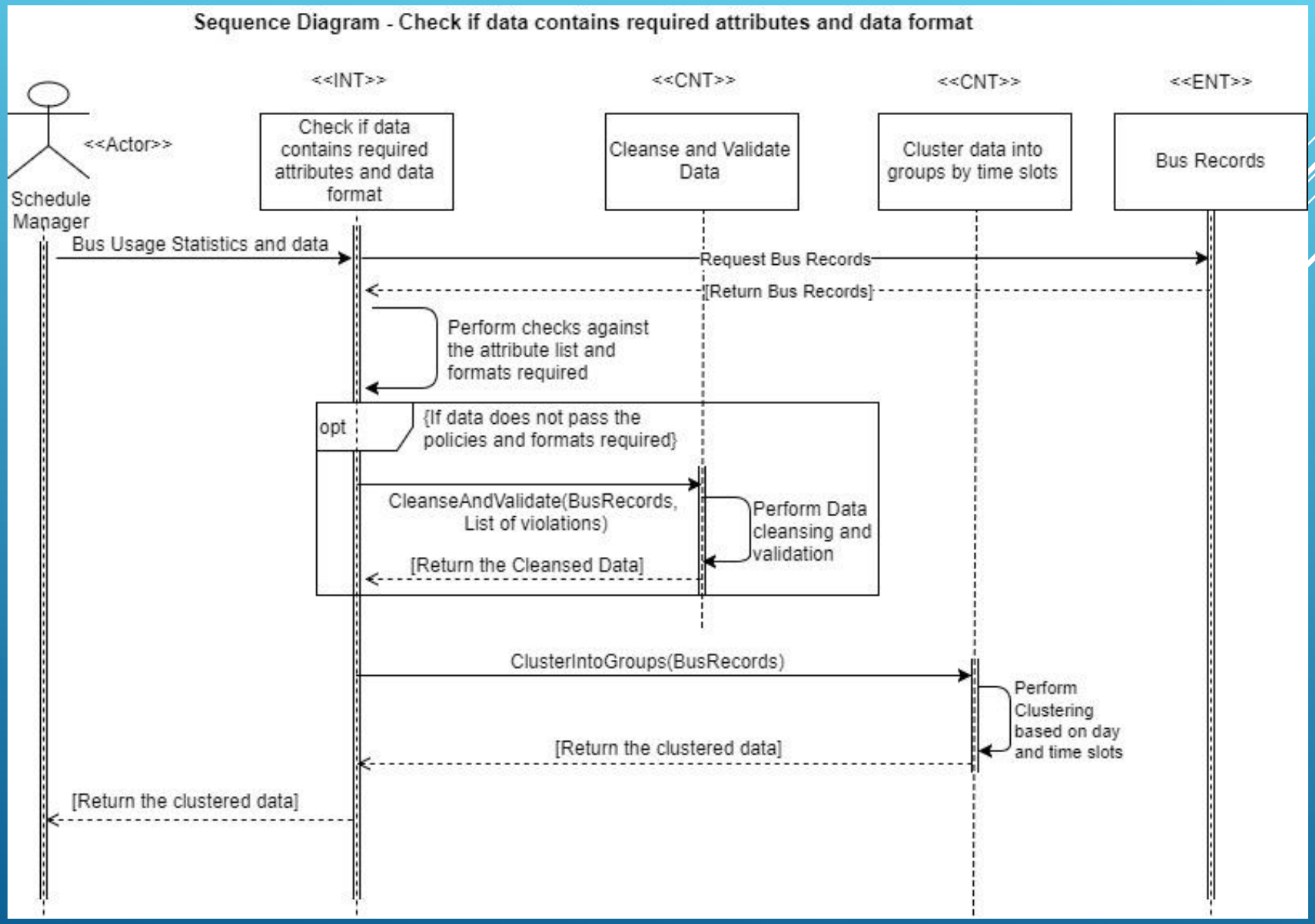
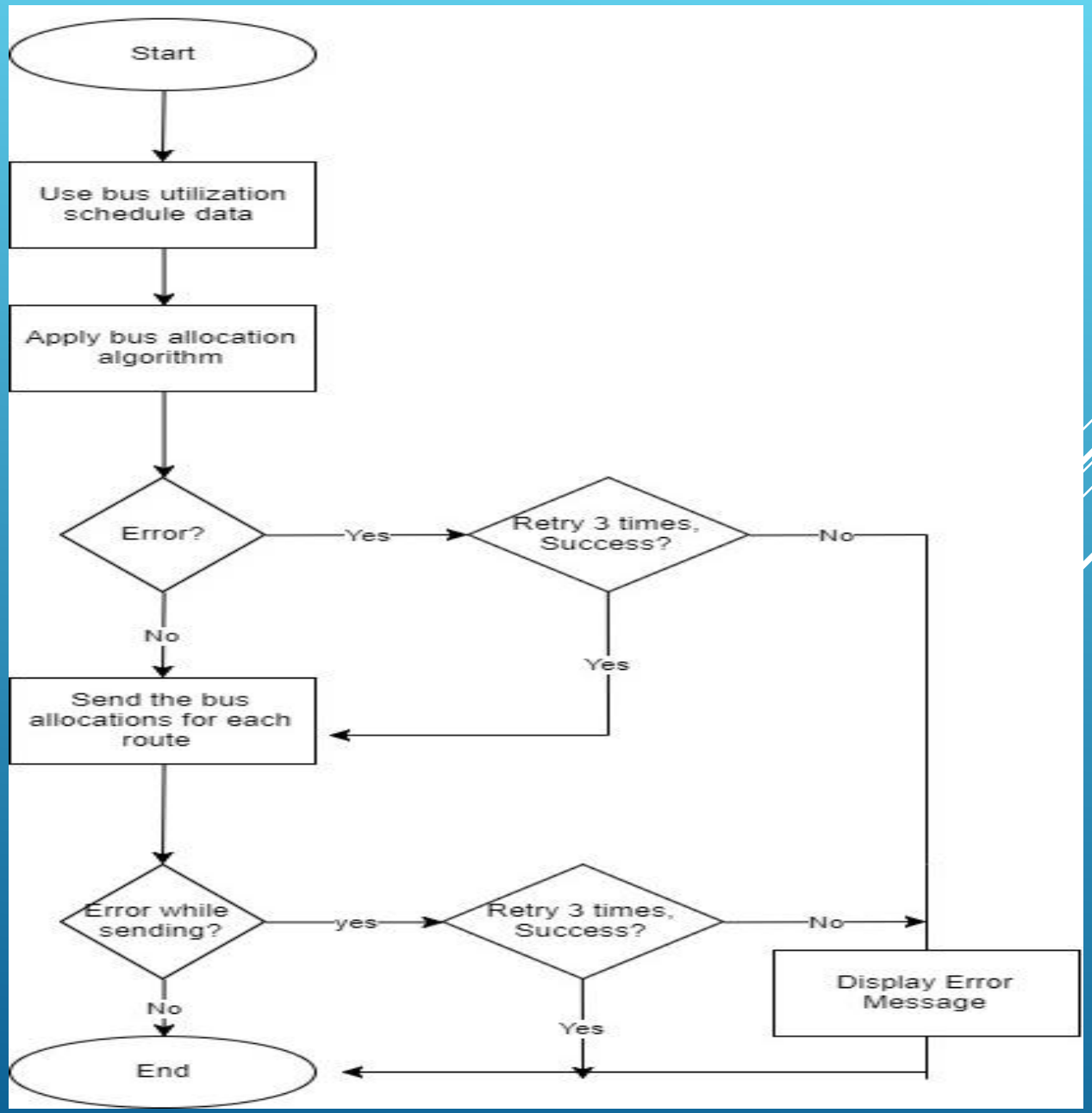


ALLOCATE BUSES TO ROUTES



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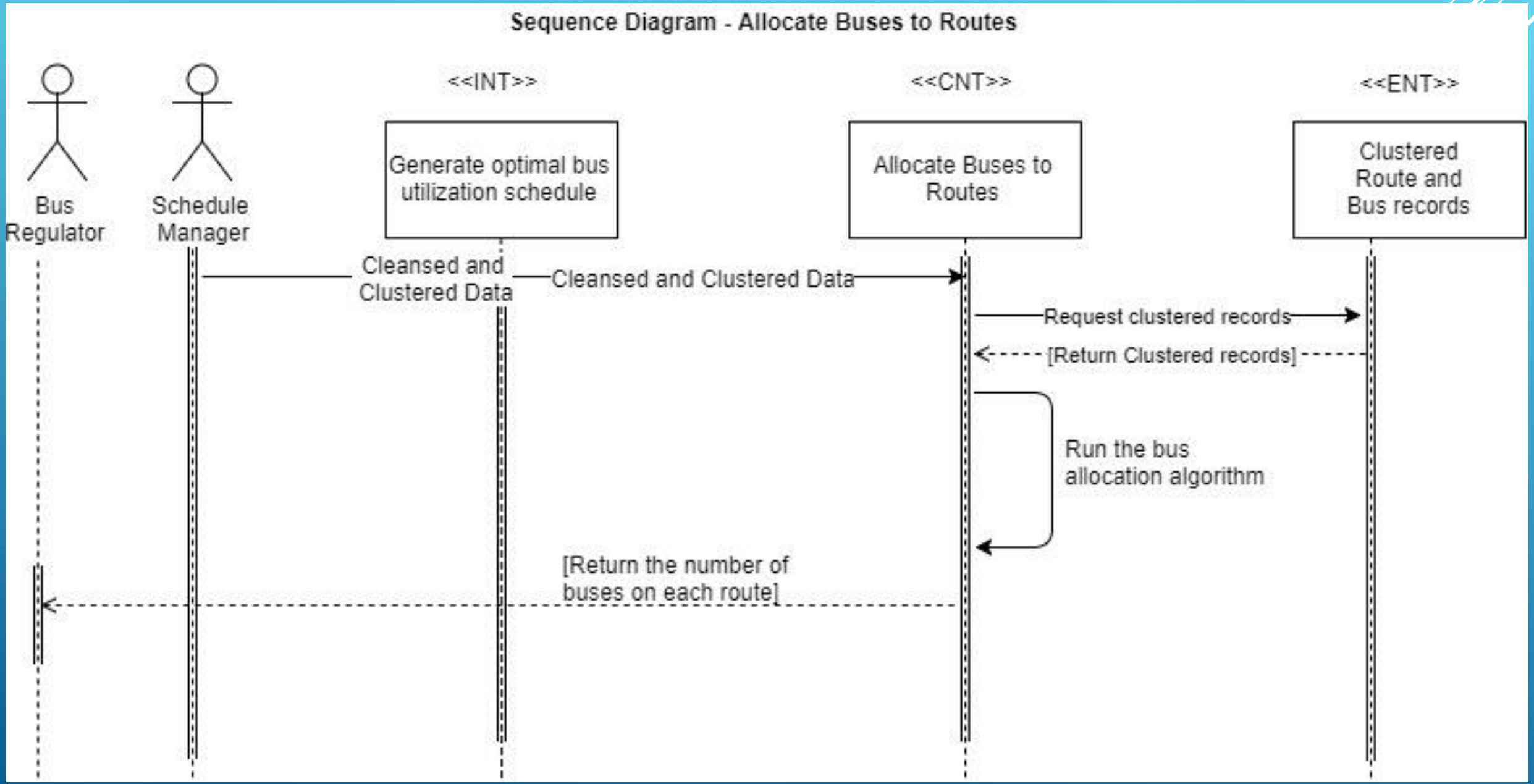
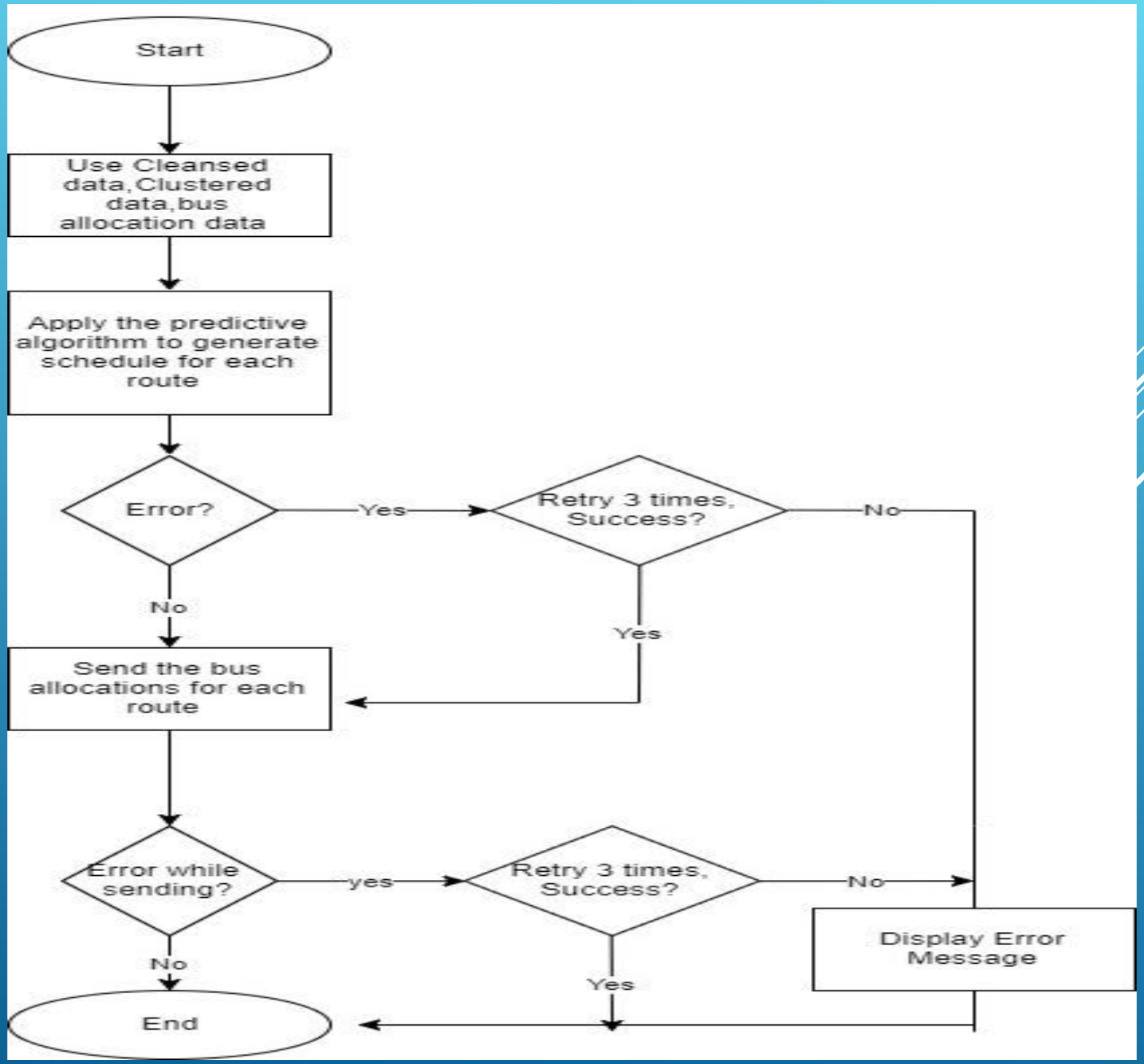


PREDICT BUS SCHEDULES FOR EACH ROUTE



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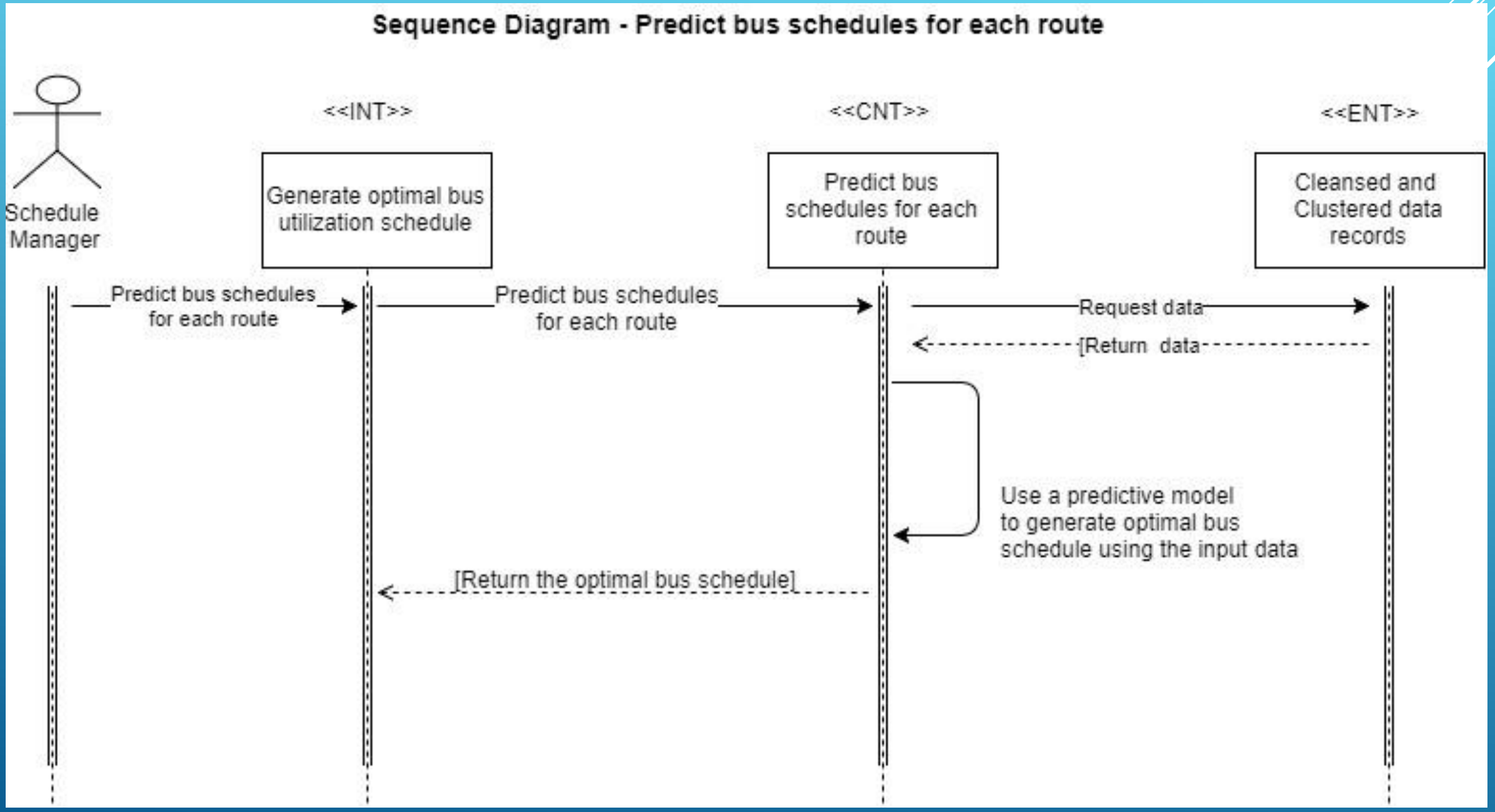
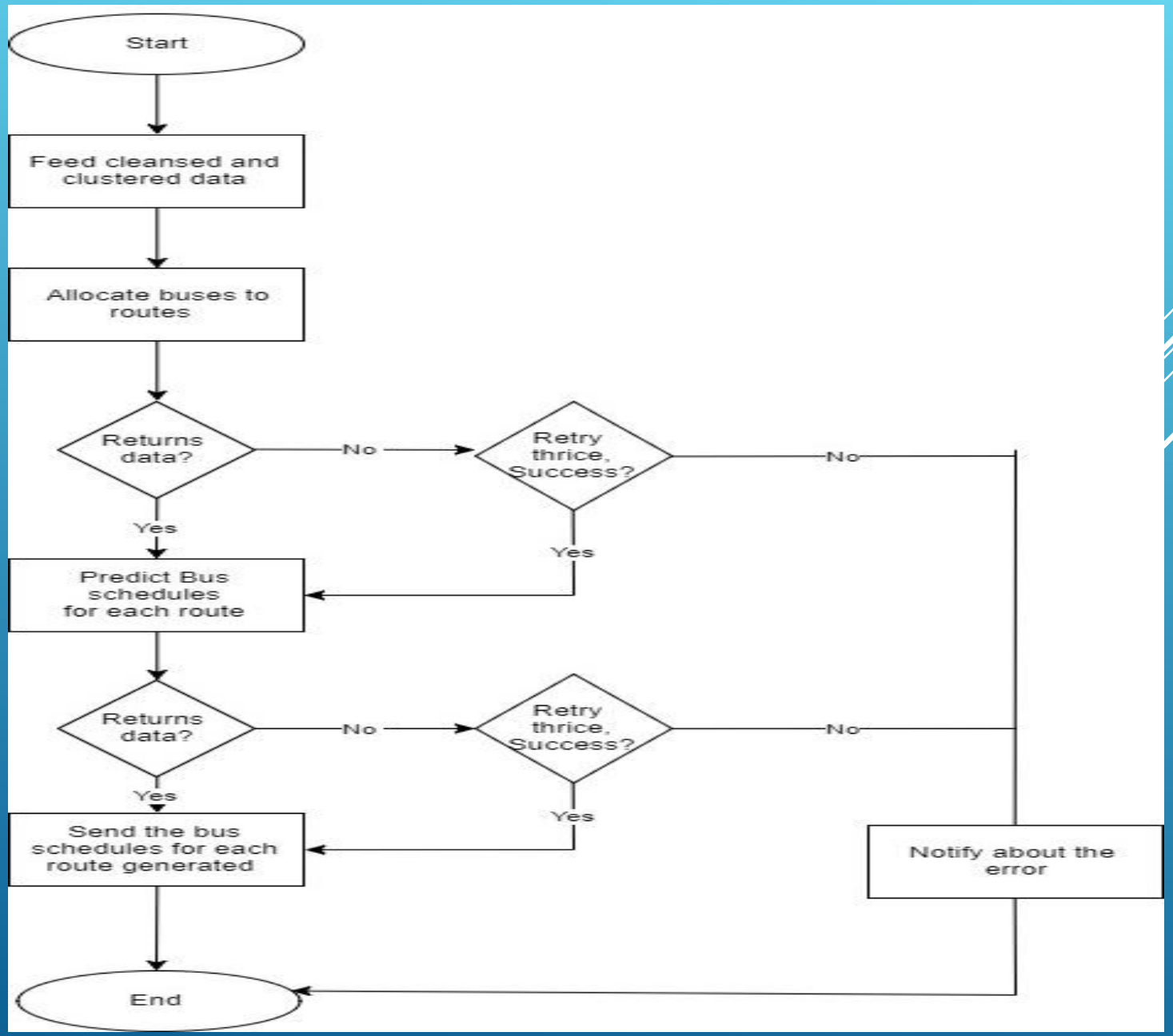


GENERATE OPTIMAL BUS UTILIZATION SCHEDULE



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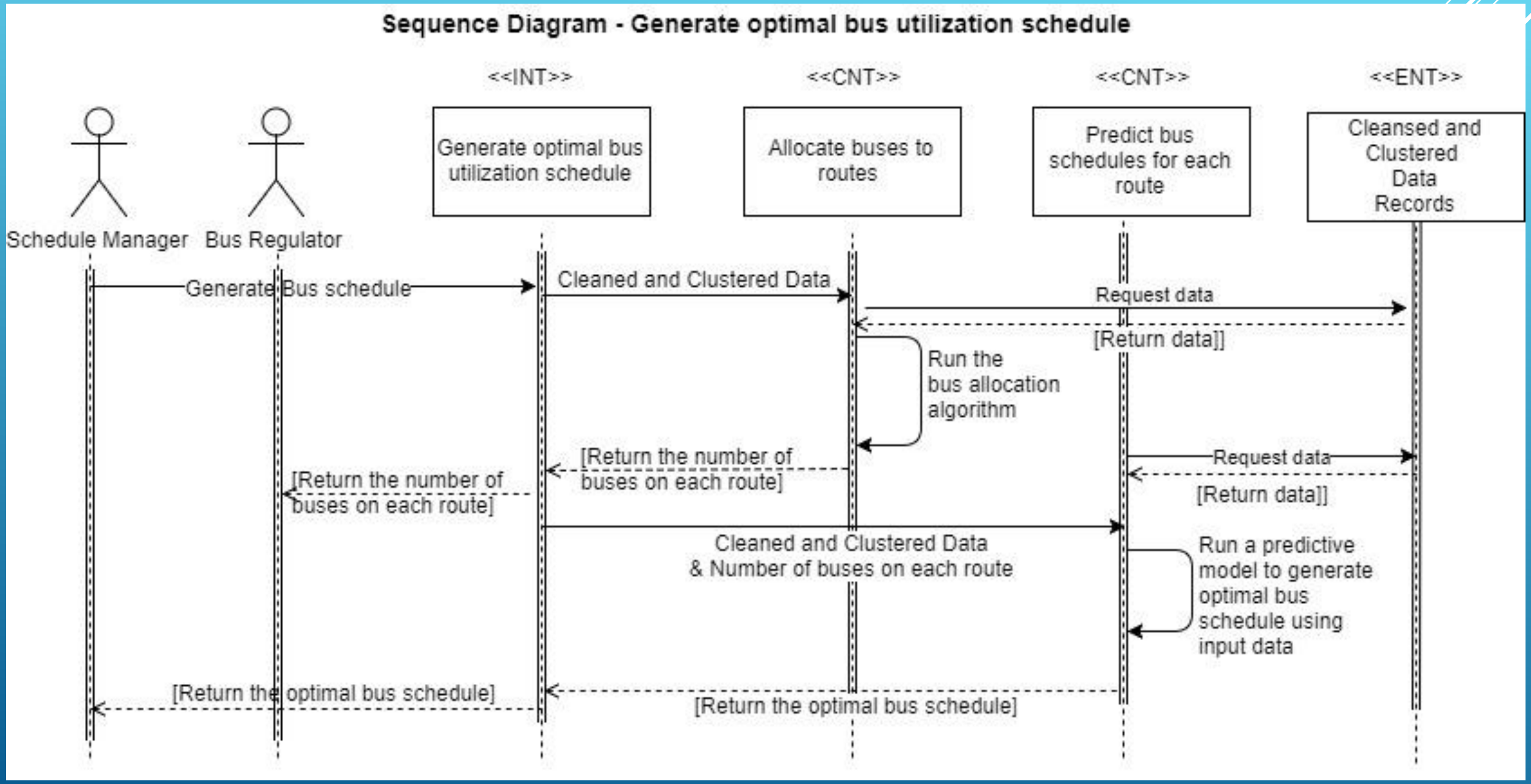

Timeline and the course of Action

	Phase I **System Design and First prototype development** **5/12/17-23/1/18 (7 weeks)**	**Phase II** **Different prototypes with different Configurations** **31/1/18-14/2/18 (2 weeks)**	**Phase III** **Production system deployment, documentation and Research paper publishing** **15/2/18-28/2/18 (2 weeks)**
Activities	1. System formulation 2. Dataset Collection 3. Pre-Processing 4. Modules Development 5. Complete system integration 6. Product Prototyping	1. Different clustering configurations development 2. Different bus allocation/scheduling configurations development 3. Comparison of results	1. Final System Configuration development and deployment 2. Documentation of the overall results obtained from various prototypes 3. Research Paper writing
Deliverables	1. System Analysis documents 2. Module deployment 3. First Prototype	1. Prototype analysis report 2. Prototype deployments 3. Comparison and finalizing production configuration based on testing results	1. Production system 2. System Documentation (Blue Book) 3. Research paper published about the system and it's performance

THANK YOU