Modeling a Pull System in Process Simulator Webinar

Process simulator

Instructor Info:

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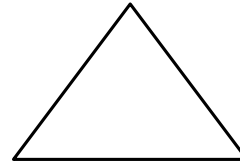
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Agenda

- Buffers vs Storages
- Ordered Arrivals
- Send Routings & Send Statement
- Order and Send Signals in Storages
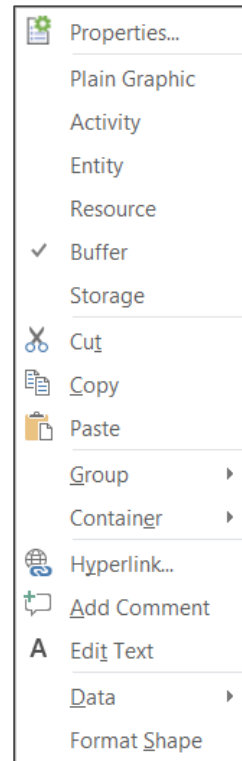- Examine different types of Kanban Systems

Poll 1

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Buffer Activities

- Accumulate, sort, add logic, or batch.

Inventory

Properties...
Plain Graphic
Activity
Entity
Resource
✓ Buffer
Storage
✂ Cut
Copy
Paste
Group ▶
Container ▶
Hyperlink...
Add Comment
A Edit Text
Data ▶
Format Shape

Shape Properties

BUFFER | LOGIC

◢ **General**

Name: Inventory 🔒

Capacity: Infinite

Output Rule: None ▼

◢ **Batching**

Type: None ▼

▷ **Notes**

◢ **Advanced**

Sync Name: ☑

Show Text: ☑

None
Batch
Unbatch
Rebatch
Accumulate

None
First In First Out
Last In First Out
By Entity Type

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Storage Activities

- Trigger arrivals either by time intervals or level

Storage
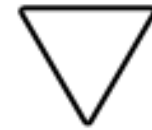
Show ShapeSheet	
Properties...	
Plain Graphic	
Activity	
Entity	
Resource	
Buffer	
✓ Storage	
✗ Cut	
Copy	
Paste	
Group	▶
Container	▶
Hyperlink...	
Add Comment	
A Edit Text	
Data	▶
Format Shape	
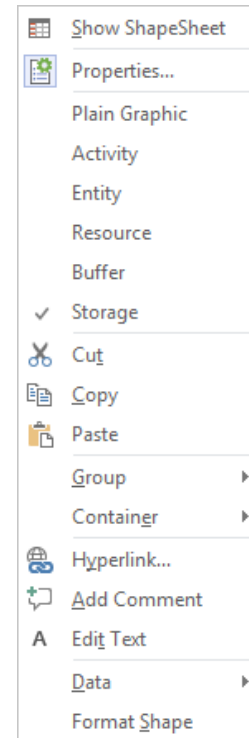
Properties   ✕

STORAGE | LOGIC

Name:	Storage_	🔒
Capacity:	Infinite	
Entity:	Work_Unit	▼
Initial Level:	100	

▲ **Trigger**

Type:	By Level	▼
Level:	10	

▲ **Order**

Entity:	Work_Unit	▼
Quantity:	100	
Source:	Work_Unit at Activity	▼

▷ Notes

▷ Advanced
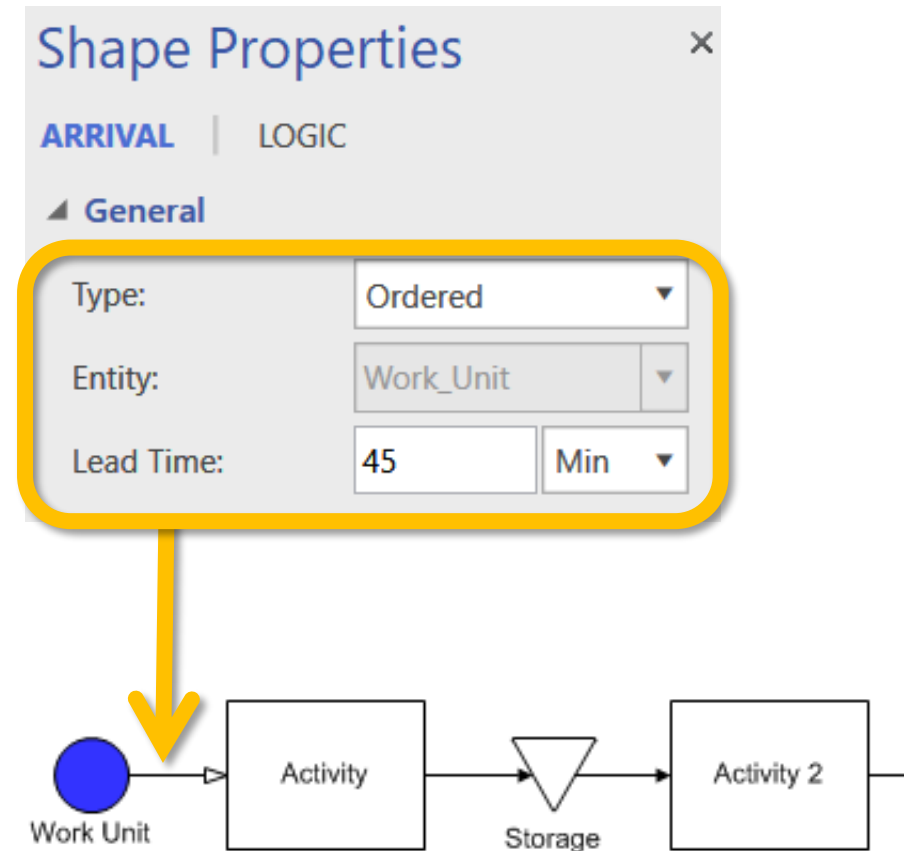
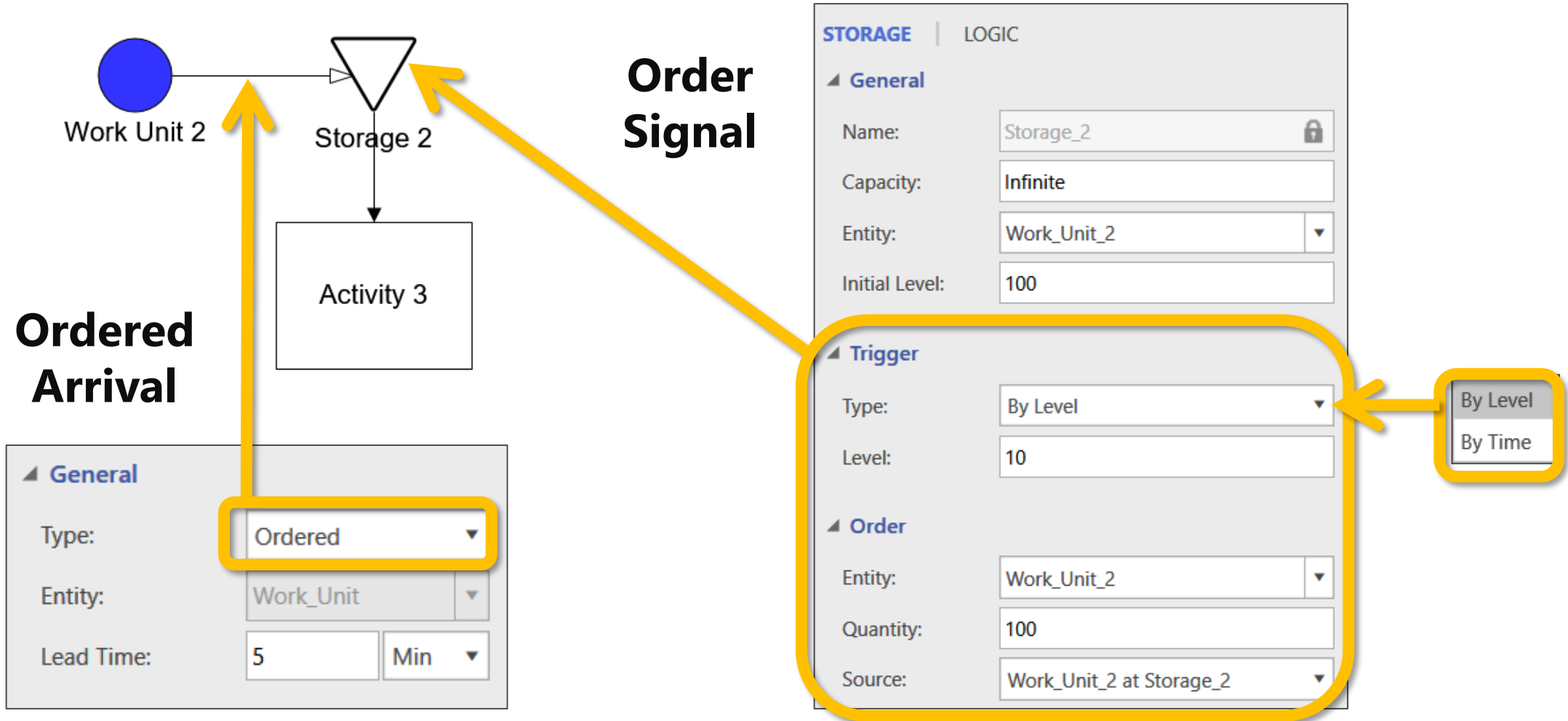| By Level |
|---|
| By Level |
| By Time |

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Ordered Arrivals

- The arrival will only happen when triggered by a storage location

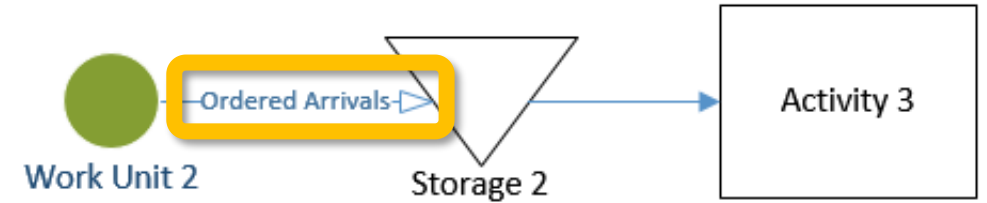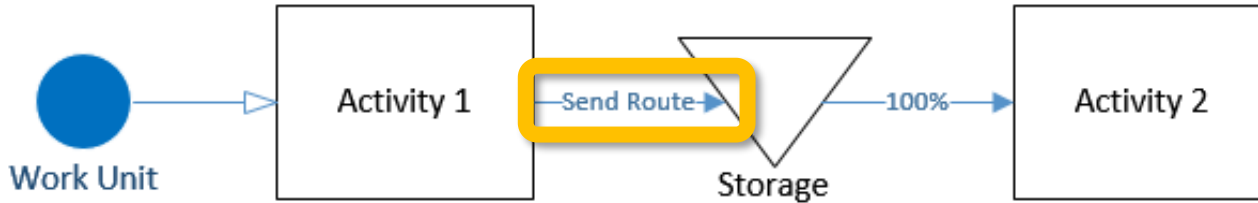# Triggering Orders with Storage Activities

Send Routing

- The Send Route is like a gate holding the Entities at the upstream Activity.
- In this example, Entities will not be allowed to route out of the "Activity" until a signal or trigger is sent from somewhere else in the model.

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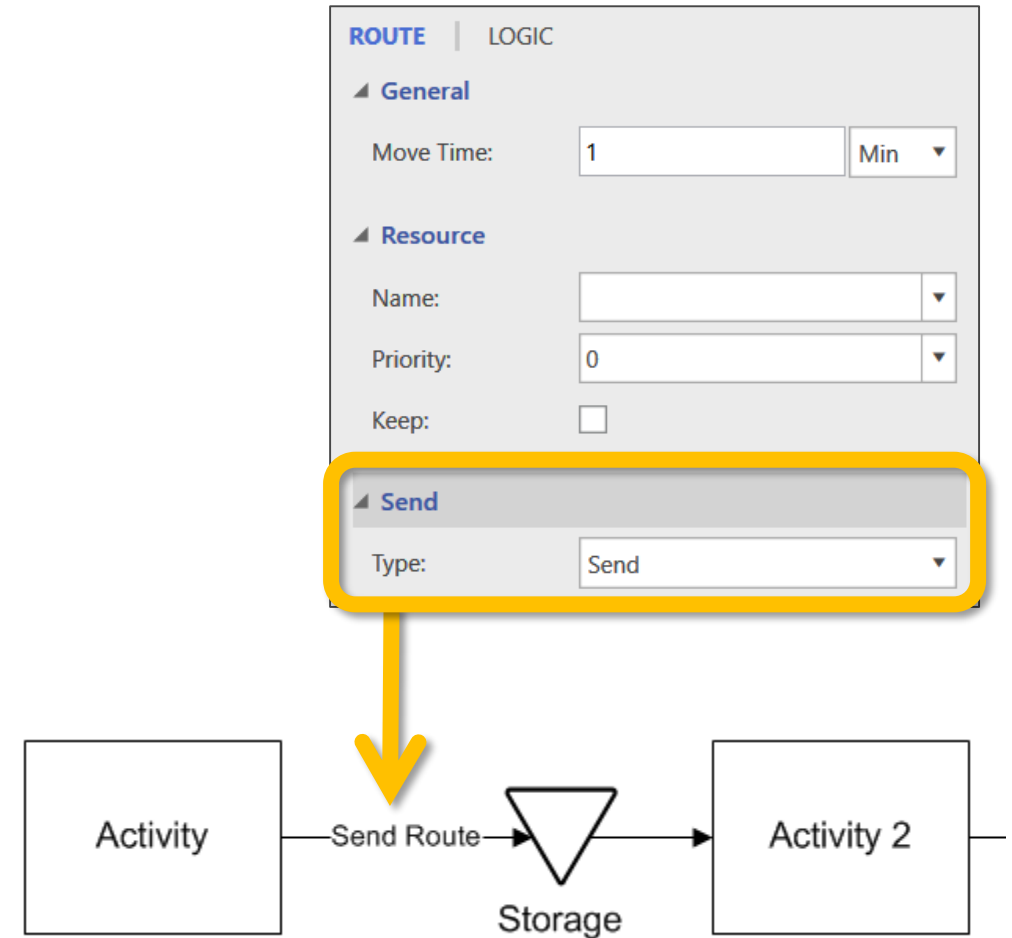
Order Signals & Storage Activities

Send Logic Statement

- The Send Routing acts as a gate where entities are held at the activity until either a **Send Logic statement** OR an **Order** from a storage allow the entities to route.

- Send statement allows entities to route from an activity where a send route is defined.

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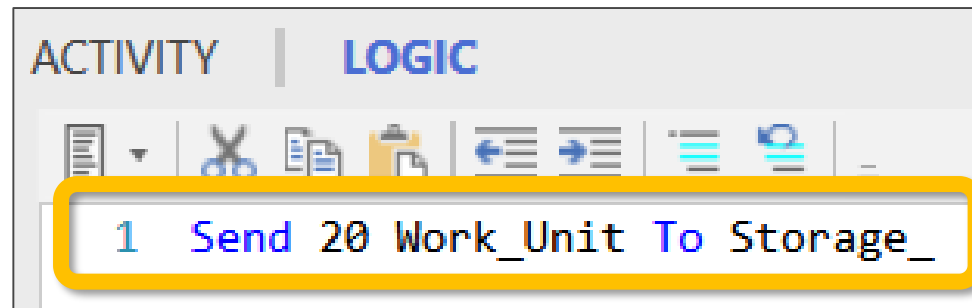
"Just-in-Time Pull System" Example

- A lamp is handed off from a Test operation to a Packaging operation only when the Packager is ready for it. Otherwise the tester holds on to the lamp.
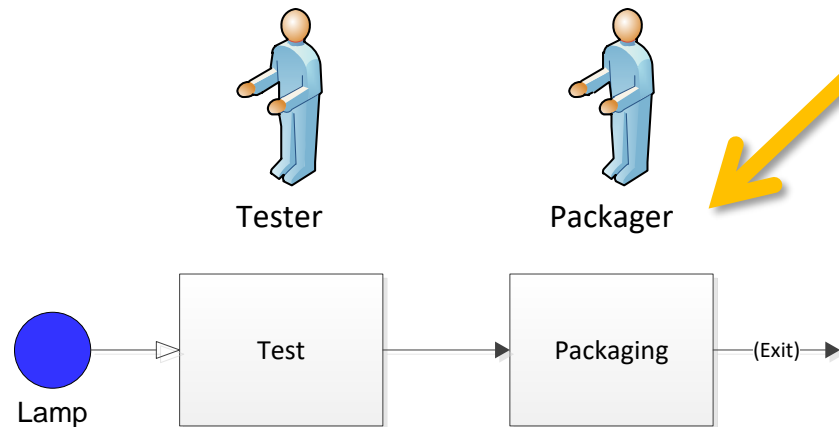
ACTIVITY | LOGIC

◢ General

Name: Packaging 🔒

Capacity: 1

Time: T(3, 5, 10) | Min ▼

Statistics: ☑

Hourly Cost: 0

▷ Availability
▷ Resource

◢ Buffers

Input: 0

Output: 0

The input buffer capacity of the Packaging activity is set to 0.

Tester

Packager

Lamp

Test

Packaging

(Exit)

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Kanban Example One

- Large industrial pumps are drawn from a Pump Final Assembly storage and boxed. When the inventory of pumps in the storage drops to 2, the Pump Inventory buffer at an adjacent facility will Send an additional 10 pumps.

Pump

Pump Inventory → Send Route → Activity 1 → Activity 2 → Pump Final Assembly → Activity 3 → Shipping Area → (Exit)
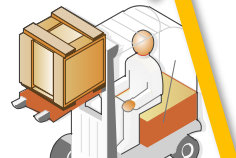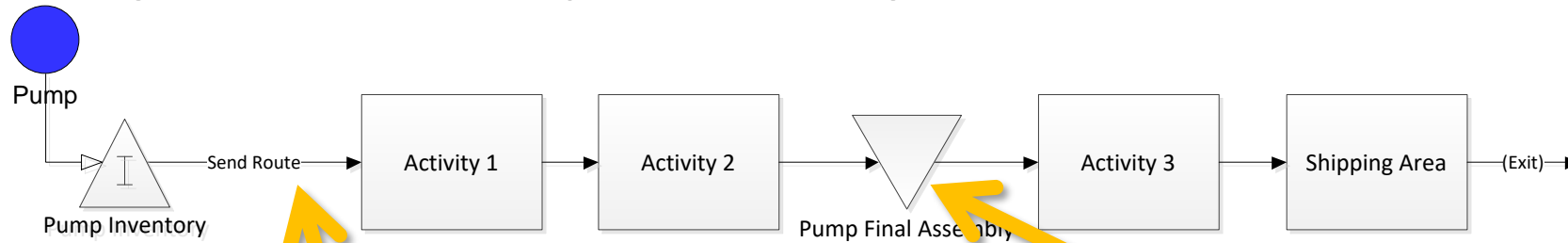
Send Route

ROUTE | LOGIC

◢ General
Move Time: 2 | Min

◢ Resource
Name: Forklift
Priority: 0
Keep: ☐

◢ Send
Type: Send

Entities are held in Pump Inventory buffer until a Send signal is received from the downstream storage indicating the drop to a trigger inventory level.
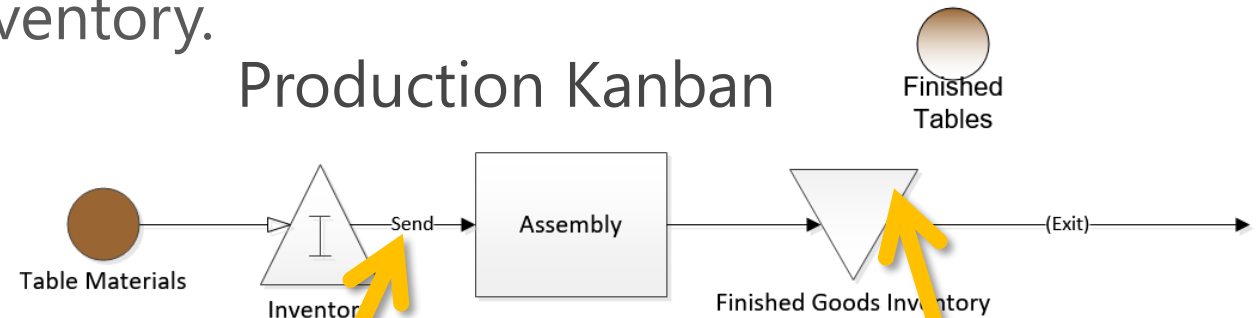
Signal to Send

STORAGE | LOGIC

◢ General
Name: Pump_Final_Assembly 🔒
Capacity: Infinite
Entity: Pump
Initial Level: 6

◢ Trigger
Type: By Level
Level: 2

◢ Order
Entity: Pump
Quantity: 10
Source: Pump_Inventory to Activity_1

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11

Kanban Example Two

- Whenever a finished goods inventory storage of Tables drops to 10, an additional 100 tables are sent from inventory to assembly and then on to finished goods to replenish the inventory.

The Send route releases entities to an upstream activity when the signal is received that a downstream inventory has dropped to a specified inventory level.

Production Kanban

Finished Tables

Table Materials → Inventory →Send→ Assembly → Finished Goods Inventory →(Exit)→

Send Route

ROUTE | LOGIC

⊿ General
Move Time: 1 Sec

⊿ Resource
Name:
Priority: 0
Keep: ☐

⊿ Send
Type: Send

Signal to Send

STORAGE | LOGIC

⊿ General
Name: Finished_Goods_Inventory 🔒
Capacity: Infinite
Entity: Finished_Tables
Initial Level: 100

⊿ Trigger
Type: By Level
Level: 10

⊿ Order
Entity: Table_Materials
Quantity: 100
Source: Inventory to Assembly

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Special Pull Situations

- In a make-to-order process the manufacture and subsequent assembly of a product doesn't begin until an order is received. The facility makes two different products (A and B). Product A requires 1 component X and 2 component Y. Product B requires 1 component Y and has 2 component Z. The component parts wait in their respective inventories until an order is received.

Uses Send routes in conjunction with the **Send** statement.
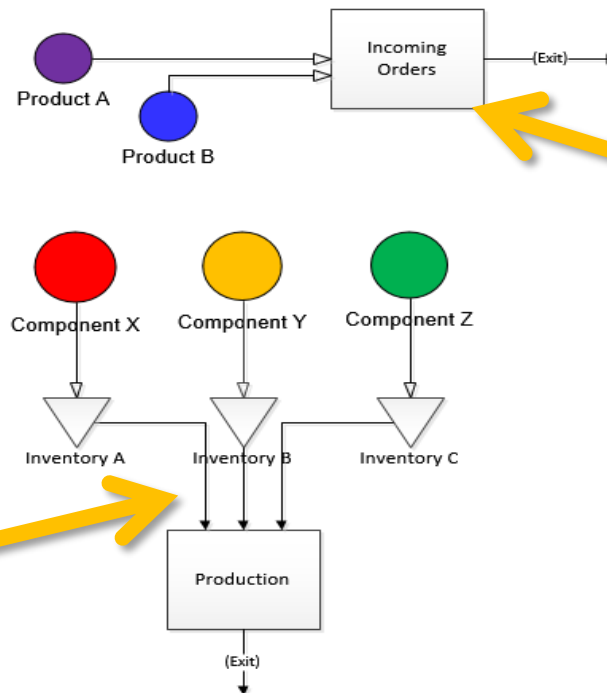
Special Pull Systems

Send Routes

```
ACTIVITY    LOGIC

1   //Signal for Product A Components:
2   If (Entity() = Product_A) Then
3   {
4         Send 1 Component_X To Production
5         Send 2 Component_Y To Production
6   }
7   //Signal for Product B Components:
8   Else
9   {
10        Send 1 Component_Y To Production
11        Send 2 Component_Z To Production
12  }
```

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Storage Racks

- Allows for routing of various entities into one Activity, but entities are sorted within each "shelf" by Entity type, allowing for their own unique re-order triggers.

- Storage shapes may be stacked. Each storage shape in the stack must have a unique entity selected in the General Entity field.

Storage

Stacked Storage
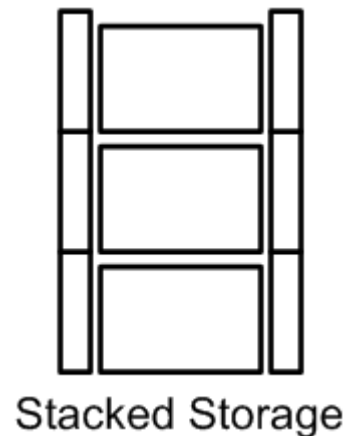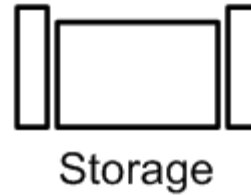
STORAGE	LOGIC

General

Name:	Supermarket
Capacity:	Infinite
Entity:	LH
Initial Level:	100

Trigger

Type:	By Level
Level:	10

Order

Entity:	LH
Quantity:	100
Source:	LH at Buffer_

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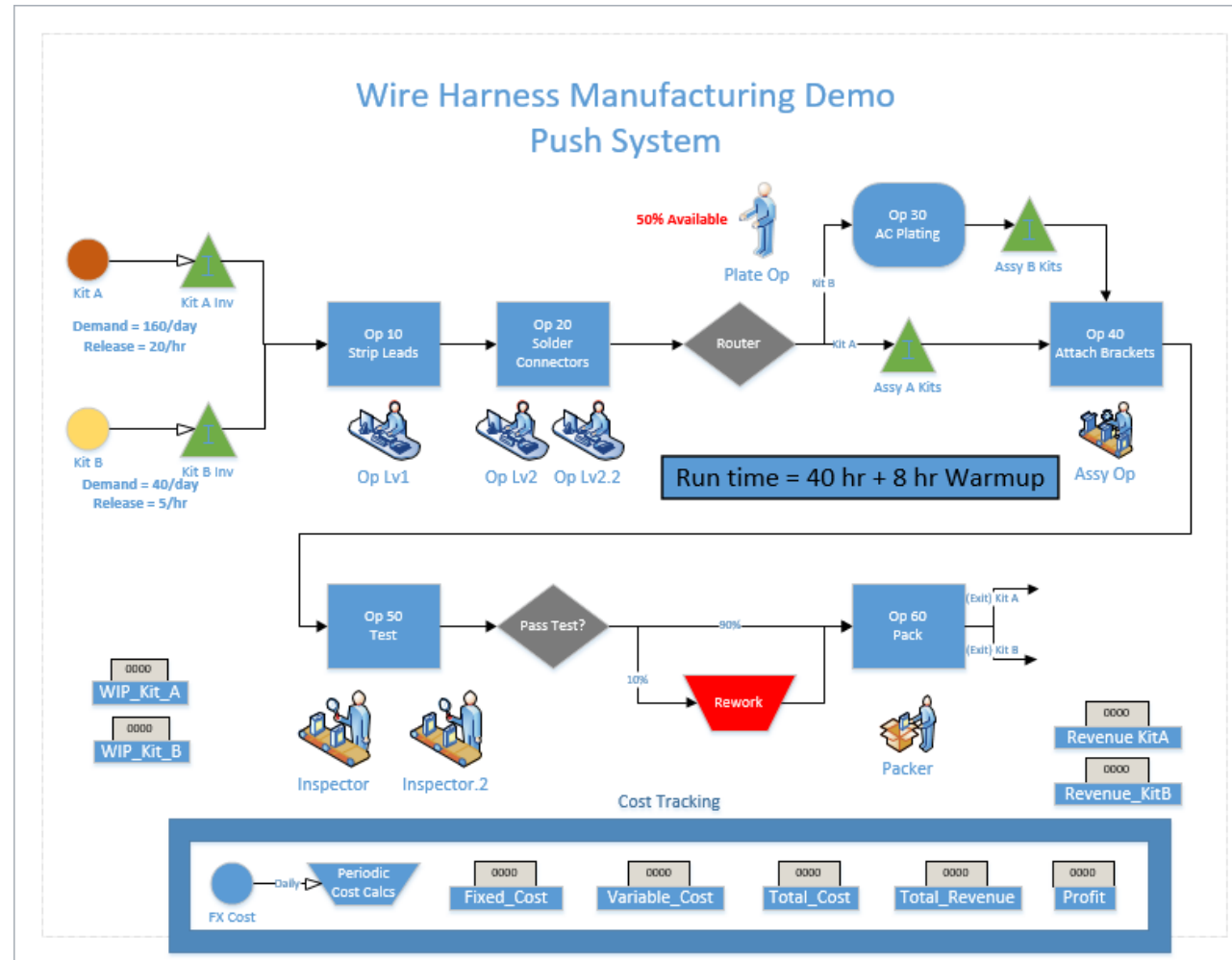
Pull System Example

- When the Order is received, a Send statement is issued to pull the needed parts (LH & RH) out of the Supermarket.
- Attach Route uses a variable (Order_Qty) to attach the correct quantity of ordered parts to the Customer Order.
- When the Inventory in the Supermarket (Storage) gets low, it is replenished with a trigger for Ordered Arrivals.
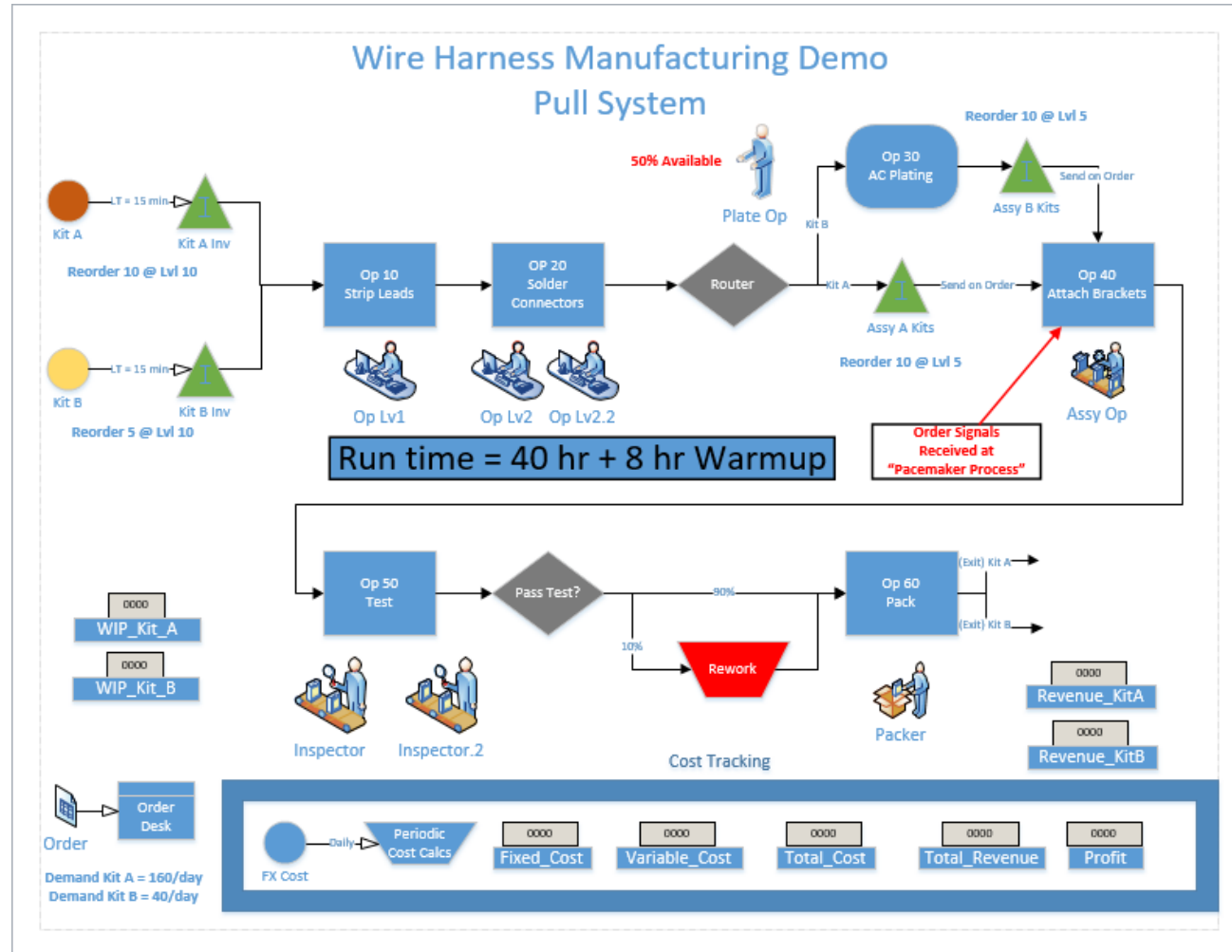

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Push vs Pull System Example

Wire Harness Manufacturing Demo
Push System

Push vs Pull System Example

Wire Harness Manufacturing Demo — Pull System
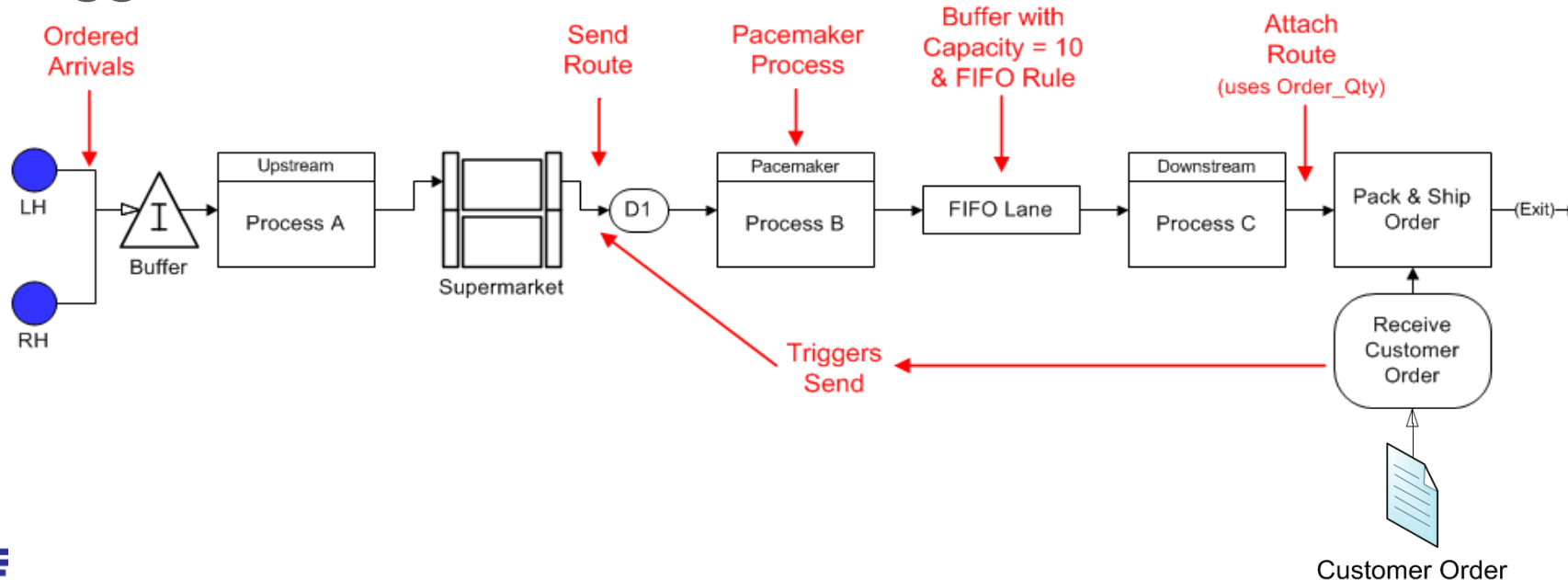
FINISHED

- Thanks for attending this training course! We hope it was helpful.
- Remember, help is only an email or phone call away.
- Good luck and happy modeling!

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