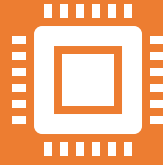


# Integration of Different Communication Protocols in Industry 4.0 Learning Laboratory

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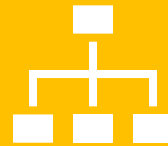
# Introduction



With the increase in the usage of modular components and improvement of intelligence of the devices, the decentralization of the different nodes in a production plant is made possible.



The project aims to develop a modular factory plan using different factory components such as conveyors, pushers, turntables, sliders and robotic arms.



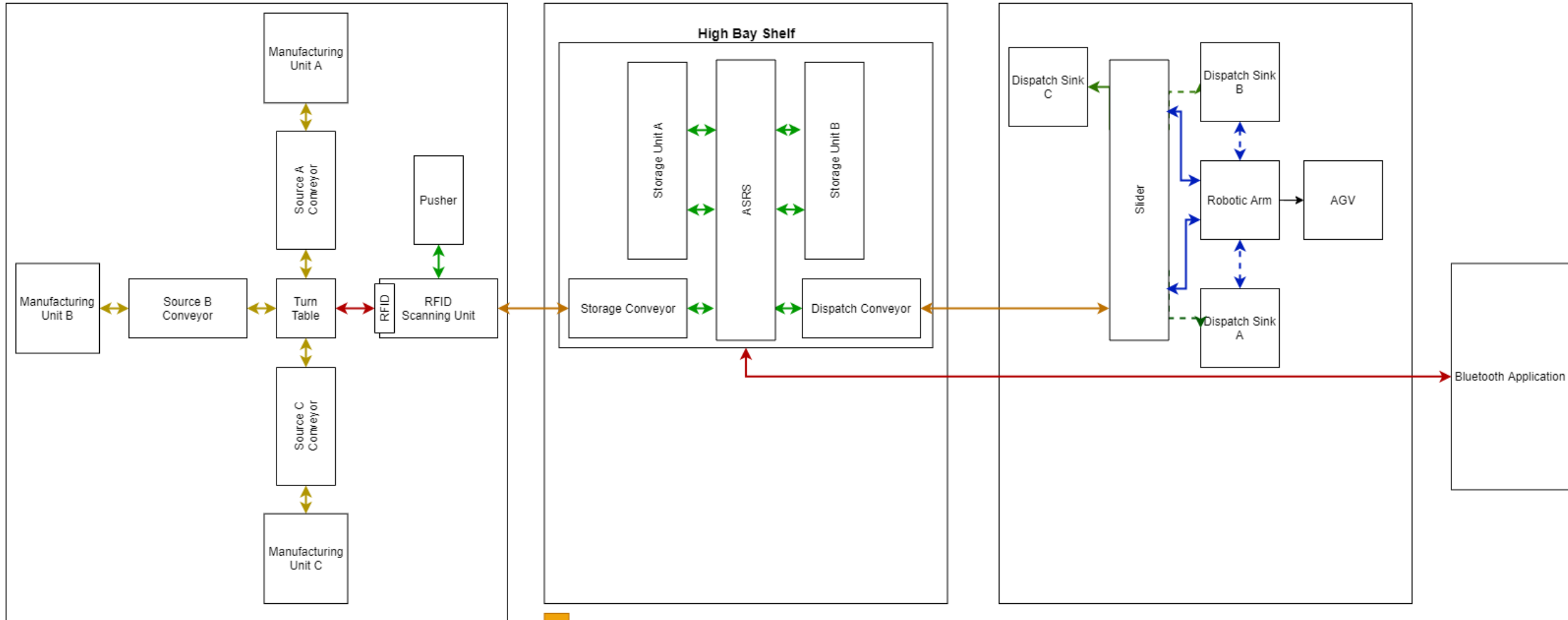
The project also aims at embedding different communication protocols between the individual nodes in the production plant.

# Factory Floor Plan

## Production area

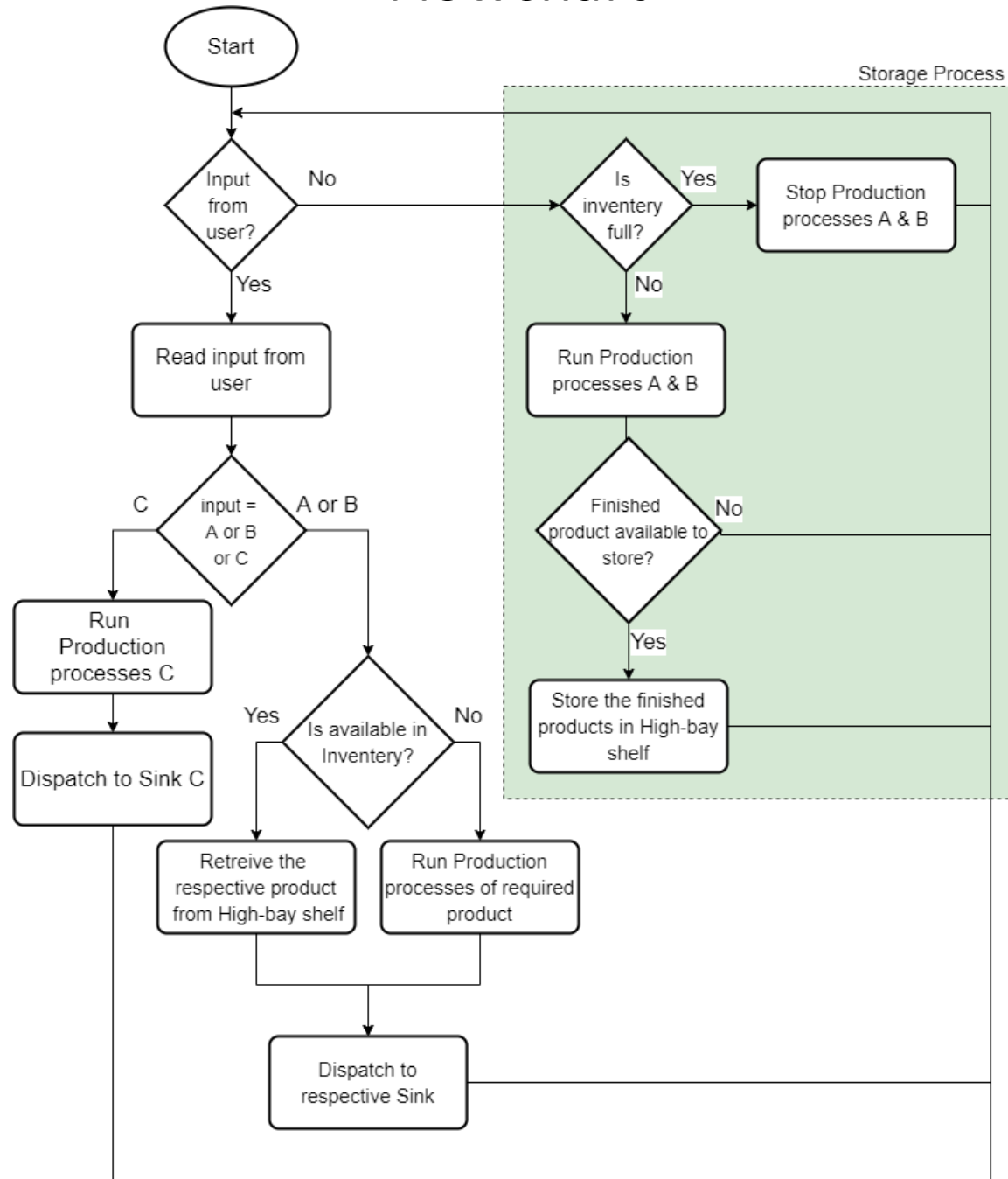
## Storage area

## Dispatch area



- Zigbee Communication
- RF Communication
- Bluetooth Communication
- LiFi Communication

# Flowchart



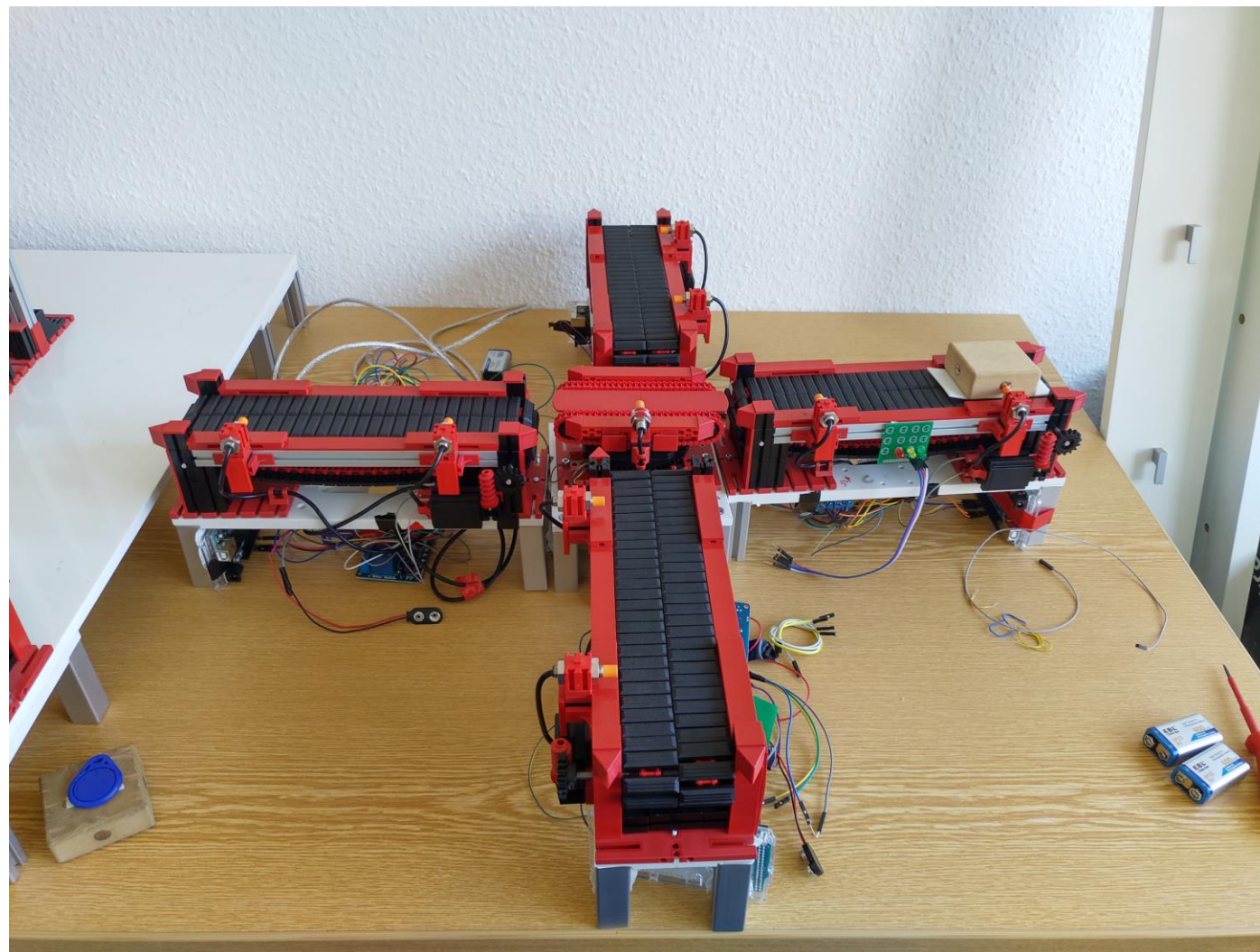
# Production Area

- There are two different categories of products which are produced, make-to-order and make-to-stock. There are also three different production lines to produce these products.
- Make-to-stock products are produced in two production lines, and only when inventory is not full. They are stored in High Bay Shelf.
- Make-to-order products are produced in single production line, only when there is a requirement from the customer. They are directly dispatched to the dispatch area without storing.

# Production Area

- Consist of 3 production lines and conveyer paths
- Produced goods are categorized into A,B & C
- Make-to-Order goods **(C)**; only produced on user requirement
  - Directly dispatched without storing
- Make-to-store goods **(A&B)**; produced and stored (in High Bay Shelf)
  - Production **(A&B)** stopped when High-Bay shelf is full
  - Production **(A&B)** resumed when vacant space in High-Bay shelf

# Progress in Production Area



# Progress in Production Area

- Communication Protocol used: LiFi
- Tasks Completed
  - Circuit building and fixing components to the conveyors
  - Basic Production Layout with LiFi protocol
- Tasks Remaining
  - Integration of Pusher
  - RFID
  - Integration with High Bay Shelf



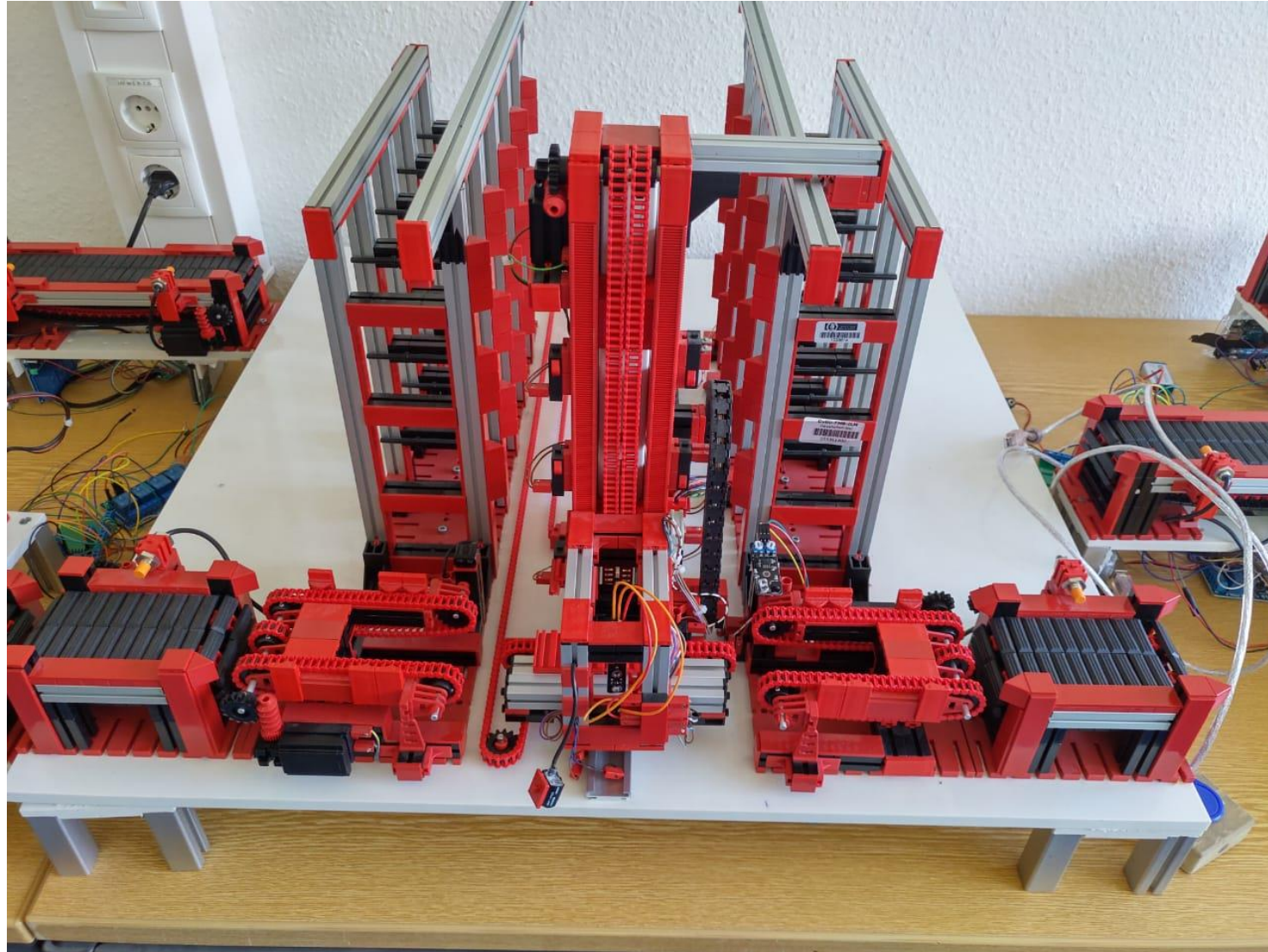
# Storage Area

- The products produced from two production lines are stored in this storage area.
- If storage area is full, then communication is done with production area to stop further production.
- If there is requirement from user for a specific product which is present in storage, it is retrieved and forwarded to dispatch area.
- If the stock of any specific product is empty or forwarded to dispatch, communication is done with production area to produce the respective product.

# Storage Area

- Goods (B&C) produced and transported through conveyer 2 & 3 are stored (High-Bay Shelf)
- Production stopped when High Bay Shelf is full
  - Sends Termination signal from storage area to production area to stop manufacturing goods (B&C)
- Dispatch of stored product (B&C) upon user requirement
  - Communication enabled between Storage area and Dispatch area.
- Selection of goods enabled using mobile application
- Dispatch of product (B or C); Storage space becomes available
  - Communication enabled between storage area and production area to resume production of dispatched goods (B or C)

# Progress in Storage Area



# Progress in Storage Area

- Tasks Completed
  - Circuit building and fixing components to the conveyors
  - Storage and retrieval process testing
- Tasks Remaining
  - Development of Android Application and its interface
  - Integration with production area and dispatch area

# Dispatch Area

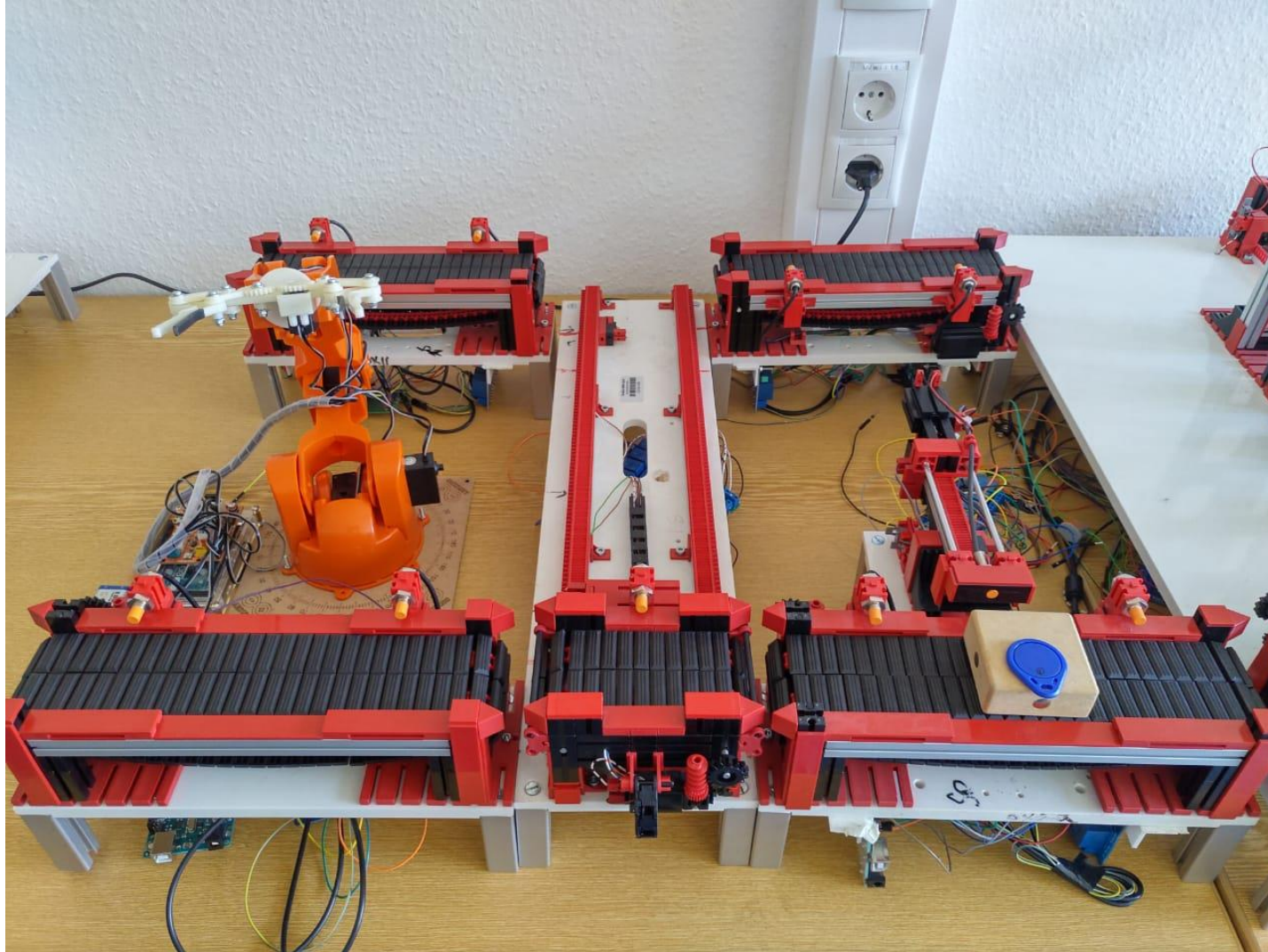
- The product which is forwarded from the storage area is deposited at the corresponding sink.

# Dispatch Area

- Contains 3 dispatch sinks
- Transport of product from Storage area to Dispatch area through dispatch conveyer
- Dispatched products (A,B or C) are transported to respective Dispatch Sink
- Communication enabled from slider to respective dispatch sinks



# Progress in Dispatch Area



# Progress in Dispatch Area

- Communication used: NRF
- Tasks Completed
  - Testing NRF in different channels
  - Fixing individual factory modules
- Tasks Remaining
  - Integration of communication with factory modules
  - Integration with High Bay Shelf



Thank you

