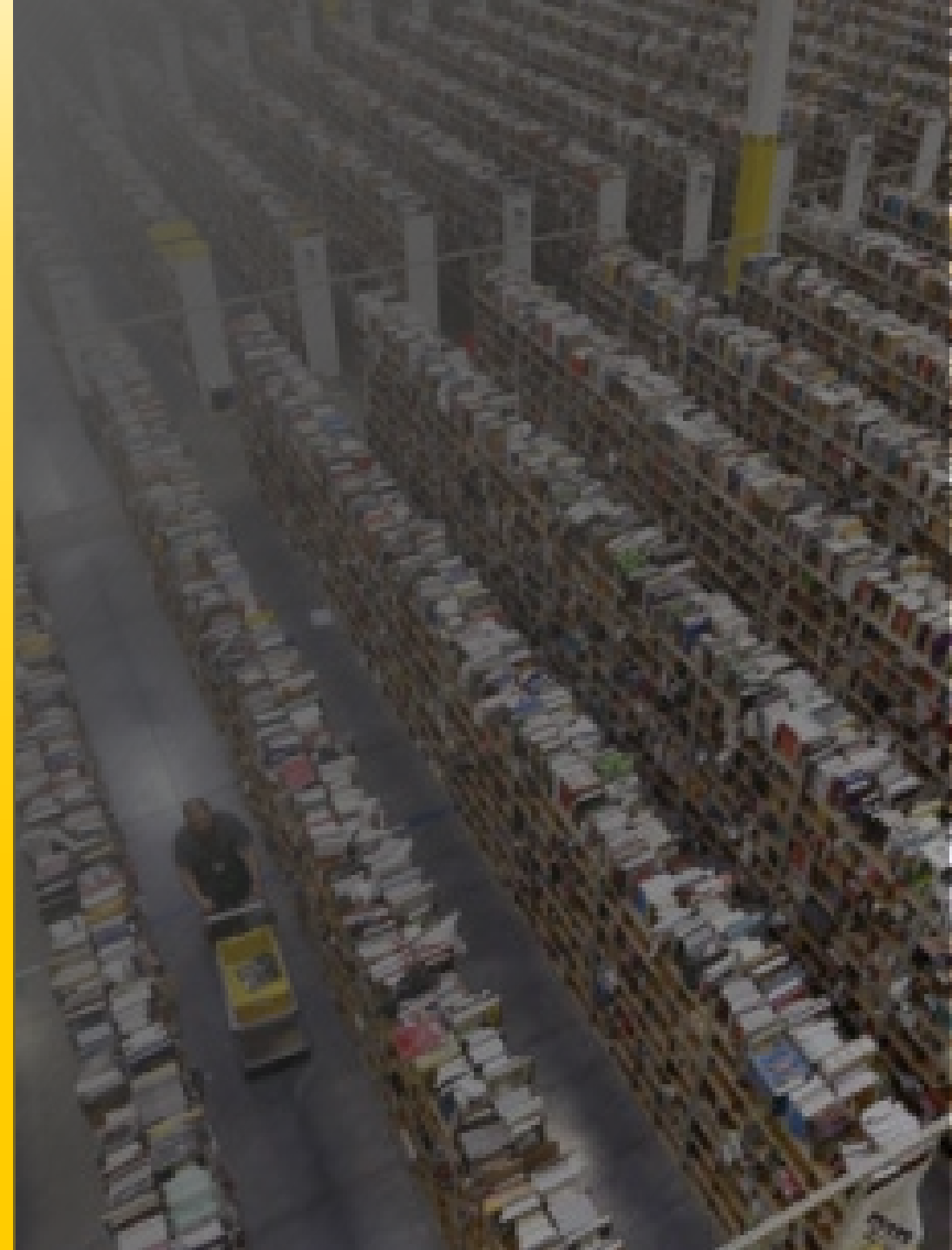


SIMULATING A CLUSTER PICK WAREHOUSE

Vijay Sharma

DHL Supply Chain

AnyLogic Conference, 2021

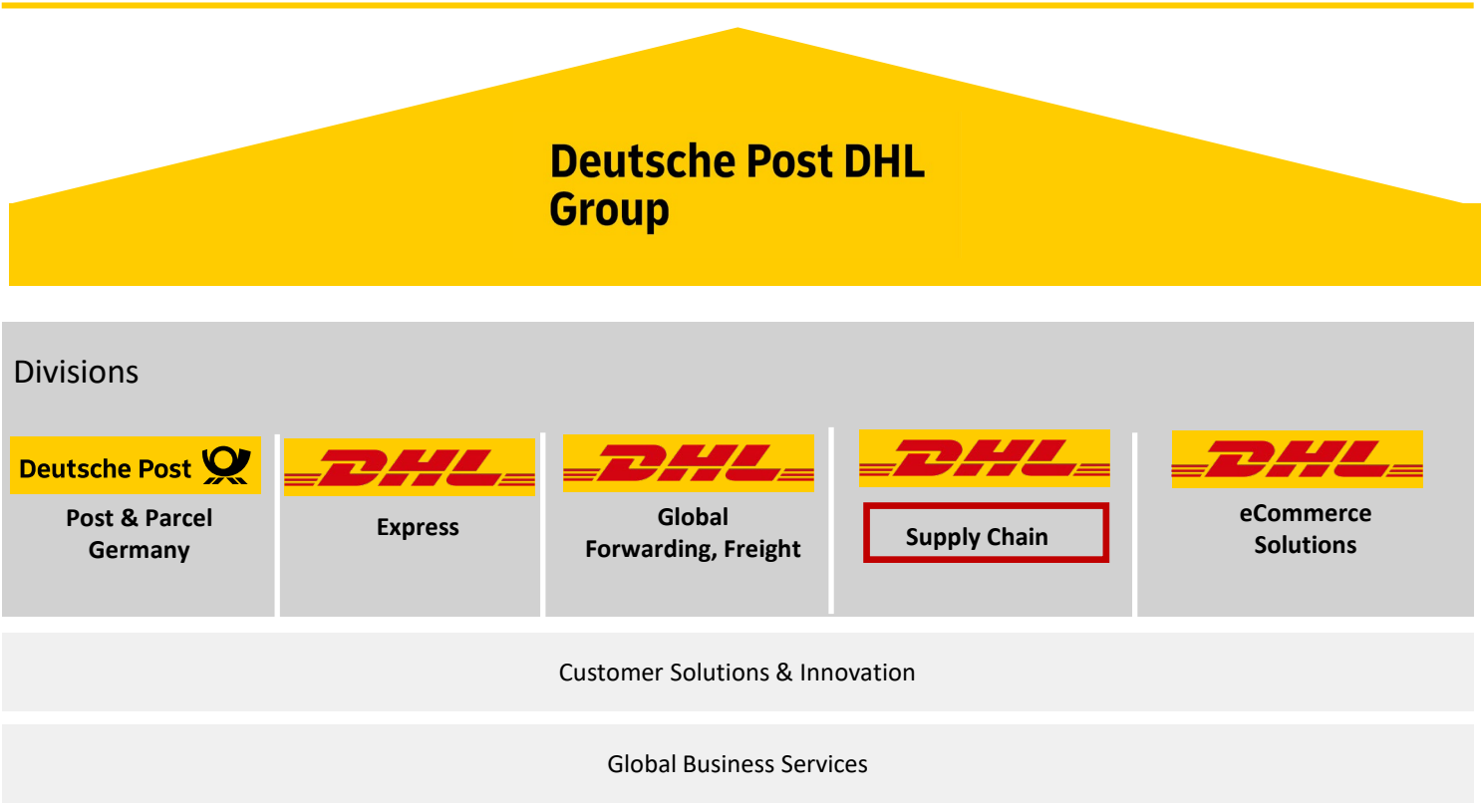


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About Us

➤ DHL Supply Chain is a division of Deutsche Post DHL Group with a global network and an extensive logistics portfolio, deals with warehousing, transport and VAS



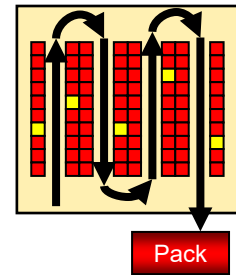
The image shows two men in a meeting room. They are standing in front of a large whiteboard covered with technical drawings and diagrams. The man on the left is wearing a dark blue shirt and a yellow DHL lanyard. The man on the right is wearing a light blue shirt and a yellow DHL lanyard. They are both looking at the whiteboard with interest. The room has large windows in the background showing green trees. On the right side of the whiteboard, there are technical drawings of mechanical parts, including what looks like a bolt or a connector. The overall atmosphere is professional and collaborative.

Background: Picking Method

1

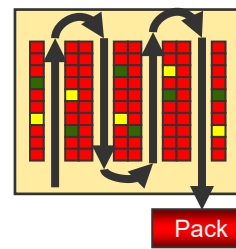
Background: Picking Method

➔ Size of the warehouse and order pattern determine the picking method in a warehouse



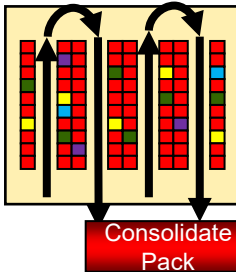
Individual Order Pick

- Small size warehouse
- Simple order with few items



Cluster Pick

- Medium size warehouse
- Complex order



Batch Pick

- Big size warehouse
- Multiple zone in warehouse

Background: Cluster Pick



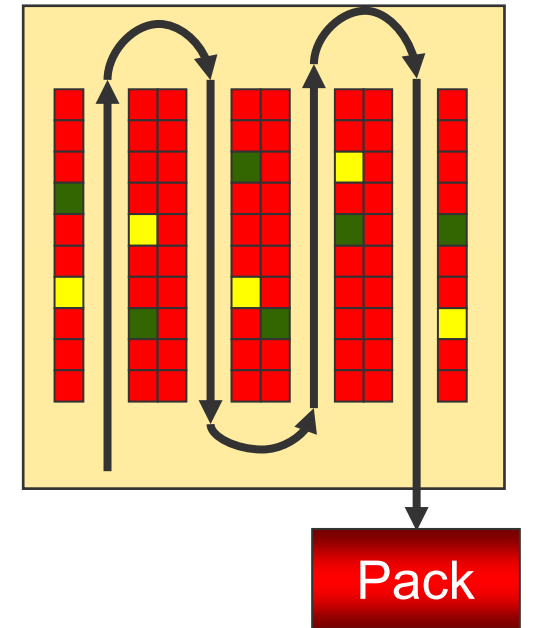
Picker picks multiple orders at once from different locations in warehouse. Congestion and efficiency are potential challenges of cluster pick method.

What is Cluster Pick ?

- A picker picks multiple orders at once from the aisles
- SKUs from the same orders can be at different locations in the warehouse
- Picker visits different locations to pick SKUs for given number of orders

Bottlenecks & Challenges

- Congestion in the aisle
- Longer travel distance
- Longer order cycle item



A photograph of two men in a meeting room. The man on the left is wearing a dark blue shirt and a yellow DHL lanyard. The man on the right is wearing a light blue shirt and a yellow DHL lanyard. They are both looking towards a large screen on the right side of the frame. The screen displays technical drawings of mechanical parts. The room has large windows in the background showing green trees. There are several sheets of paper pinned to a wall on the left side of the frame. A semi-transparent yellow banner is overlaid at the bottom of the image, containing the text 'IDEA: The Optimization Tool' and a large number '2' inside a yellow circle.

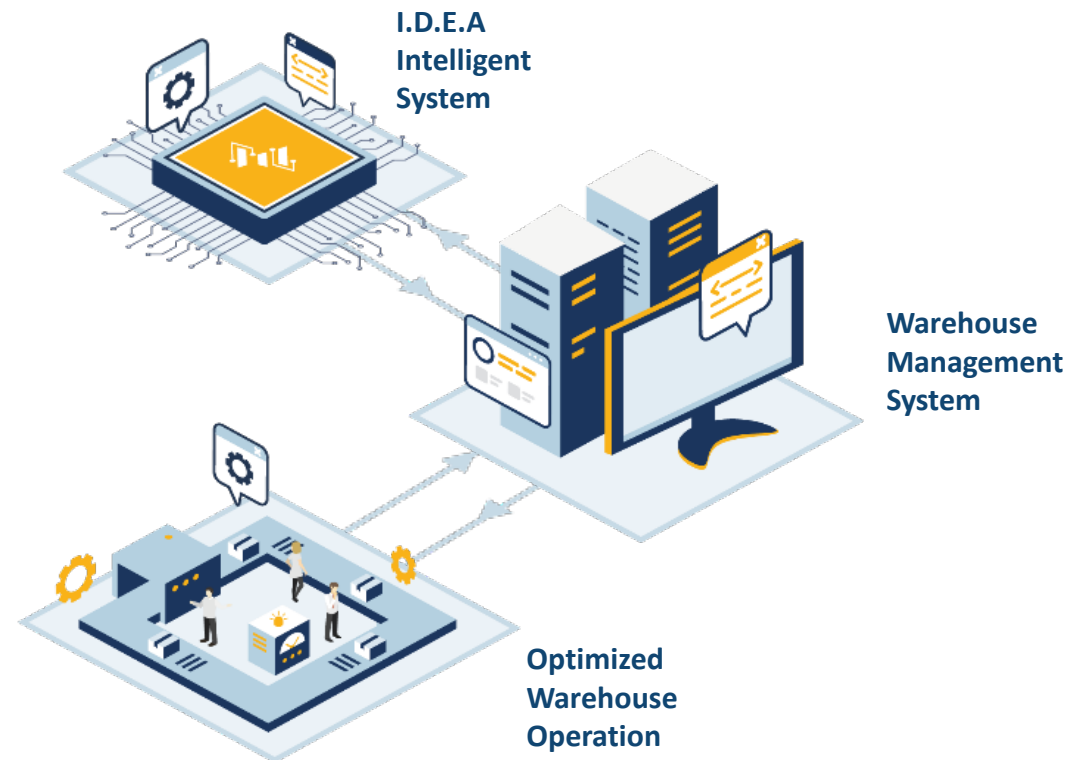
IDEA: The Optimization Tool

2

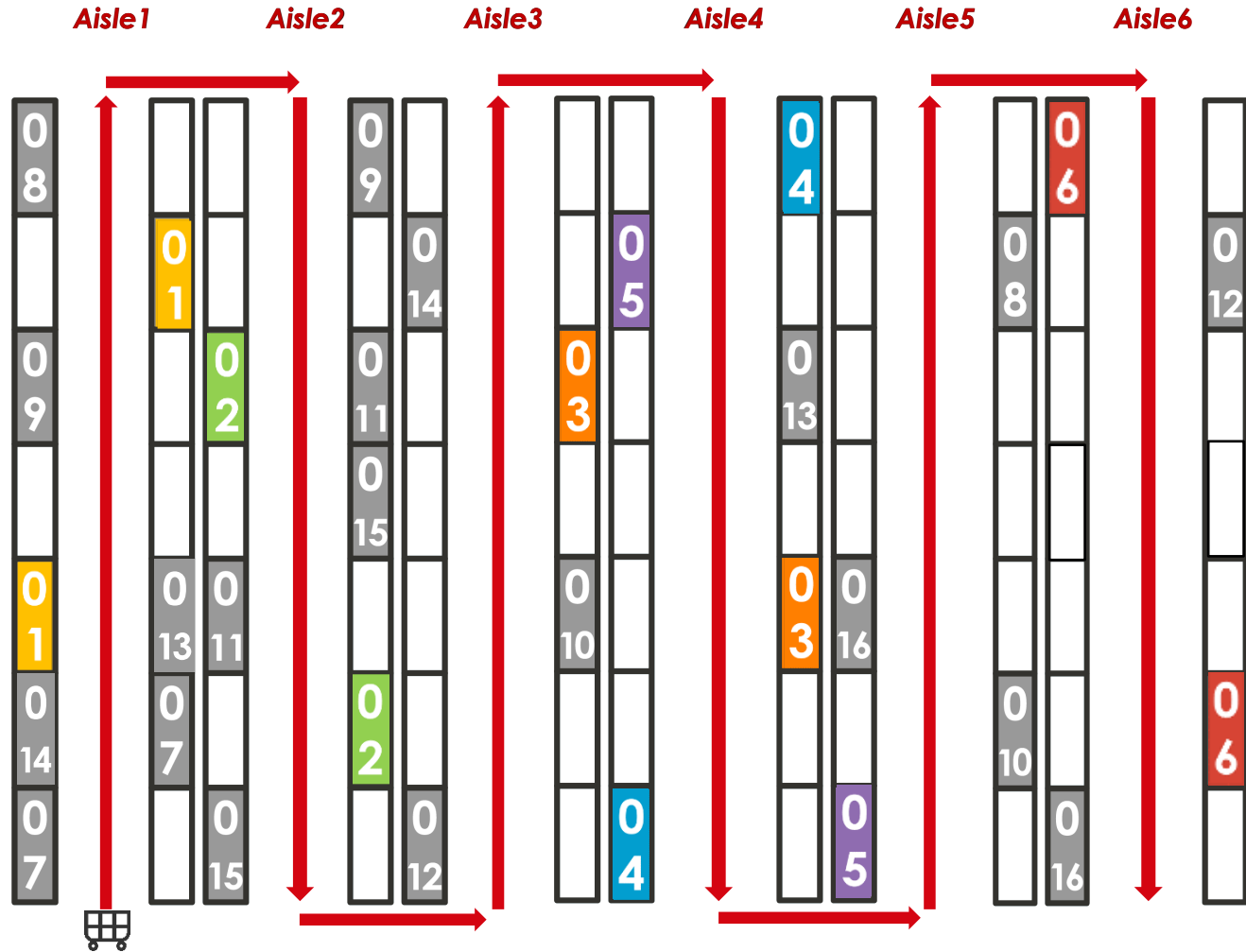
I.D.E.A. (Instantly Discover Efficient Activities)

 DHL developed the tool IDEA to address challenges in cluster pick operations

- An order grouping tool developed by Operations Science Team in DHL Supply Chain based on an intelligent algorithm
- A plug-in micro-service software that turbo-charges a WMS by optimizing tasking function of WMS
- Minimizes travel distance, number of stops, balances work across zones/MHE
- Increases UPH, minimizes order cycle time and reduces congestion



Basic Grouping Logic - First Come First Serve (FCFS)

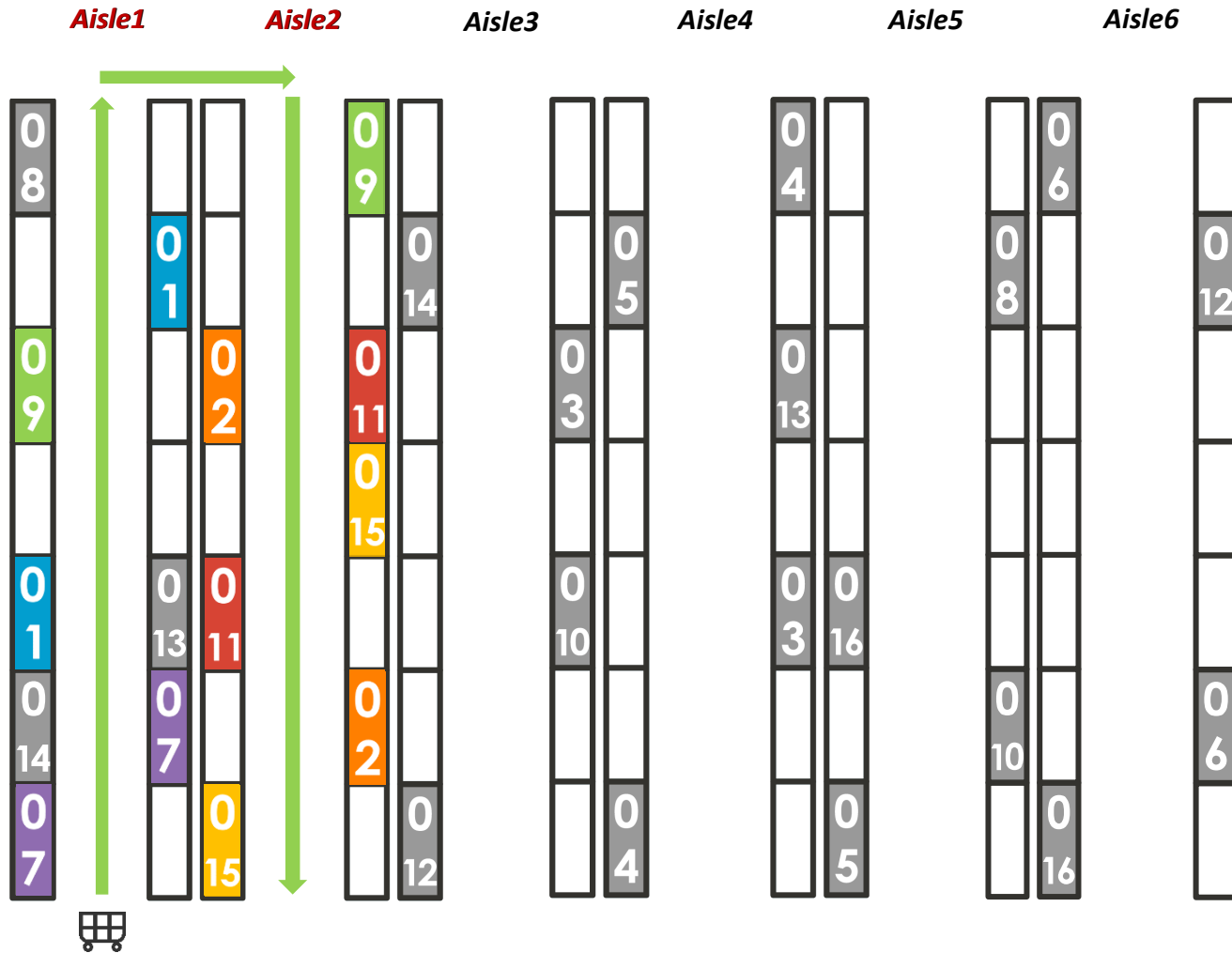


FCFS Pick Assignment

- Orders assigned = 1,2,3,4,5,6
- Number of Aisles visited = 6



I.D.E.A. Order Grouping Logic



Optimal Pick Assignment

- Orders assigned = 1,2,7,9,11,15
- Number of Aisles visited = 2

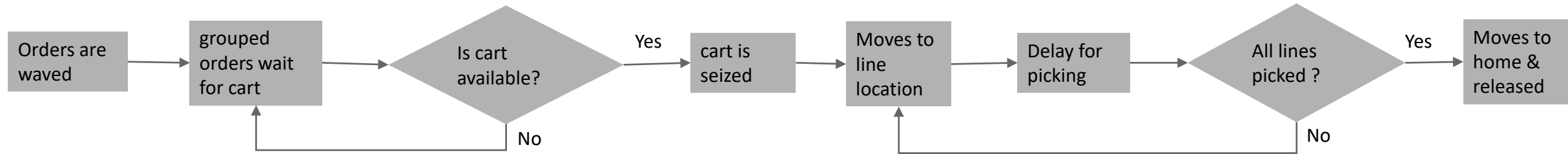


The image shows two men in a professional setting, likely a conference room. They are standing in front of a large screen that displays various technical diagrams and charts. The man on the left is wearing a dark blue shirt and a yellow lanyard with a DHL logo. The man on the right is wearing a light blue shirt and a yellow lanyard with a DHL logo. They are both looking towards the screen with interest. The background shows a window with greenery outside. The overall atmosphere is one of collaborative work and learning.

Modeling Cluster Pick in AnyLogic

3

Modelling Cluster Pick in AnyLogic



- Simulation process is based on the movement of carts in the warehouse
- Grouped orders are waved and assigned to the available cart
- Cart is seized and directed to the line in the aisle for picking, spends some amount of time for picking
- After the delay it is moved to the next location, if there are more lines to visit
- If all the lines are picked, cart is moved to the home location and released and made available for next grouped order

Input Data Format



Below data format is required to use the simulation model

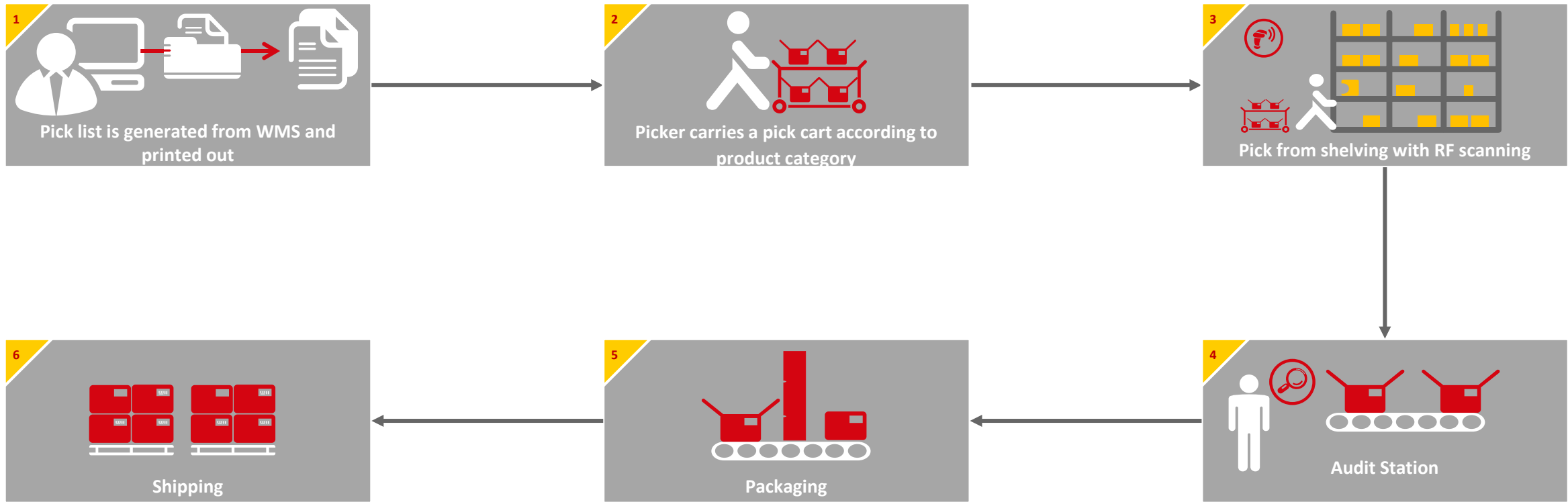
WAVE	TIME	CART_ID	ZONE	AREA	AISLE	POSITION	LEVEL	QTY	SEQ
W001	06-06-2020 3:38:20 PM	C11	Z1	A1	3	28	1	4	1
W001	06-06-2020 3:38:20 PM	C11	Z1	A2	2	15	1	5	2
W001	06-06-2020 3:38:20 PM	C11	Z1	A2	5	25	1	1	3
W001	06-06-2020 3:38:20 PM	C22	Z1	A1	1	25	1	5	1
W001	06-06-2020 3:38:20 PM	C22	Z1	A2	4	4	1	5	2
W001	06-06-2020 3:38:20 PM	C22	Z1	A2	5	11	1	4	3
W002	06-06-2020 4:04:09 PM	C33	Z1	A2	6	12	1	2	1
W002	06-06-2020 4:04:09 PM	C33	Z1	A2	8	54	1	5	2
W002	06-06-2020 4:04:09 PM	C33	Z1	A3	3	17	1	8	3
W002	06-06-2020 4:04:09 PM	C44	Z1	A1	7	57	1	6	1
W002	06-06-2020 4:04:09 PM	C44	Z1	A2	2	48	1	7	2
W002	06-06-2020 4:04:09 PM	C44	Z1	A2	5	60	1	12	3
W002	06-06-2020 4:04:09 PM	C44	Z1	A3	9	28	1	1	4

A photograph of two men in a meeting room. The man on the left is wearing a dark blue shirt and a yellow DHL lanyard. The man on the right is wearing a light blue shirt and a yellow DHL lanyard. They are both looking towards a large screen on the right side of the frame. The screen displays technical drawings of mechanical parts. In the background, there are several sheets of paper pinned to a wall, also showing technical drawings. The room has large windows with a view of green trees outside. The overall atmosphere is professional and collaborative.

Case Study

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Overview of Operation



Simulation

Current Picking Method

- Cluster Picking
- Individual Order Picking

Warehouse shifts

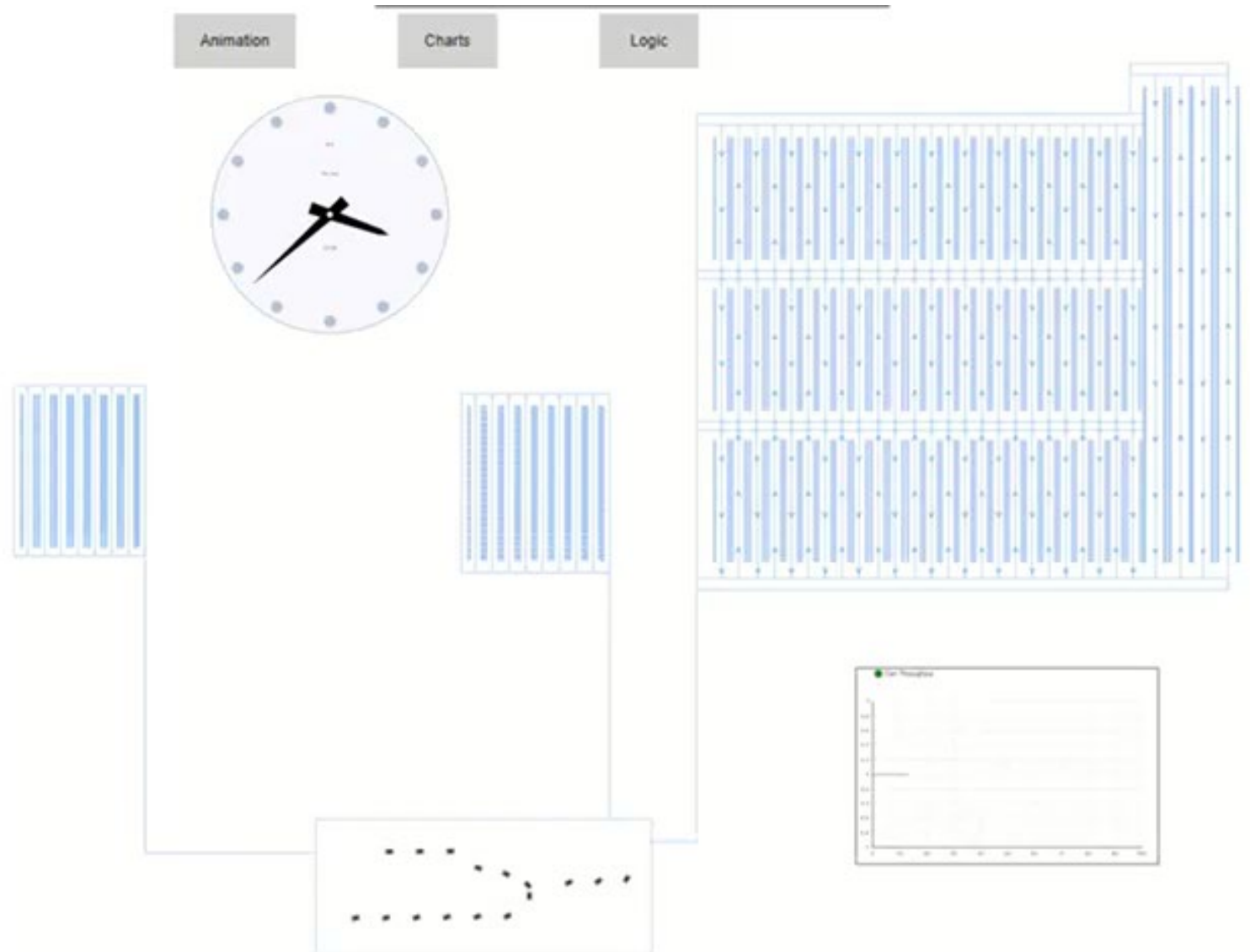
- 3 Shifts a day
- 16 Picker per Shift

Waving Strategy

- WAVE EVERY HOUR (proposed)
 - IDEA
 - FCFS

Assumption

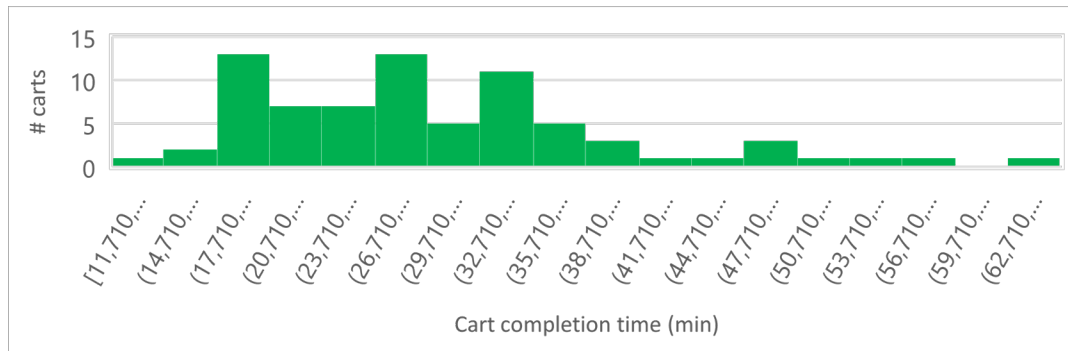
Parameter	Value
Cart Travel Speed	0.6 m / sec
Picking Time	10-12 sec



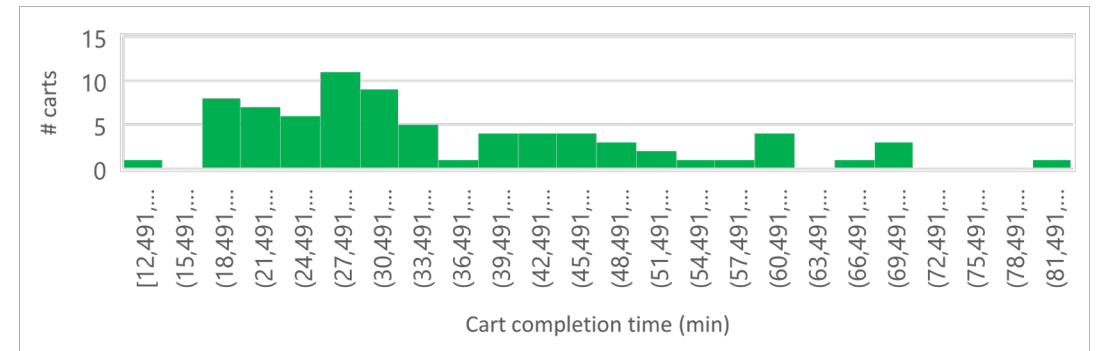
Productivity (IDEA vs FCFS)

➔ Average cart completion time and average waiting time in IDEA is better than FCFS

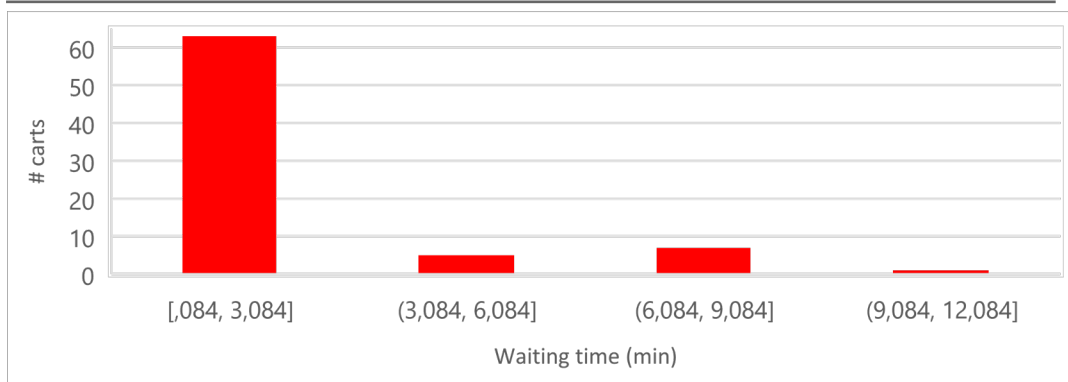
➔ **IDEA – Cart completion time (Average: 33.4)**



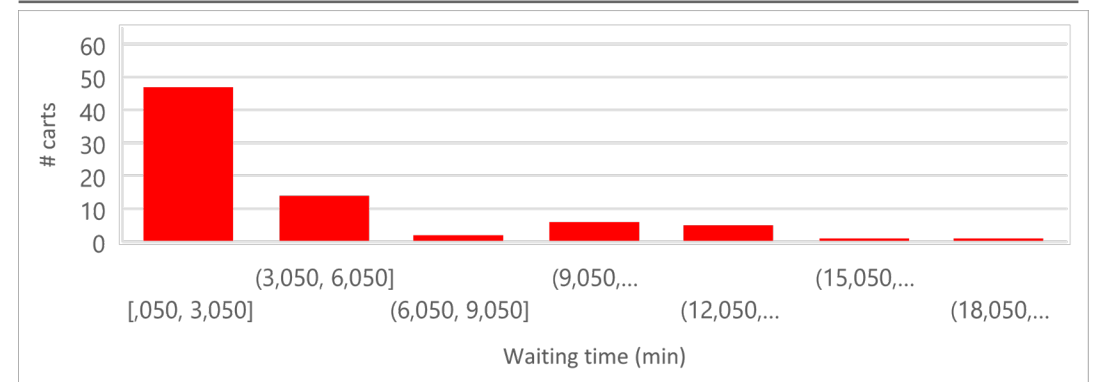
➔ **FCFS – Cart completion time (Average: 38.06)**



➔ **IDEA - Waiting time (Average: 2.26)**



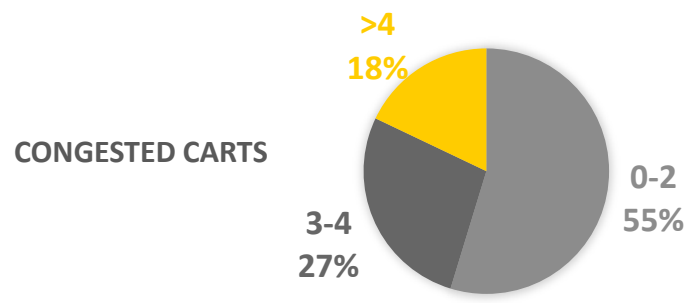
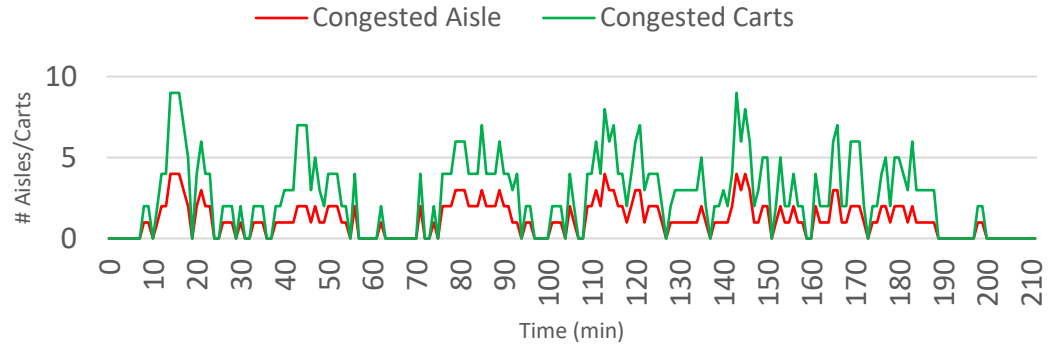
➔ **FCFS - Waiting time (Average: 3.54)**



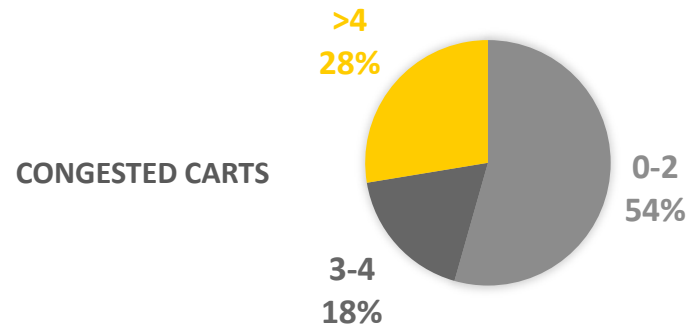
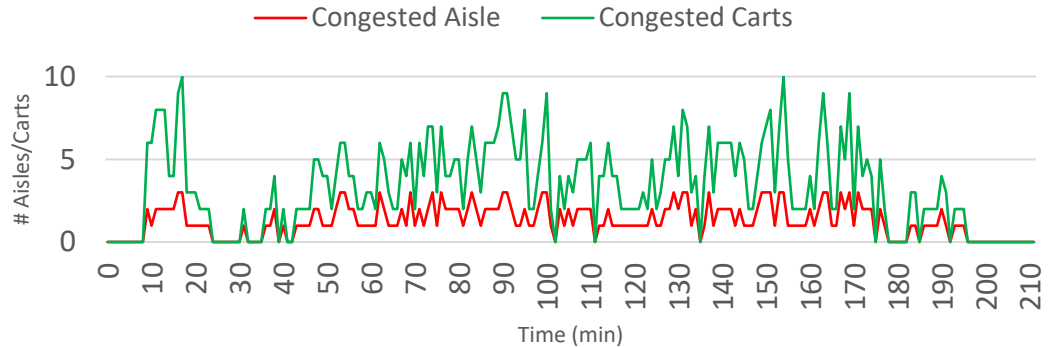
Congestion (IDEA vs FCFS)

➤➤ 18% of times IDEA has more than 4 carts congested while 28% is there in FCFS

IDEA



FCFS



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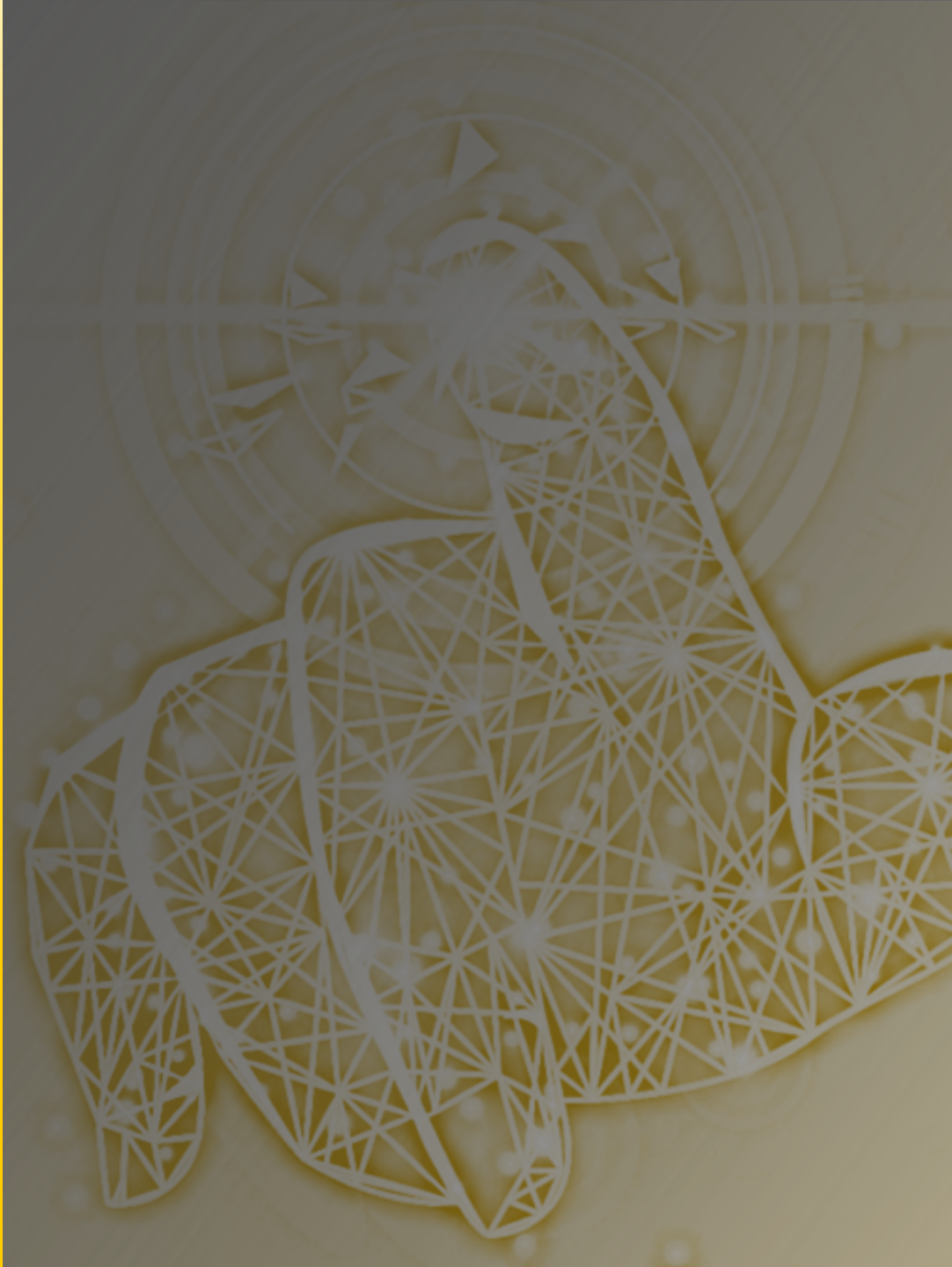
Summary

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Summary

- Created a simulation model for cluster pick with the help of AnyLogic software
- Validated the increase in productivity and reduction in congestion while using IDEA
- Increased productivity by 14% compared to FCFS
- Reduced congestion by 35% compared to FCFS
- IDEA can reduce 2 pickers

THANK YOU



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