Practical No. -5

Question 5:

1. Design and Develop a Discrete-Event model that will simulate process by:
   -
   i. Creating a simple model.
   ii. Adding Resources.
   iii. Creating 3D Animation.
   iv. Modelling Delivery

Job Shop Model: Simulating Manufacturing and Shipping Processes

Aim:

To develop a comprehensive discrete-event model using AnyLogic's Process Modelling Library and Material Handling Library, simulating the manufacturing and shipping processes of a small job shop.

Procedure:

Step-1: Setup and Arrival Simulation:

- Establish the model environment with a receiving dock and storage area.
- Define arrival patterns for pallets and implement storage logic.
- Utilize the Process Modelling Library to model the pallet arrival process.
- Configure storage parameters and resource allocation.

Step-2: Expansion with Forklift Trucks:

- Integrate forklift truck agents into the model to handle pallet storage and transportation.
- Develop logic for pallet movement and storage using forklift trucks.
- Configure forklift behaviour and interaction with storage facilities.
- Validate the expanded model against expected outcomes.

Step-3: Introduction of 3D Animation:

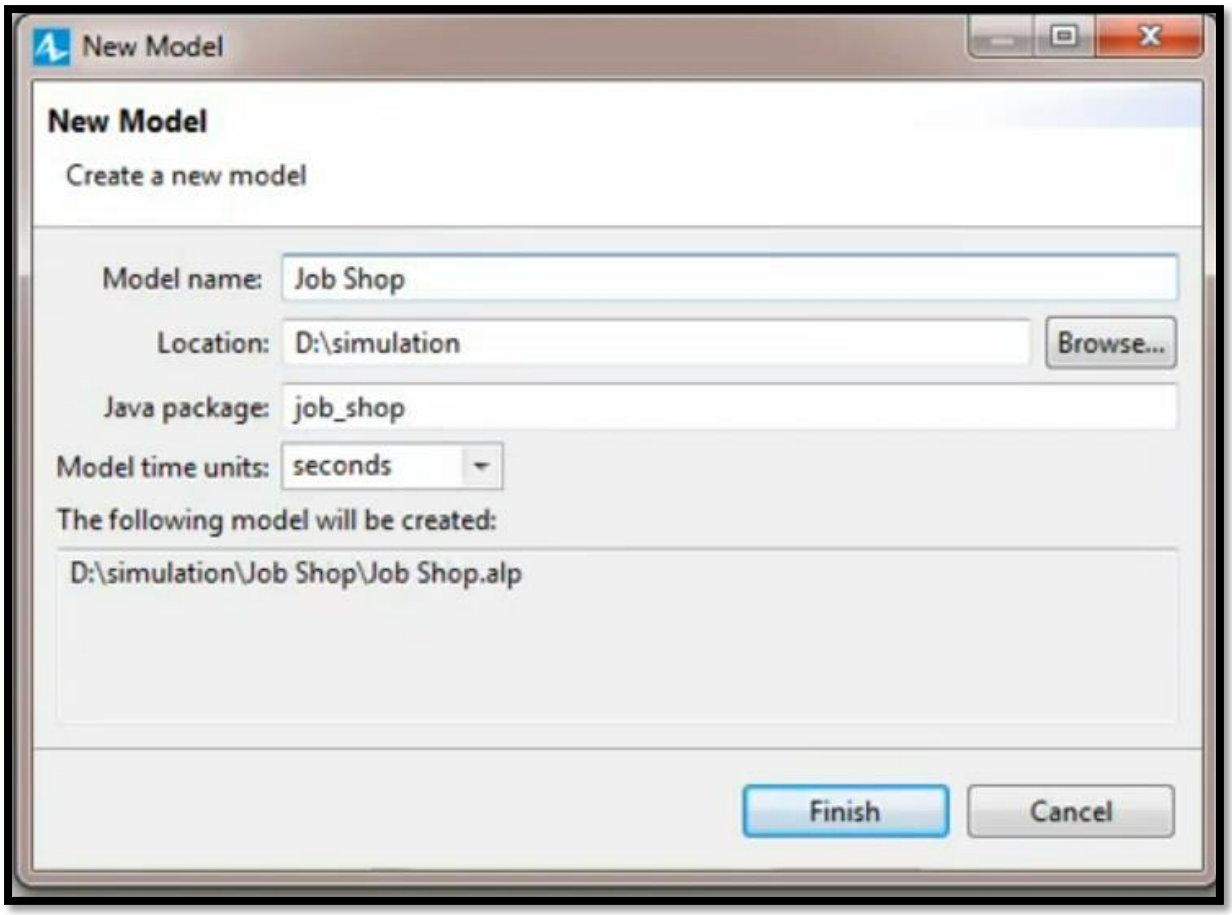
- Implement 3D objects representing the job shop environment and equipment.
- Integrate animation elements for pallet movement, forklift operations, and storage.
- Adjust animation parameters for optimal visualization.
- Test and refine the 3D animation features for clarity and accuracy.

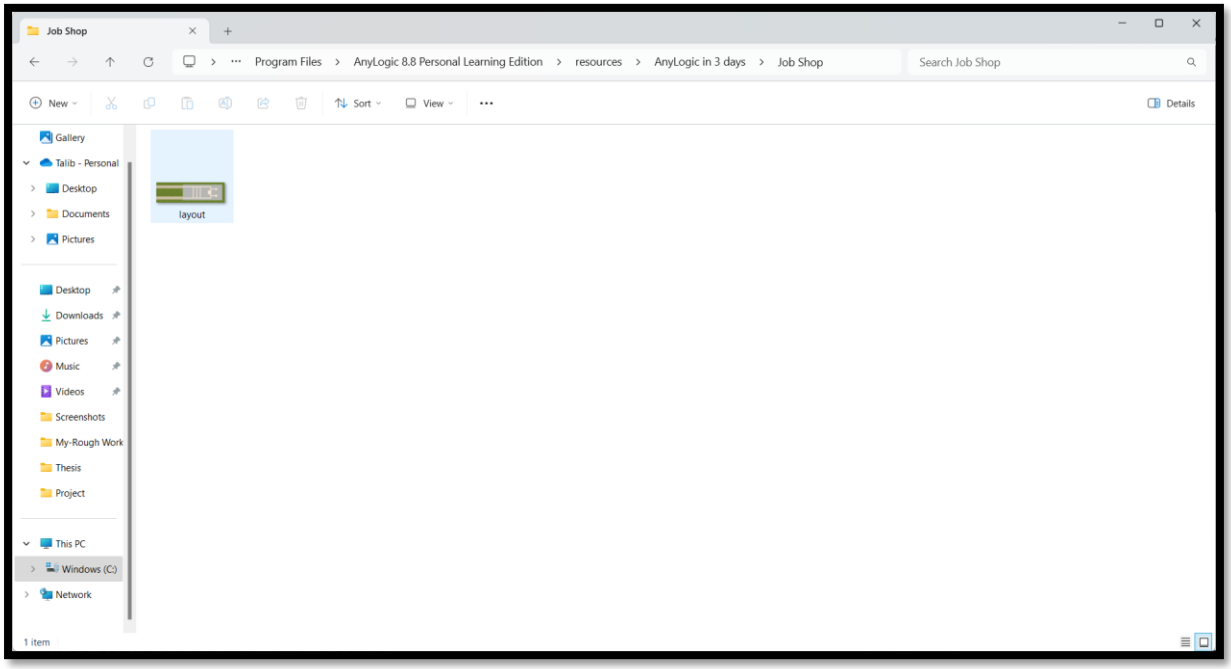
Step-4: Integration of Delivery Trucks:

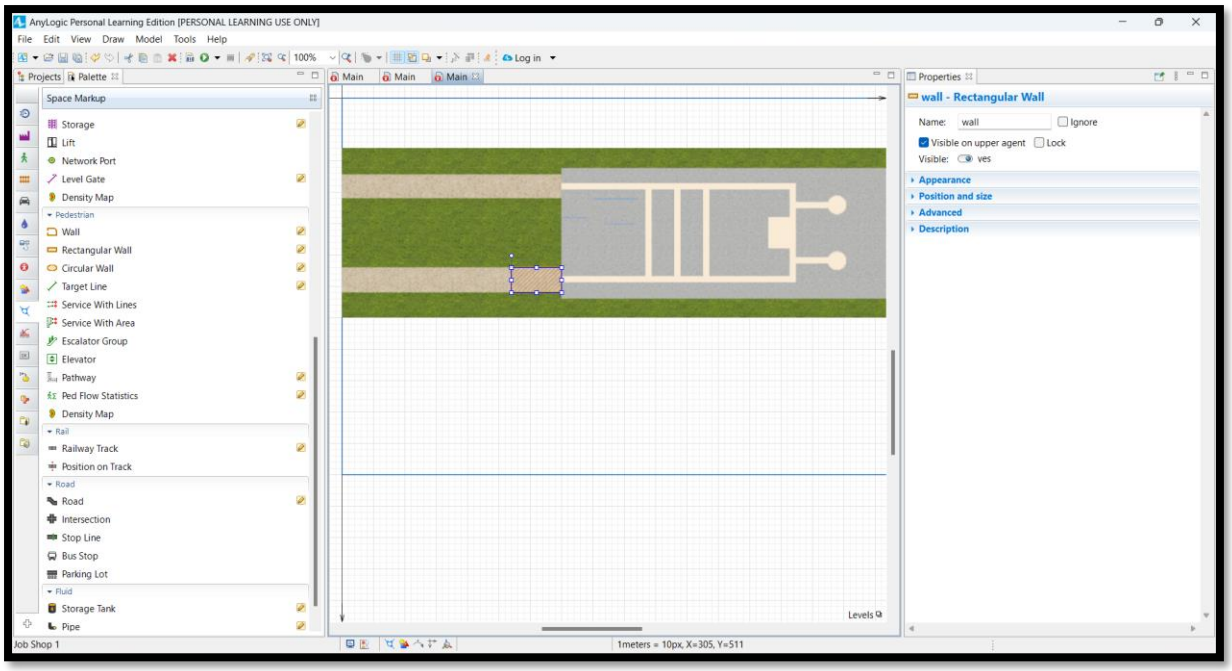
- Incorporate delivery truck agents into the model.
- Define arrival patterns and delivery schedules for trucks.
- Implement logic for unloading pallets from trucks at the receiving dock.
- Ensure seamless interaction between delivery trucks, receiving dock, and storage facilities.

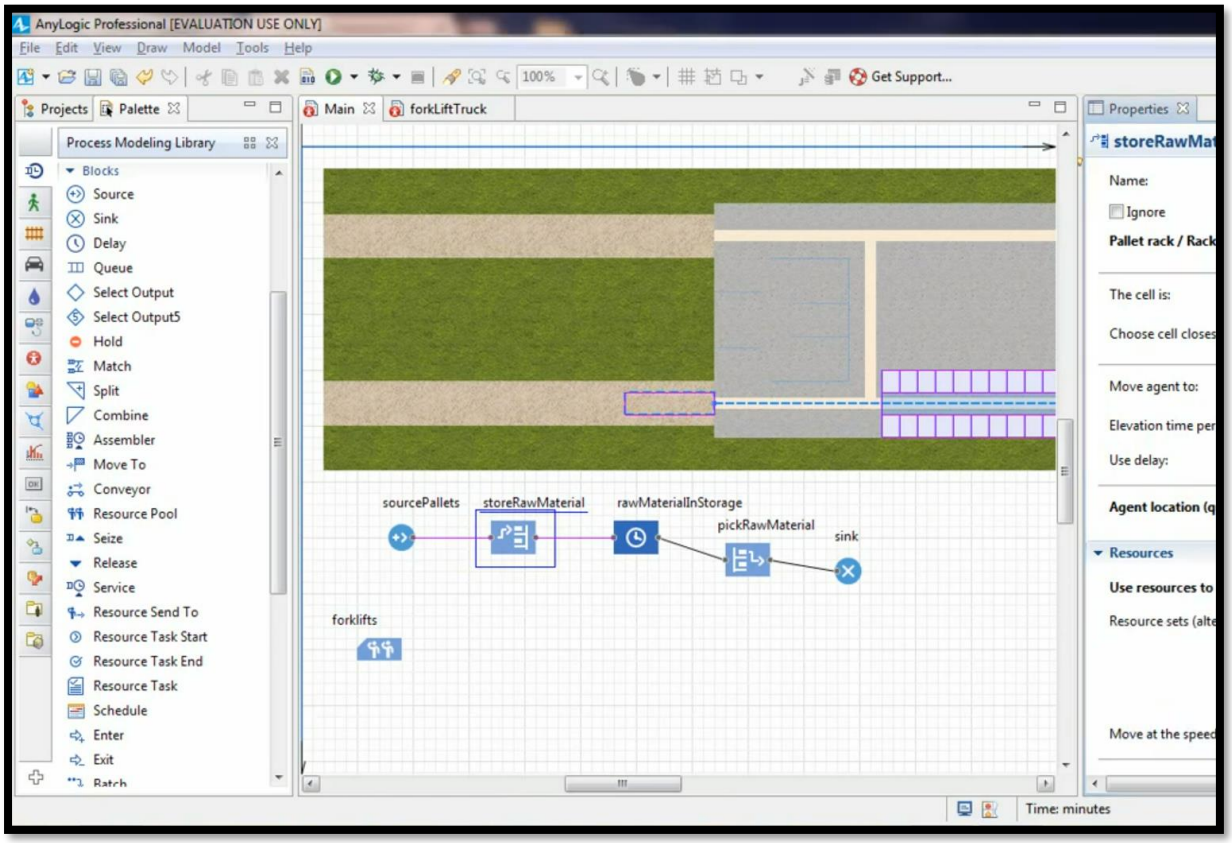
Step-5: Modelling CNC Machines:

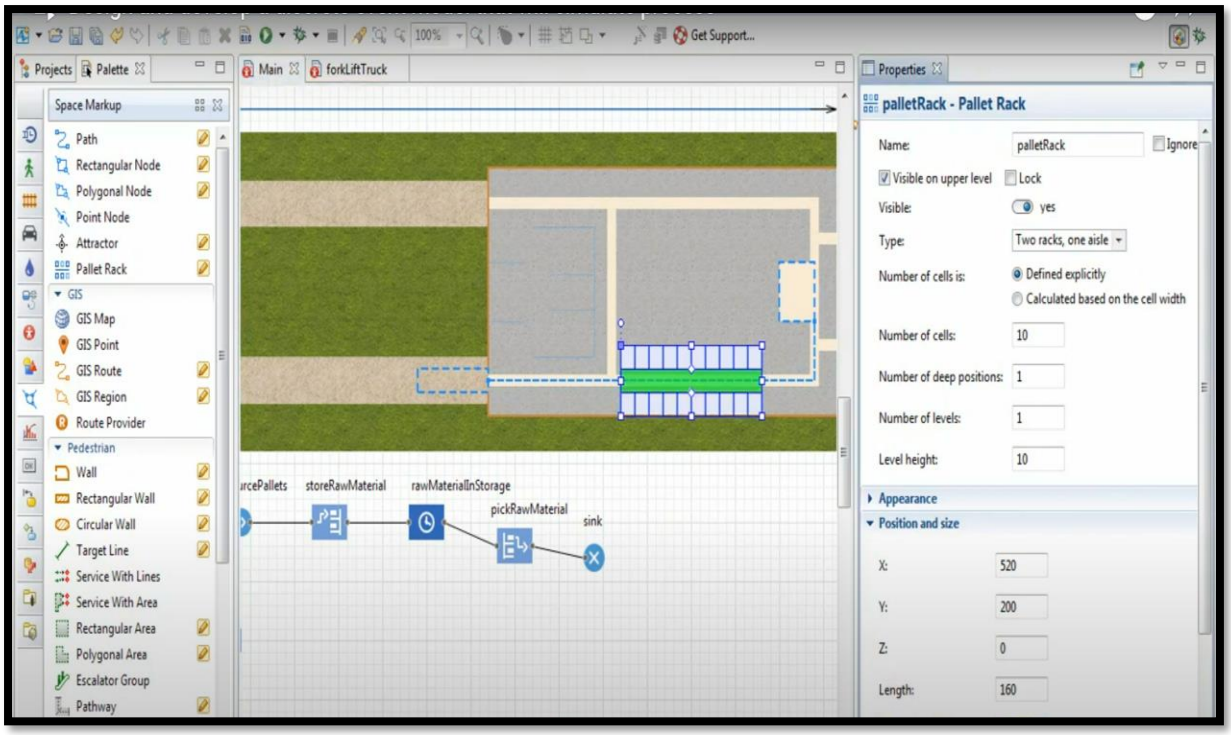
- Integrate CNC machine agents and define processing logic.
- Configure parameters such as processing time, machine capacity, and resource utilization.
- Implement logic for scheduling pallets for processing based on production orders.
- Validate the CNC machine operations against expected production outputs.

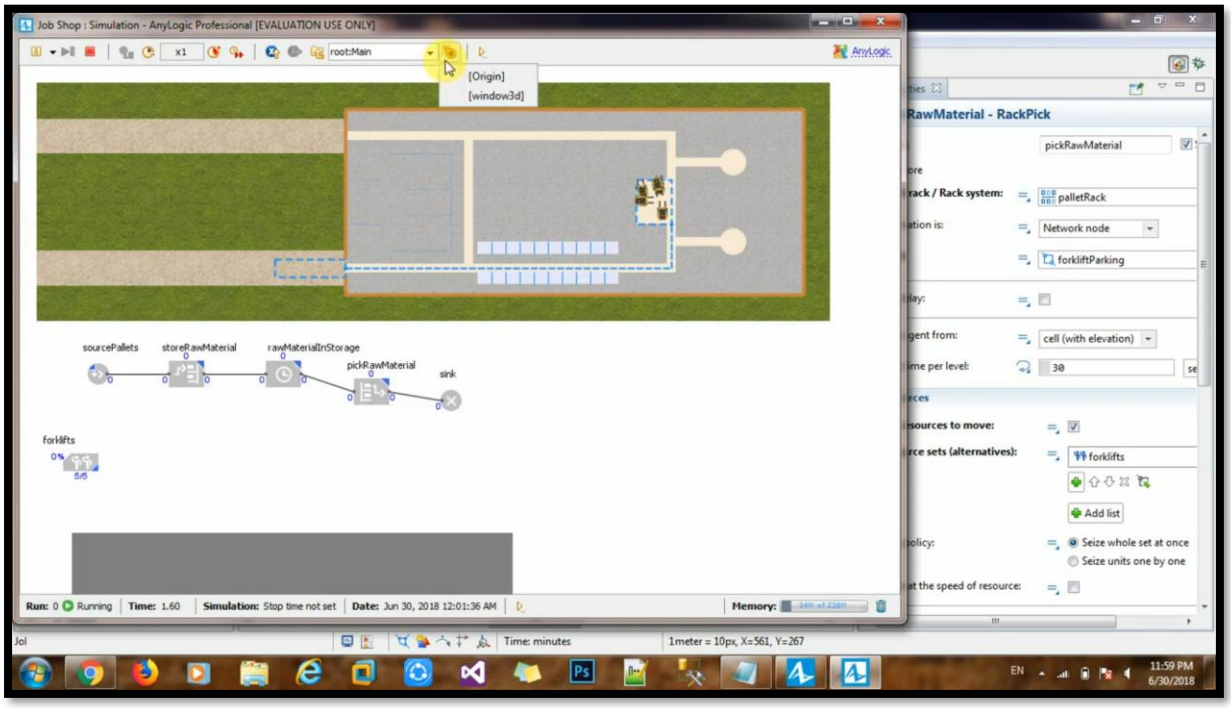

New Model
New Model
Create a new model
Model name:
Job Shop
Location:
D:\simulation
Browse...
Java package:
job_shop
Model time units:
seconds
The following model will be created:
D:\simulation\Job Shop\Job Shop.alp
Finish
Cancel

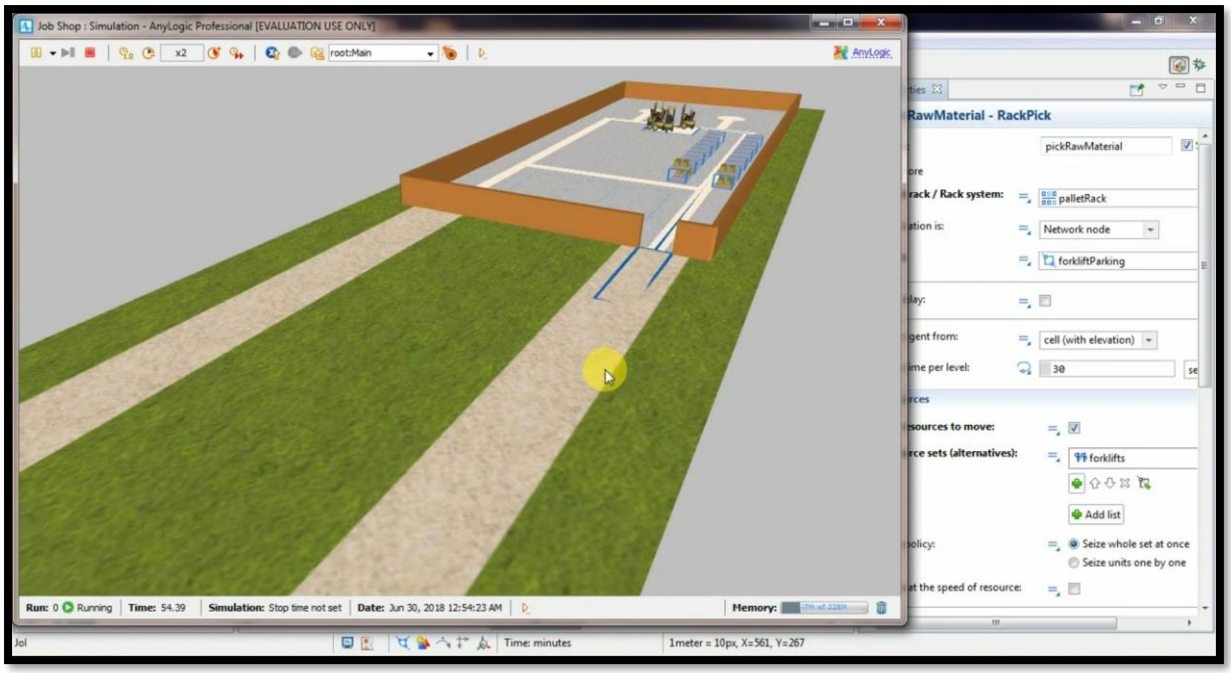

Job Shop
Program Files
AnyLogic 8.8 Personal Learning Edition
resources
AnyLogic in 3 days
Job Shop
Search Job Shop
New
Sort
View
Details
Gallery
Talib - Personal
Desktop
Documents
Pictures
Desktop
Downloads
Pictures
Music
Videos
Screenshots
My-Rough Work
Thesis
Project
This PC
Windows (C:)
Network
layout
1 item

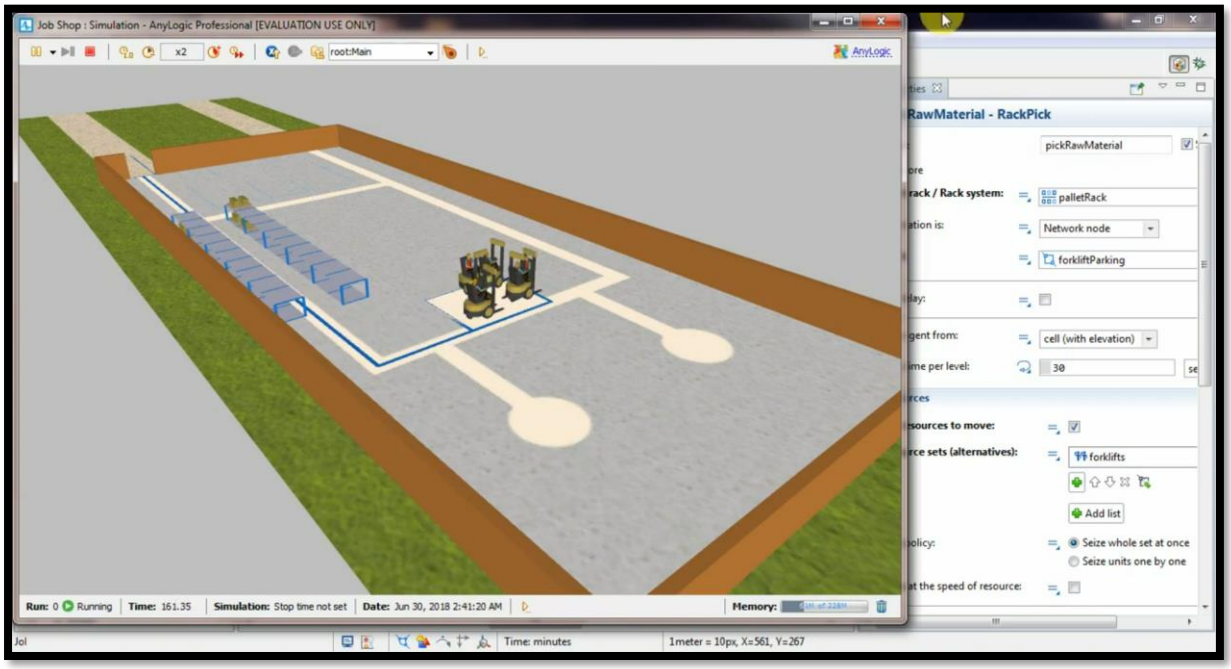

AnyLogic Personal Learning Edition [PERSONAL LEARNING USE ONLY]
File Edit View Draw Model Tools Help
Projects Palette
Space Markup
Storage
Lift
Network Port
Level Gate
Density Map
Pedestrian
Wall
Rectangular Wall
Circular Wall
Target Line
Service With Lines
Service With Area
Escalator Group
Elevator
Pathway
Ped Flow Statistics
Density Map
Rail
Railway Track
Position on Track
Road
Road
Intersection
Stop Line
Bus Stop
Parking Lot
Fluid
Storage Tank
Pipe
Main
Properties
wall - Rectangular Wall
Name: wall
Ignore
Visible on upper agent
Lock
Visible: yes
Appearance
Position and size
Advanced
Description
Levels
Job Shop 1
1meters = 10px, X=305, Y=511

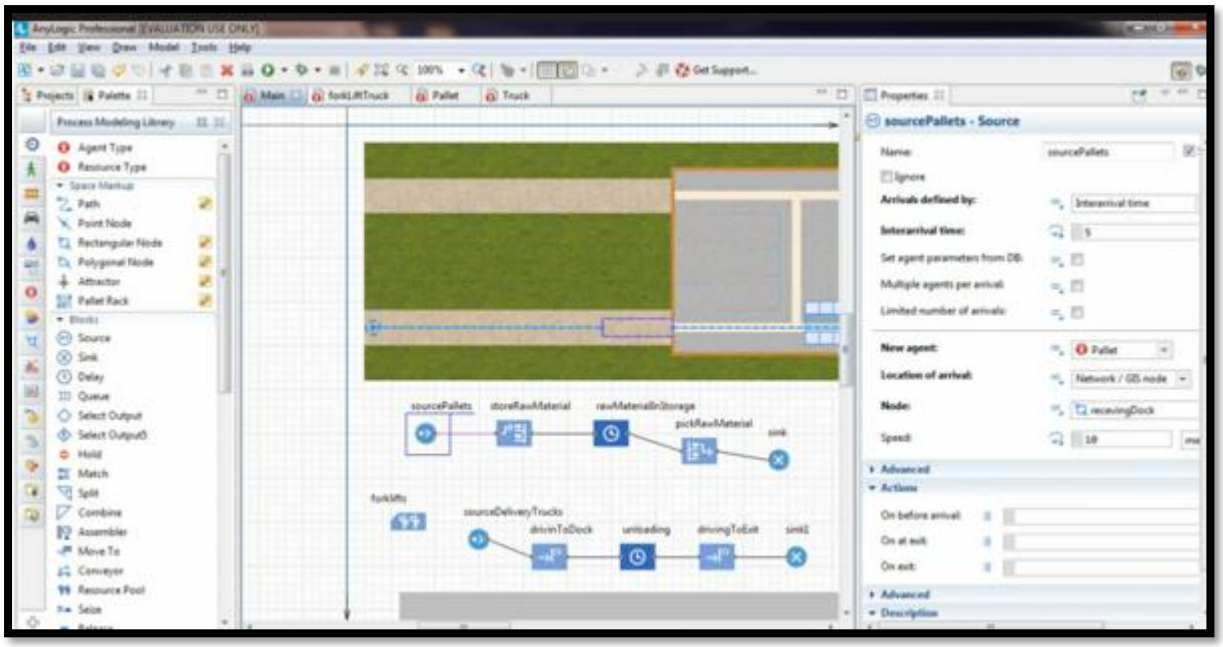

AnyLogic Professional [EVALUATION USE ONLY]
File Edit View Draw Model Tools Help
Get Support...
Projects Palette
Process Modeling Library
Blocks
Source
Sink
Delay
Queue
Select Output
Select Output5
Hold
Match
Split
Combine
Assembler
Move To
Conveyor
Resource Pool
Seize
Release
Service
Resource Send To
Resource Task Start
Resource Task End
Resource Task
Schedule
Enter
Exit
Batch
Main
forkLiftTruck
sourcePallets
storeRawMaterial
rawMaterialInStorage
pickRawMaterial
sink
forklifts
Properties
storeRawMat
Name:
Ignore
Pallet rack / Rack
The cell is:
Choose cell closes
Move agent to:
Elevation time per
Use delay:
Agent location (q
Resources
Use resources to
Resource sets (alte
Move at the speed
Time: minutes

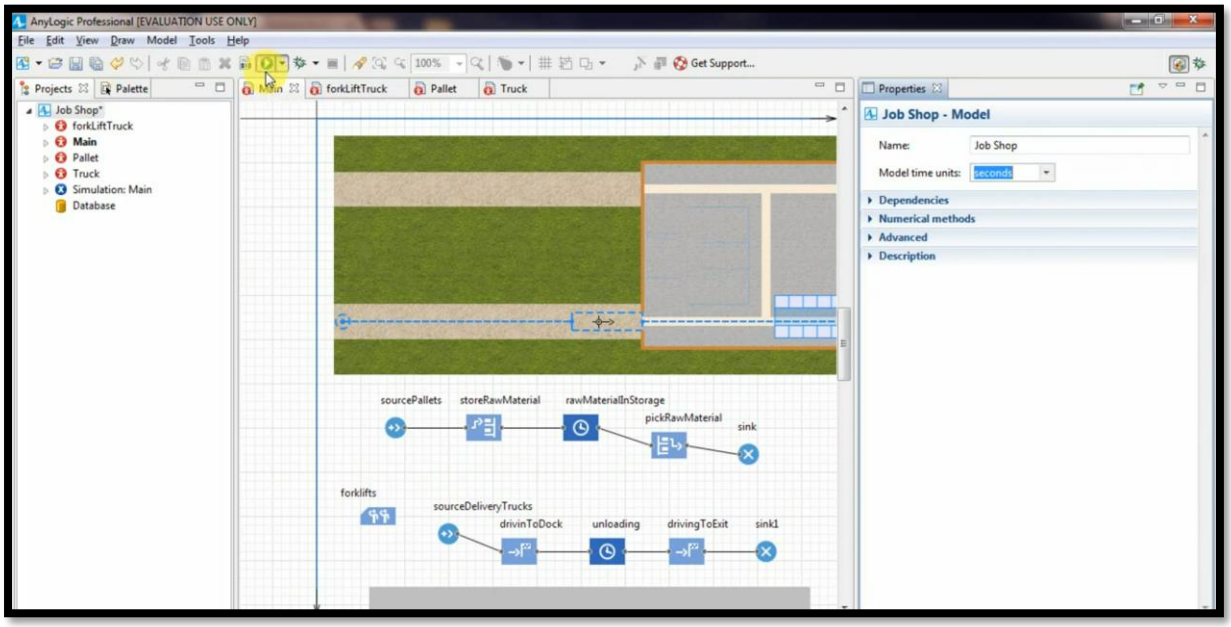

Projects
Palette
Space Markup
Path
Rectangular Node
Polygonal Node
Point Node
Attractor
Pallet Rack
GIS
GIS Map
GIS Point
GIS Route
GIS Region
Route Provider
Pedestrian
Wall
Rectangular Wall
Circular Wall
Target Line
Service With Lines
Service With Area
Rectangular Area
Polygonal Area
Escalator Group
Pathway
Main
forkLiftTruck
sourcePallets
storeRawMaterial
rawMaterialInStorage
pickRawMaterial
sink
Properties
palletRack - Pallet Rack
Name: palletRack
Ignore
Visible on upper level
Lock
Visible: yes
Type: Two racks, one aisle
Number of cells is: Defined explicitly
Calculated based on the cell width
Number of cells: 10
Number of deep positions: 1
Number of levels: 1
Level height: 10
Appearance
Position and size
X: 520
Y: 200
Z: 0
Length: 160

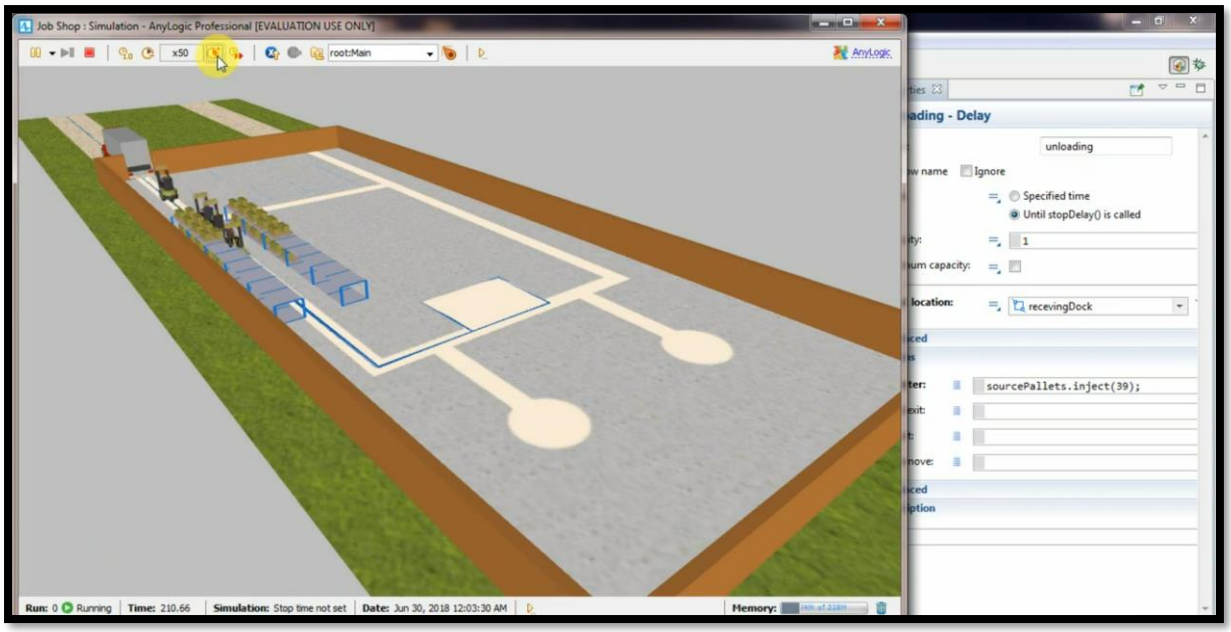

Job Shop : Simulation - AnyLogic Professional [EVALUATION USE ONLY]
root:Main
[Origin]
[window3d]
sourcePallets
storeRawMaterial
rawMaterialInStorage
pickRawMaterial
sink
forklifts
RawMaterial - RackPick
pickRawMaterial
palletRack
Network node
forkliftParking
cell (with elevation)
30
forklifts
Add list
Seize whole set at once
Seize units one by one
Run: 0 Running
Time: 1.60
Simulation: Stop time not set
Date: Jun 30, 2018 12:01:36 AM
Memory:
Time: minutes
1meter = 10px, X=561, Y=267
11:59 PM
6/30/2018

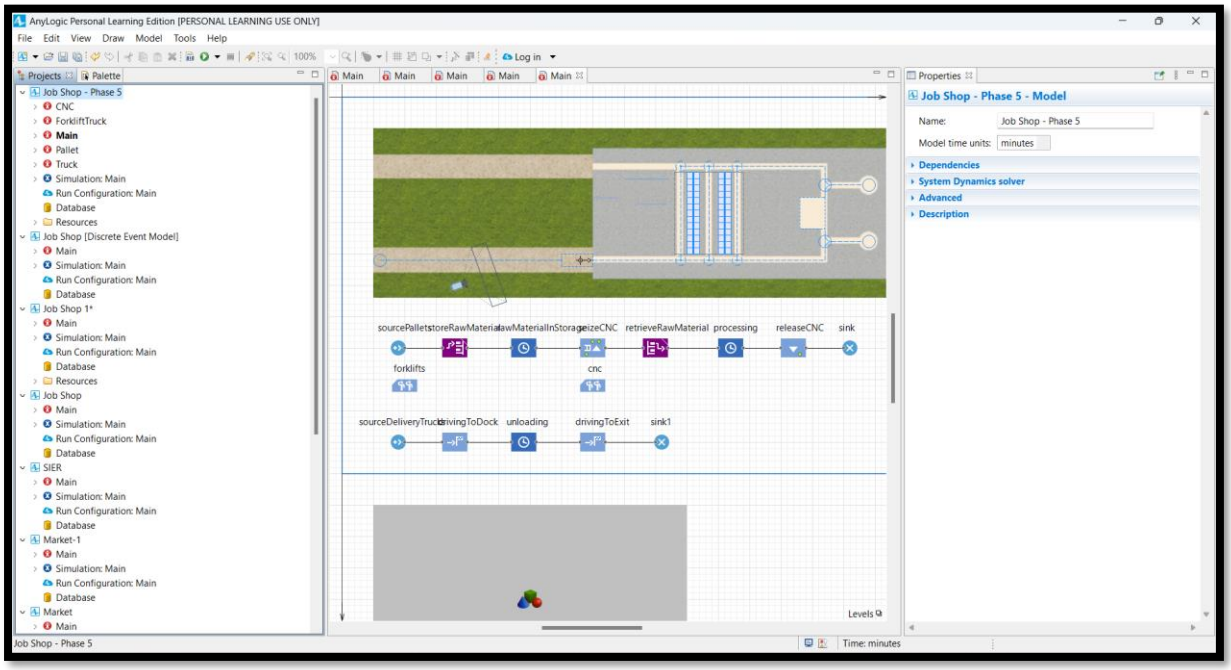

Job Shop : Simulation - AnyLogic Professional [EVALUATION USE ONLY]
x2
root:Main
AnyLogic
RawMaterial - RackPick
pickRawMaterial
rack / Rack system:
palletRack
Network node
forkliftParking
cell (with elevation)
30
forklifts
Add list
Seize whole set at once
Seize units one by one
Run: 0 Running
Time: 54.39
Simulation: Stop time not set
Date: Jun 30, 2018 12:54:23 AM
Memory:
Time: minutes
1meter = 10px, X=561, Y=267

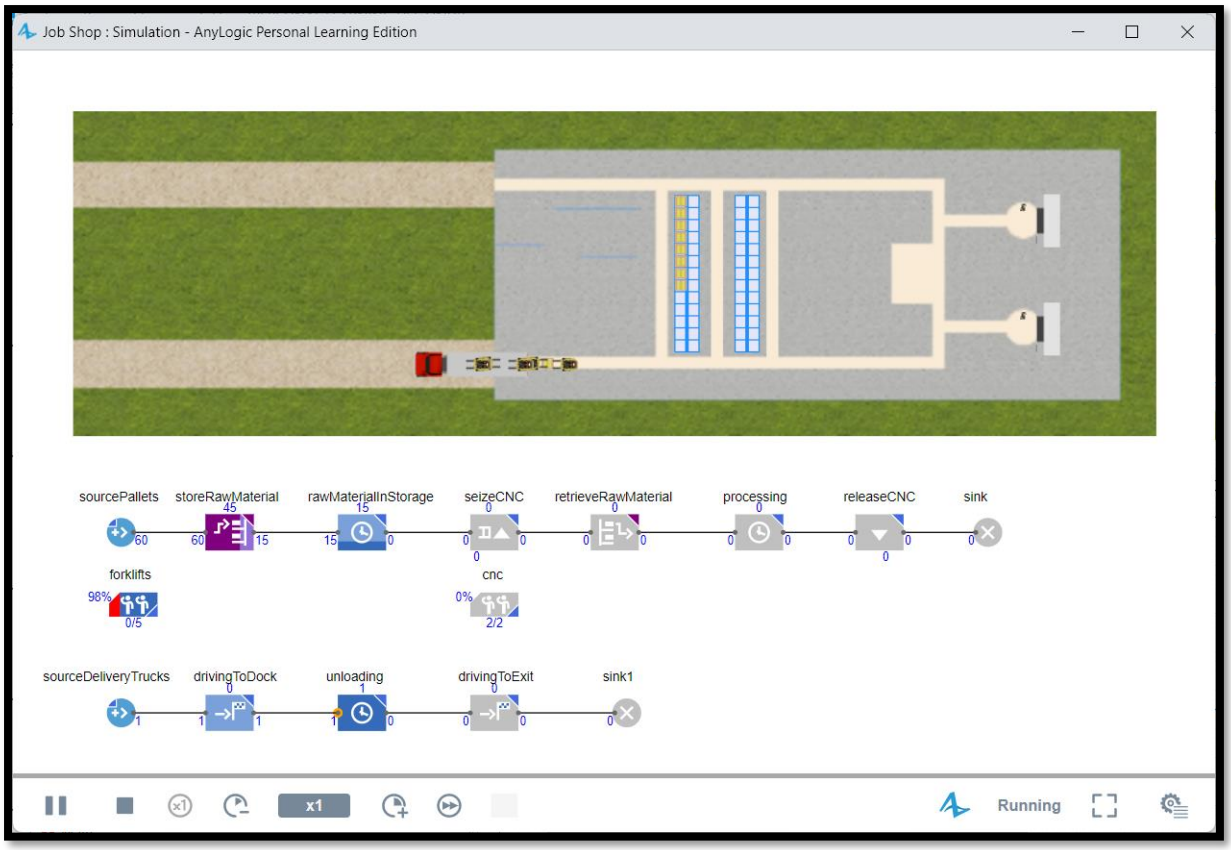

Job Shop : Simulation - AnyLogic Professional [EVALUATION USE ONLY]
x2
root:Main
AnyLogic
RawMaterial - RackPick
pickRawMaterial
rack / Rack system:
palletRack
Network node
forkliftParking
cell (with elevation)
30
forklifts
Add list
Seize whole set at once
Seize units one by one
Run: 0 Running
Time: 161.35
Simulation: Stop time not set
Date: Jun 30, 2018 2:41:20 AM
Memory:
Time: minutes
1meter = 10px, X=561, Y=267

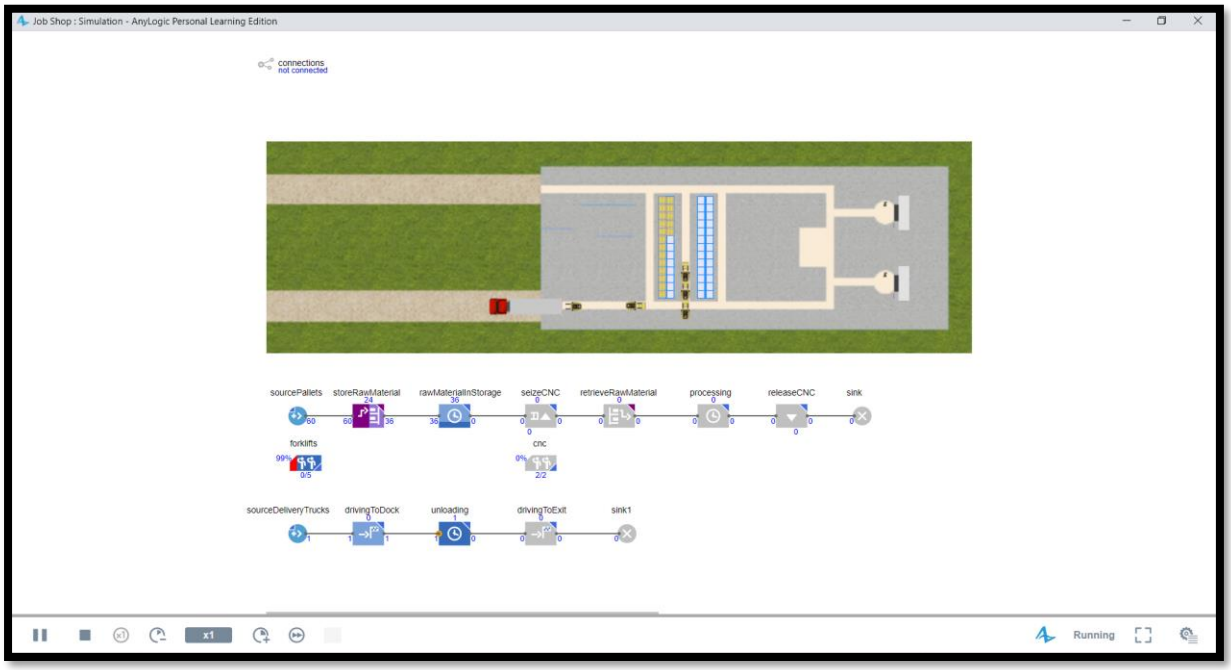

AnyLogic Professional [EVALUATION USE ONLY]
File Edit View Draw Model Tools Help
Projects Palette
Process Modeling Library
Agent Type
Resource Type
Space Markup
Path
Point Node
Rectangular Node
Polygonal Node
Attractor
Pallet Rack
Blocks
Source
Sink
Delay
Queue
Select Output
Select Output5
Hold
Match
Split
Combine
Assembler
Move To
Conveyor
Resource Pool
Seize
Main
forkLiftTruck
Pallet
Truck
sourcePallets
storeRawMaterial
rawMaterialInStorage
pickRawMaterial
sink
forklifts
sourceDeliveryTrucks
drivinToDock
unloading
drivingToExit
sink1
Properties
sourcePallets - Source
Name:
sourcePallets
Ignore
Arrivals defined by:
Interarrival time
Interarrival time:
5
Set agent parameters from DB
Multiple agents per arrival
Limited number of arrivals:
New agent:
Pallet
Location of arrival:
Network / GIS node
Node:
receivingDock
Speed:
10
Advanced
Actions
On before arrival:
On at exit:
On exit:
Advanced
Description

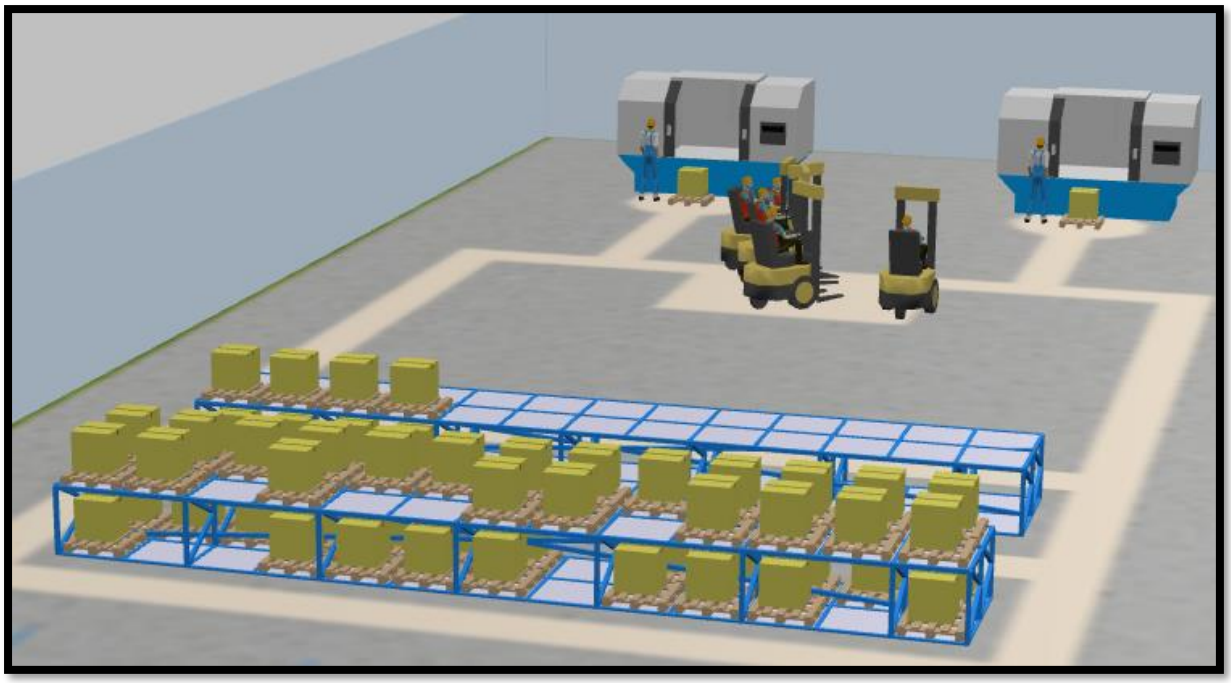

AnyLogic Professional [EVALUATION USE ONLY]
File Edit View Draw Model Tools Help
Get Support...
Projects
Palette
Job Shop*
forkLiftTruck
Main
Pallet
Truck
Simulation: Main
Database
Main
forkLiftTruck
Pallet
Truck
sourcePallets
storeRawMaterial
rawMaterialInStorage
pickRawMaterial
sink
forklifts
sourceDeliveryTrucks
drivinToDock
unloading
drivingToExit
sink1
Properties
Job Shop - Model
Name:
Job Shop
Model time units:
seconds
Dependencies
Numerical methods
Advanced
Description


Job Shop : Simulation - AnyLogic Professional [EVALUATION USE ONLY]
x50
root:Main
AnyLogic
ading - Delay
unloading
Ignore
Specified time
Until stopDelay() is called
location:
recevingDock
sourcePallets.inject(39);
Run: 0 Running
Time: 210.66
Simulation: Stop time not set
Date: Jun 30, 2018 12:03:30 AM
Memory:


AnyLogic Personal Learning Edition [PERSONAL LEARNING USE ONLY]
File Edit View Draw Model Tools Help
Projects
Palette
Job Shop - Phase 5
CNC
ForkliftTruck
Main
Pallet
Truck
Simulation: Main
Run Configuration: Main
Database
Resources
Job Shop [Discrete Event Model]
Job Shop 1*
Job Shop
SIER
Market-1
Market
Properties
Job Shop - Phase 5 - Model
Name:
Job Shop - Phase 5
Model time units:
minutes
Dependencies
System Dynamics solver
Advanced
Description
sourcePallets
storeRawMaterial
awMaterialInStorage
eizeCNC
retrieveRawMaterial
processing
releaseCNC
sink
forklifts
cnc
sourceDeliveryTruck
drivingToDock
unloading
drivingToExit
sink1
Levels
Time: minutes


Job Shop : Simulation - AnyLogic Personal Learning Edition
sourcePallets
storeRawMaterial
rawMaterialInStorage
seizeCNC
retrieveRawMaterial
processing
releaseCNC
sink
forklifts
cnc
sourceDeliveryTrucks
drivingToDock
unloading
drivingToExit
sink1
x1
Running


Job Shop : Simulation - AnyLogic Personal Learning Edition
connections
not connected
sourcePallets
storeRawMaterial
rawMaterialInStorage
seizeCNC
retrieveRawMaterial
processing
releaseCNC
sink
forklifts
cnc
sourceDeliveryTrucks
drivingToDock
unloading
drivingToExit
sink1
x1
Running



Conclusion:

By following the outlined procedure, users can create a comprehensive discrete-event model of a job shop's manufacturing and shipping processes. This model, developed using AnyLogic, simulates pallet arrival, storage, transportation, and processing at CNC machines, providing valuable insights into system performance, resource utilization, and production efficiency.