# RokConnect: Hackathon

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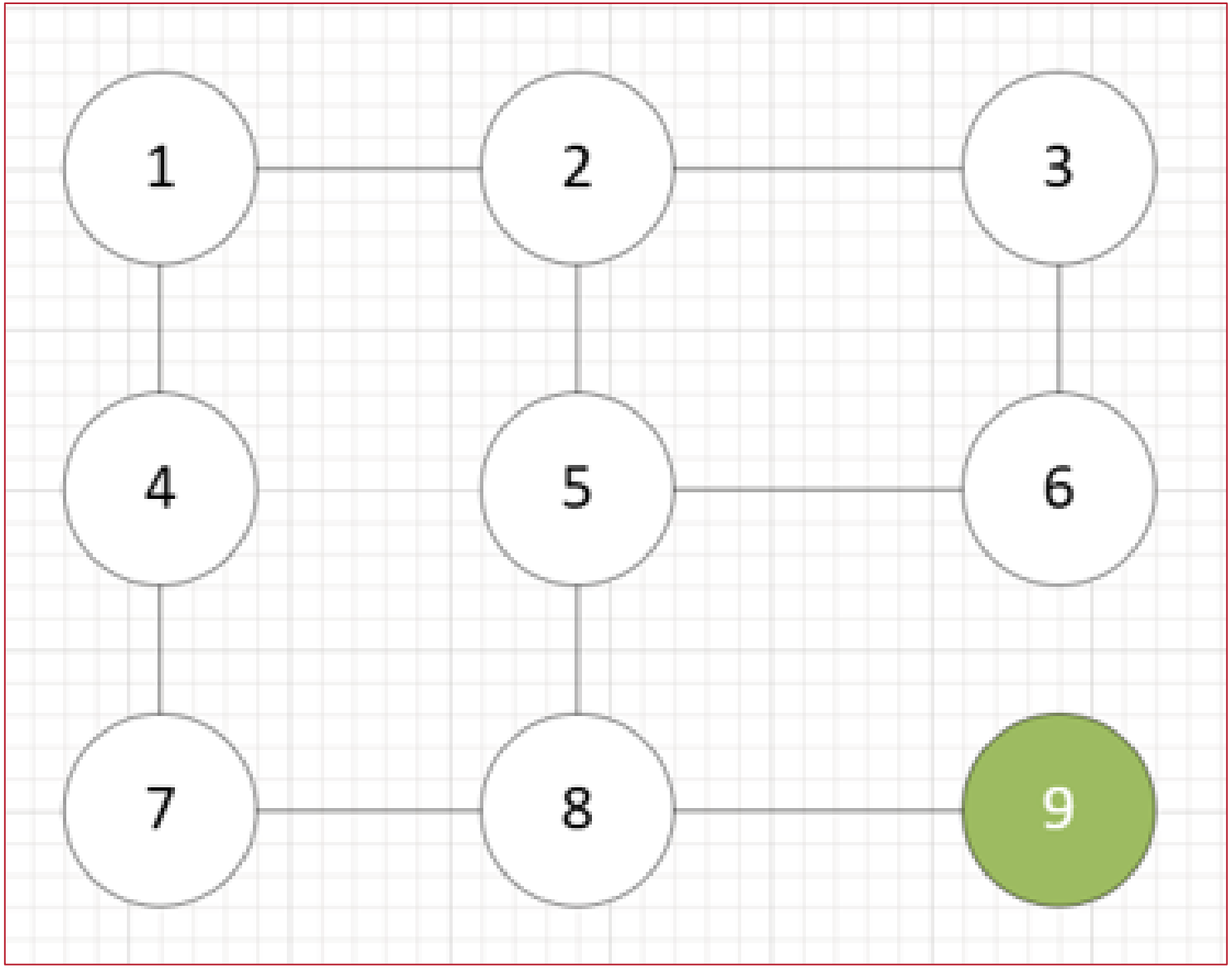
# Problem Statement

- The task is to manage a fleet of AGVs to execute all the payloads in the schedule in the fastest and the most efficient way possible.
- Participants were provided with a payload dataset, a route map for AGVs to travel and certain criteria in terms of load carrying capacity, collision avoidance and AGV battery life to keep in mind while designing the schedules.
- Final goal of the hackathon is to design a dynamic and robust AGV schedule that delivers all the payloads in minimum timeframe, adhering to all the criteria provided.

# Route Map



# Operational Parameters

- Number of stations = 9
- Charging station = Station 9
- Number of AGVs = 3 (agv_1, agv_2, agv_3)
- Maximum weight an AGV can carry at a time = 10
- Time taken by an AGV to cross 1 unit distance with 0 load = 5 minutes
- Time taken by an AGV to cross 1 unit distance with 10 load = 10 minutes
- Charging time for an AGV = 15 minutes to fully charge
- Discharge time for an AGV = 45 minutes to fully discharge

# Assumptions

- Initially the three AGVs will be positioned at nodes 1, 3 and 7 respectively
- All AGVs are charged at a 100% to begin with
- Loading and Offloading time is 0
- AGVs can be parked at any station (including charging stations), this will not block any of the connected paths
- One AGV can carry multiple payloads as along as the maximum carrying capacity is not exceeded

# Sample Dataset

| ID | Source Station | Destination Station | Payload Weight | Priority | Time of Scheduling |
|---|---|---|---|---|---|
| payload_1 | 7 | 2 | 10 | 3 | 8:01 |
| payload_2 | 5 | 3 | 6 | 2 | 8:02 |
| payload_3 | 5 | 6 | 4 | 3 | 8:02 |
| payload_4 | 4 | 1 | 10 | 2 | 8:03 |
| payload_5 | 6 | 8 | 6 | 1 | 8:04 |

# Deliverables

1. Algorithm design: A detailed description of the scheduling algorithm.
2. Execution logs in the format - **agv_{num}-{start_node}-{end_node}-{timestamp}-{weight}-payload_{num}** .
   For example: If agv_1 is executing payload_1, then the logs should have the following records :
   agv_1-7-4-8:01-10-payload_1
   agv_1-4-2-8:06-10-payload_1
   agv_1-2-1-8:11-10-payload_1

1. Following reports:
   a. Total execution time
   b. Average delivery time for each priority class
2. Number of charges each AGV took

Anything else that the participant/s want to include to illustrate the performance is greatly encouraged

# Evaluation Metrics

**Total Execution Time**: The entire operation should be completed in the minimum possible timeframe while maintaining efficiency.

**Algorithm Efficiency:** The designed algorithm should be efficient, scalable, and robust enough to handle dynamic changes in the schedule.

**Runtime Execution Logs**: Clear and detailed execution logs should be maintained to monitor and analyze the performance of the AGV fleet in real-time.

**Average Delivery Time by Priorities**: High-priority payloads (e.g., Priority 1) should have a shorter average delivery time compared to lower priority payloads (e.g., Priority 3), ensuring that urgent tasks are executed first.

**Collision Avoidance**: The solution should incorporate effective collision avoidance mechanisms to ensure the safe operation of the AGVs within the fleet.

**Load Carrying Capacity**: The AGV fleet should be optimized to handle payloads efficiently within their load-carrying capacity, ensuring that each AGV operates at its optimal level.

**Battery Life Management:** The solution should include strategies to manage AGV battery life effectively, minimizing downtime and ensuring continuous operation.

# Thank You

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