END3032 – SYSTEMS SIMULATION

Laboratory Practice #8

The Shipping Boxes Unlimited Problem

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Problem Definition

- Computer monitors arrives at the Shipping Boxes Unlimited on average every 15 minutes according to the exponential distribution.
- Then they are sent to the packing table.
- Similarly, empty boxes arrive at the factory at the rate of one every 15 minutes, exponentially and they are sent to the packing table.
- At this station, monitors are packed into boxes.
- Then packed boxes are sent for inspection. The inspector checks the contents of the box and tallies with the packing slip.
- Inspector loads packed boxes on an empty pallet.
- The loaded pallet is sent to the shipping dock and waits in the shipping queue.
- At the shipping dock, the packed boxes are unloaded from the pallet and they are prepared for the shipment.
- The empty pallet is returned, via pallet queue, to the inspector. There is only one pallet used in the system and this way it is recirculated.

Problem Definition

- Processing times are given in Table 1:

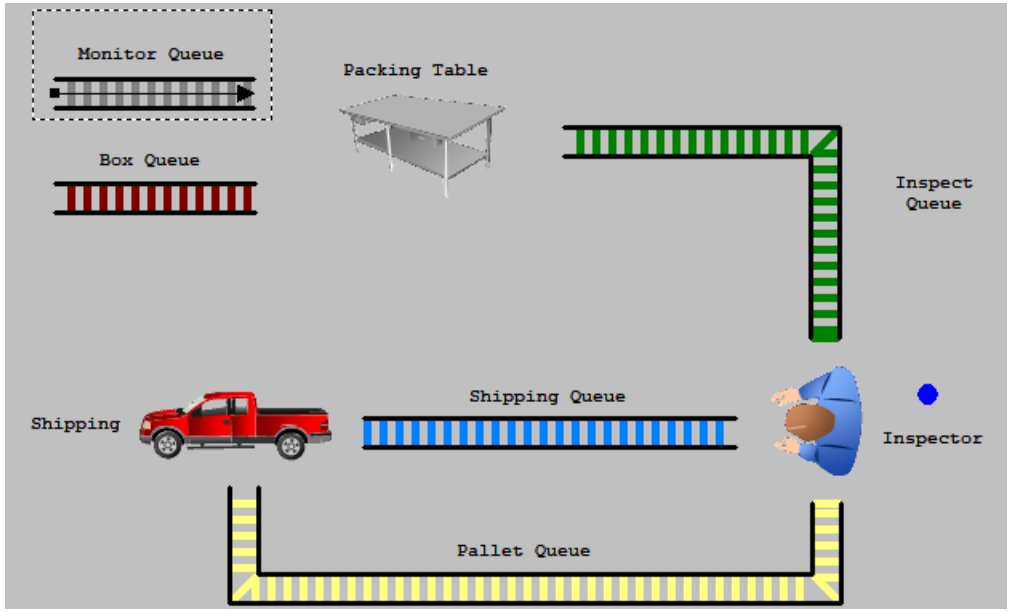
Process	Time (min)
Packing	Normal (5, 1)
Inspection	Normal (4, 2)
Loading on the pallet	Uniform (3, 1)
Unloading from the pallet	Uniform (3, 1)
Preparing for the shipment	Uniform (5, 1)

- Make a simulation model and estimate the number of monitors shipped and the amount of the work-in-process (WIP) of the monitors.
- Run the simulation model for 100 hours.

Implementation on ProModel

- Define the locations

Icon	Name	Cap.	Units	DTs...	Stats	Rules...
	Monitor_Queue	INFINITE	1	None	Time Series	Oldest, FIFO
	Box_Queue	INFINITE	1	None	Time Series	Oldest, FIFO
	Packing_Table	1	1	None	Time Series	Oldest
	Inspect_Queue	INFINITE	1	None	Time Series	Oldest, FIFO
	Inspector	1	1	None	Time Series	Oldest
	Shipping_Queue	INFINITE	1	None	Time Series	Oldest, FIFO
	Shipping	1	1	None	Time Series	Oldest
	Pallet_Queue	INFINITE	1	None	Time Series	Oldest, FIFO



Implementation on ProModel

- Define the entities

Entities

Icon	Name	Speed (fpm)	Stats
	Monitor	150	Time Series
	Empty_Box	150	Time Series
	Packed_Box	150	Time Series
	Empty_Pallet	150	Time Series
	Loaded_Pallet	150	Time Series

- Set entity arrivals

Arrivals

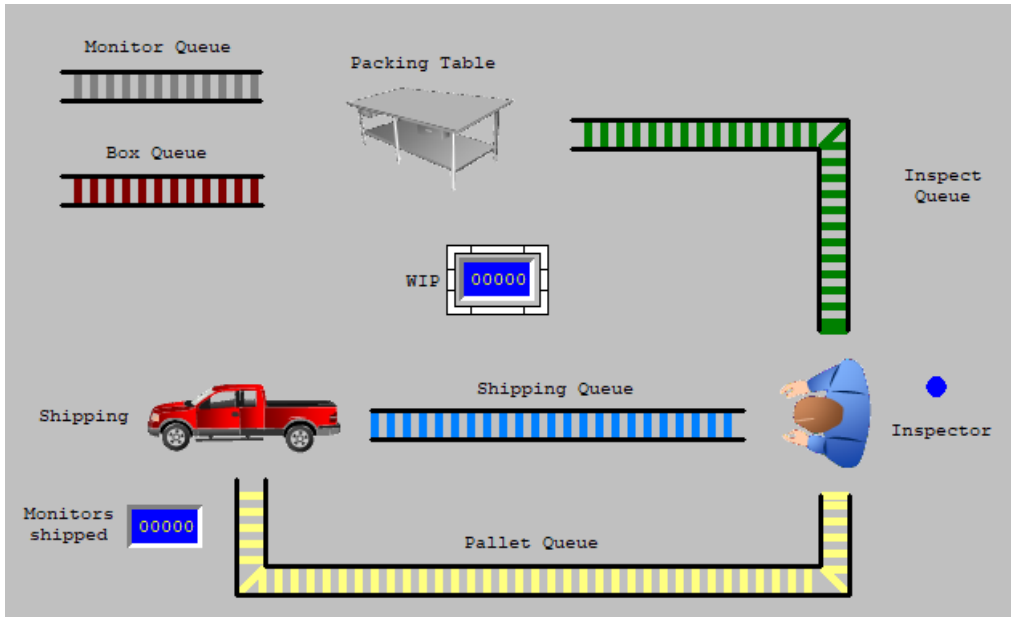
Entity...	Location...	Qty Each...	First Time...	Occurrences	Frequency
Monitor	Monitor_Queue	1	0	INF	E (15) MIN
Empty_Box	Box_Queue	1	0	INF	E (15) MIN
Empty_Pallet	Pallet_Queue	1	0	1	0

Implementation on ProModel

- Define variables in order to estimate the number of monitors shipped and WIP of the monitors
  - Put icons on the layout

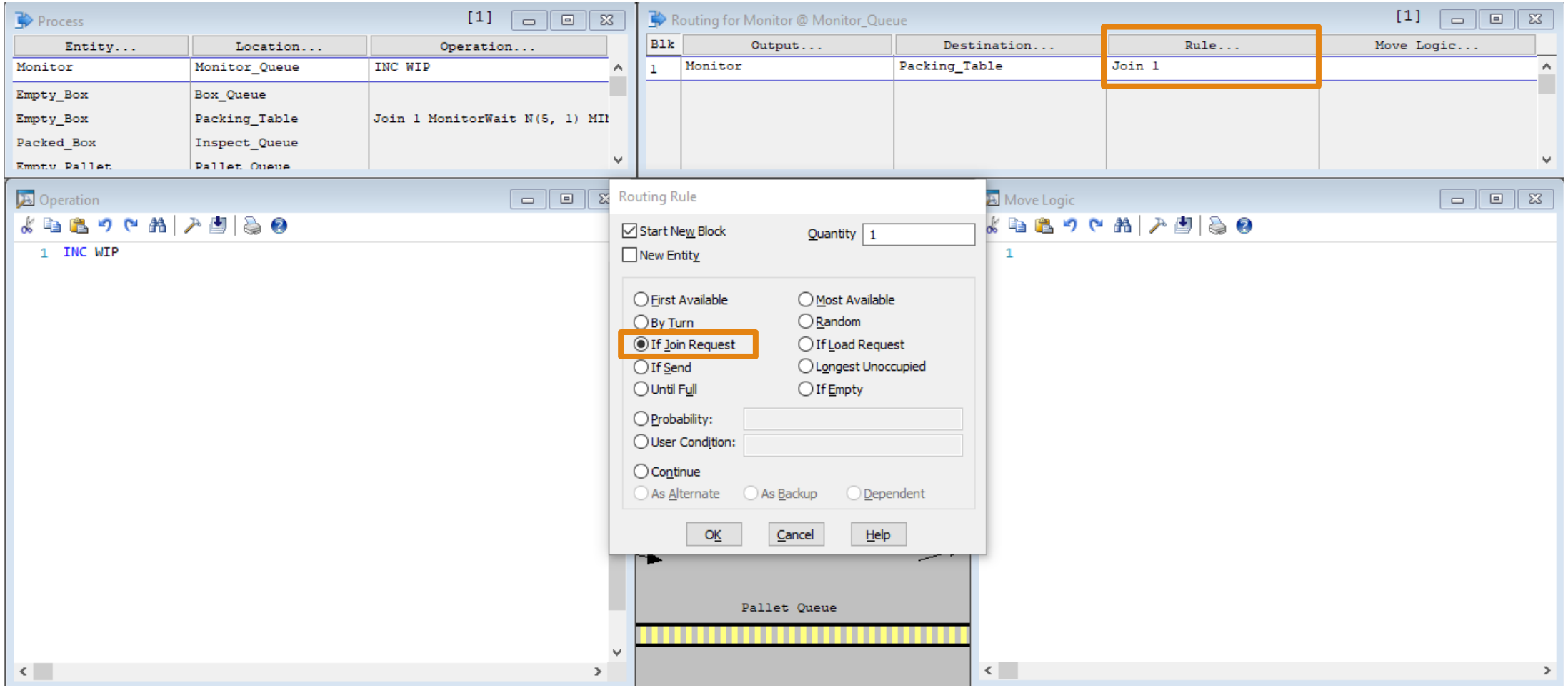
Variables (global)

Icon	ID	Type	Initial value
Yes	Monitors_shipped	Integer	0
Yes	WIP	Integer	0



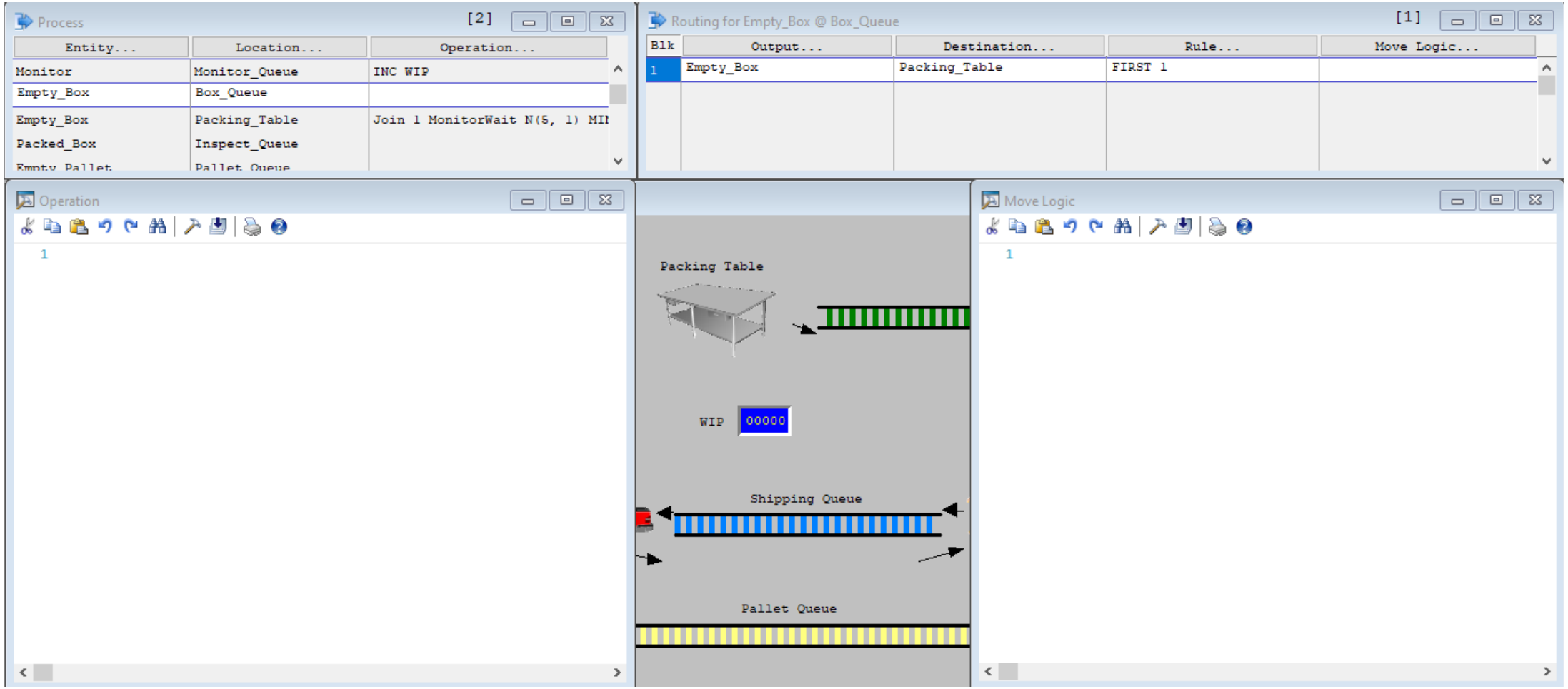
Implementation on ProModel

- Processing for Monitor: Monitor Queue → Packing Table



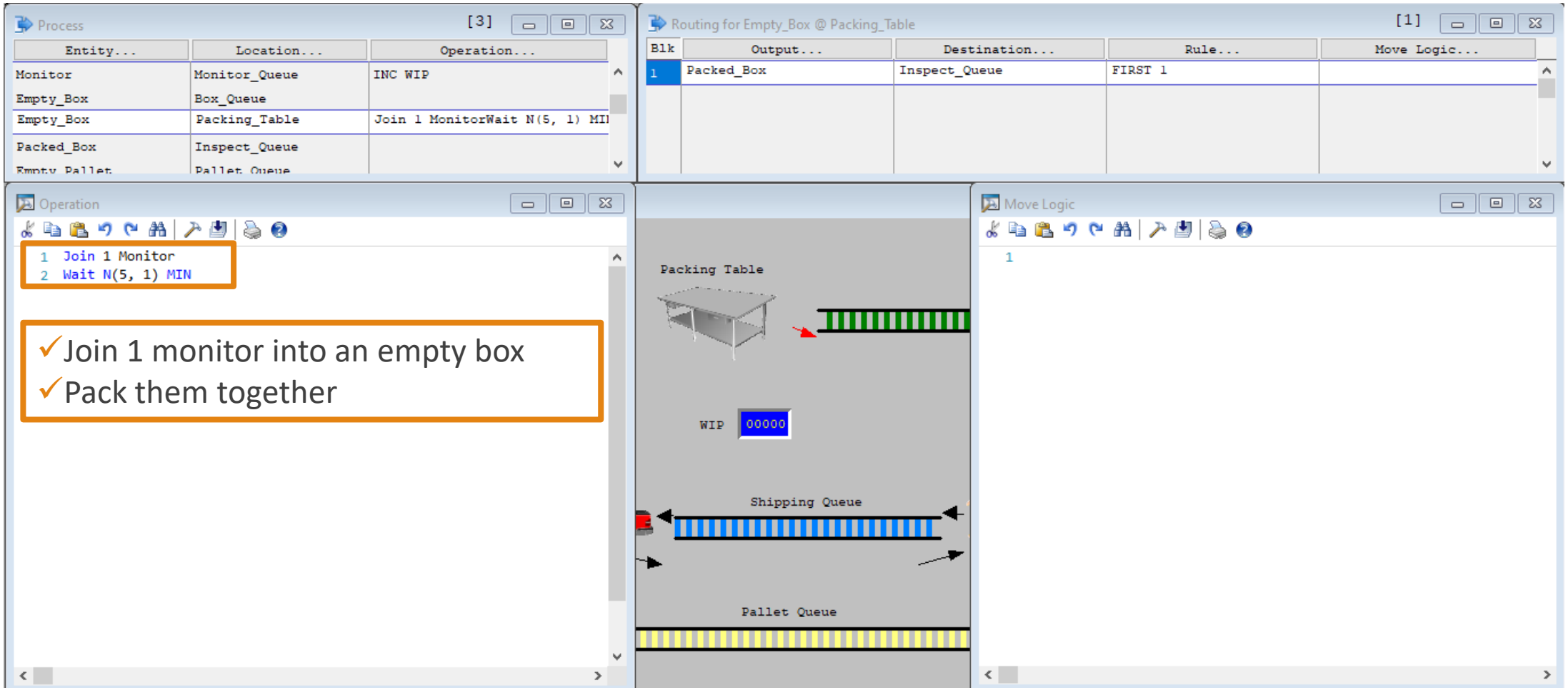
Implementation on ProModel

- Processing for Empty Box: Box Queue → Packing Table



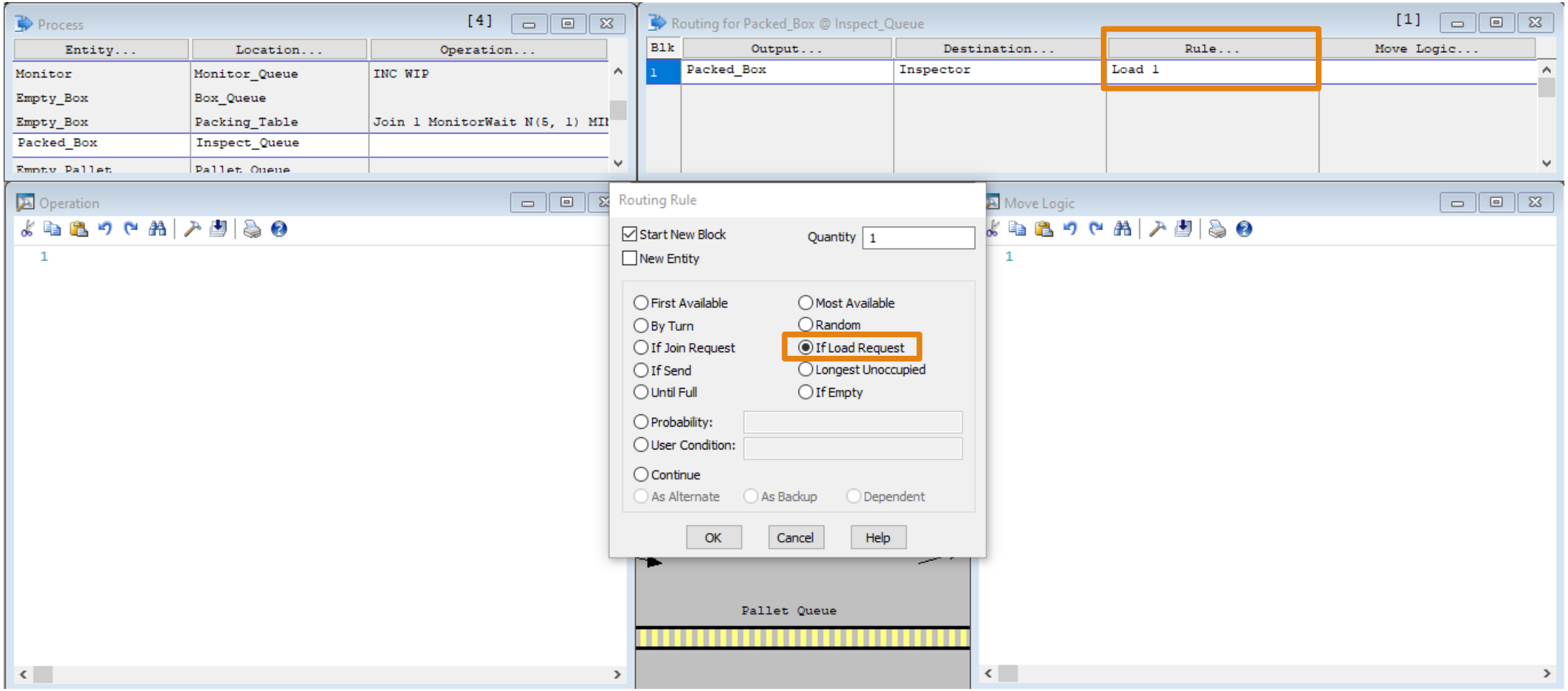
Implementation on ProModel

- Processing: Packing Table → Inspect Queue



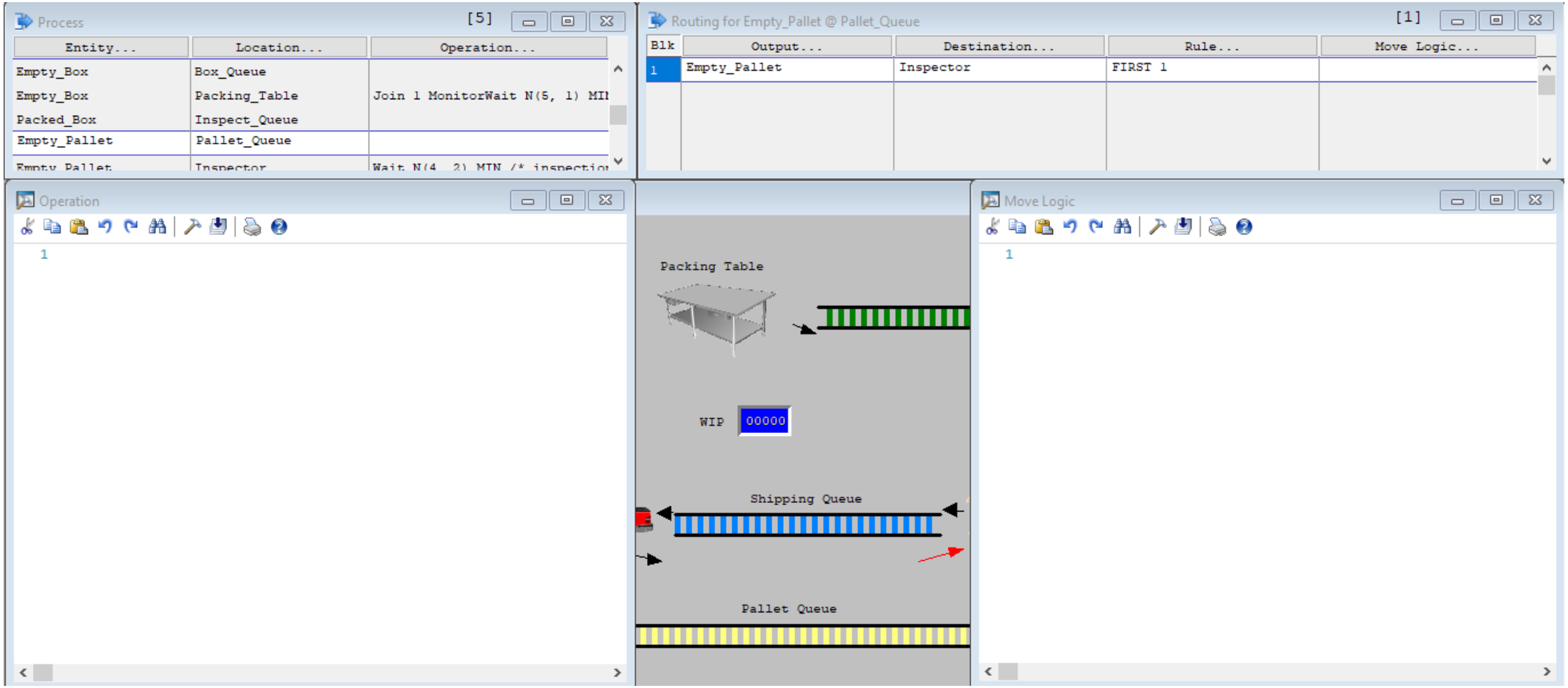
Implementation on ProModel

- Processing for Packed Box: Inspect Queue → Inspector



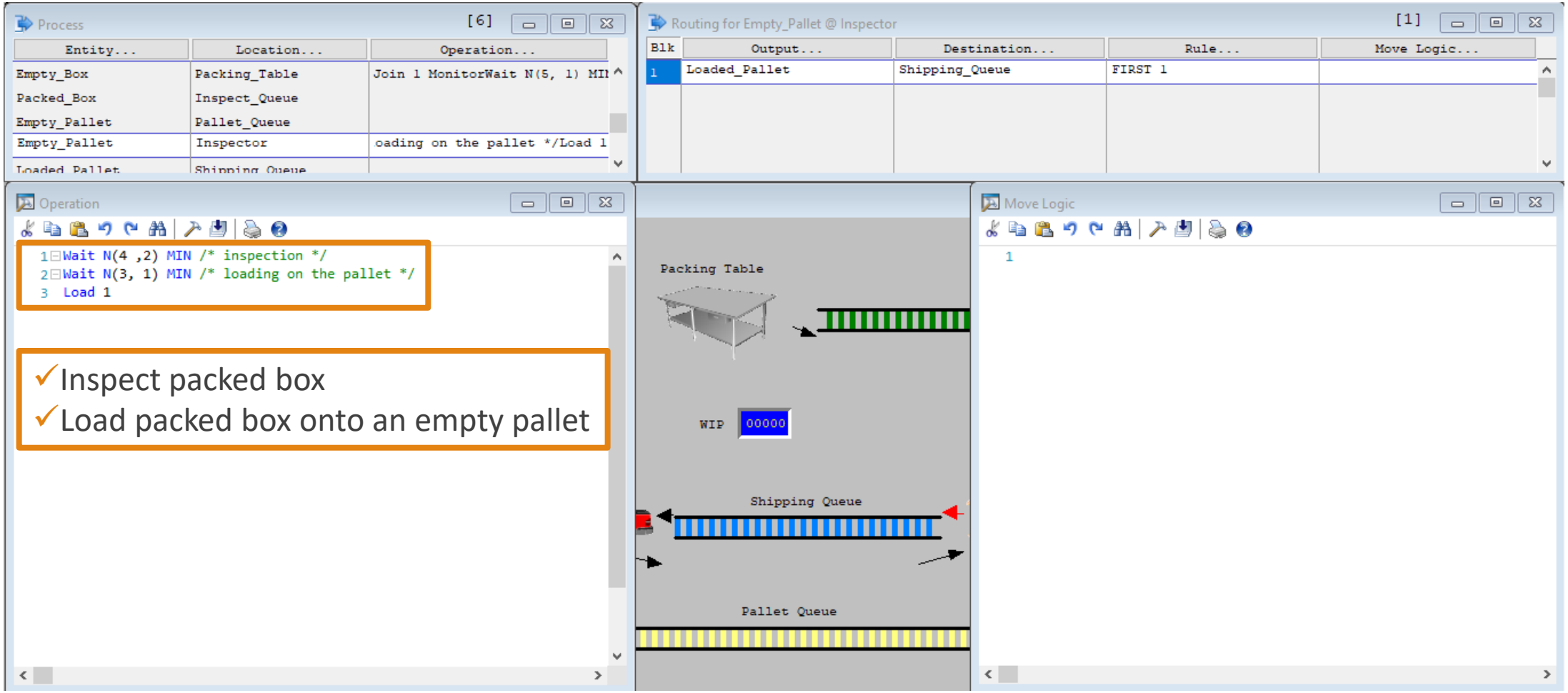
Implementation on ProModel

- Processing for Empty Pallet: Pallet Queue → Inspector



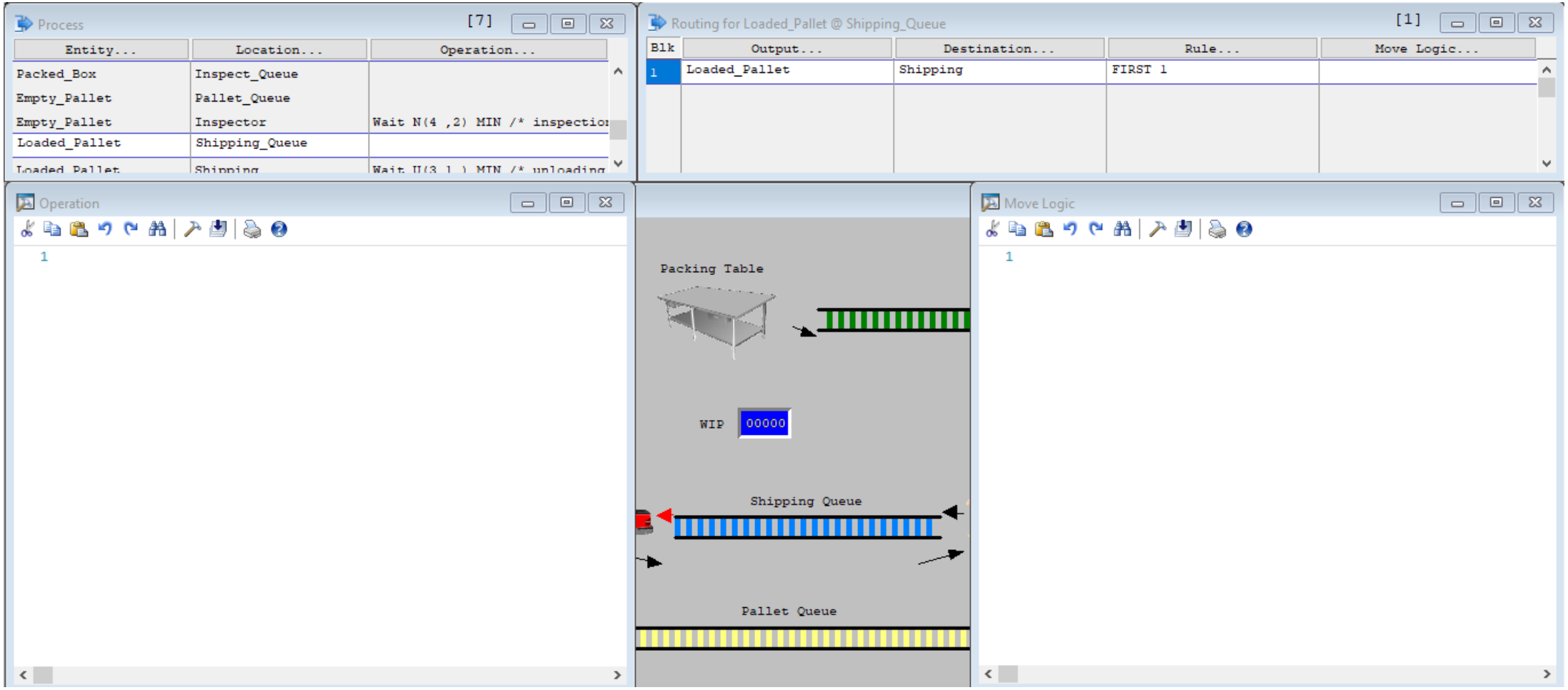
Implementation on ProModel

- Processing: Inspector → Shipping Queue



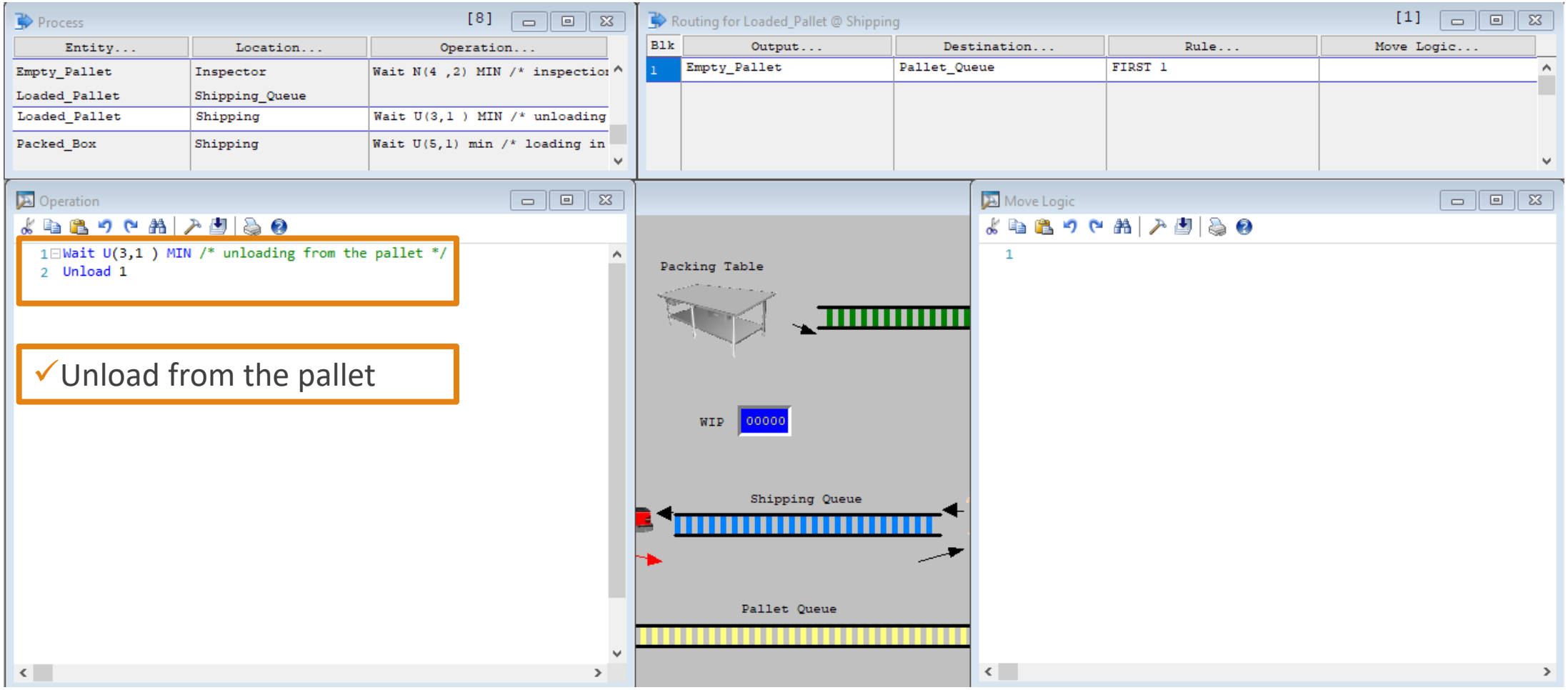
Implementation on ProModel

- Processing: Shipping Queue → Shipping



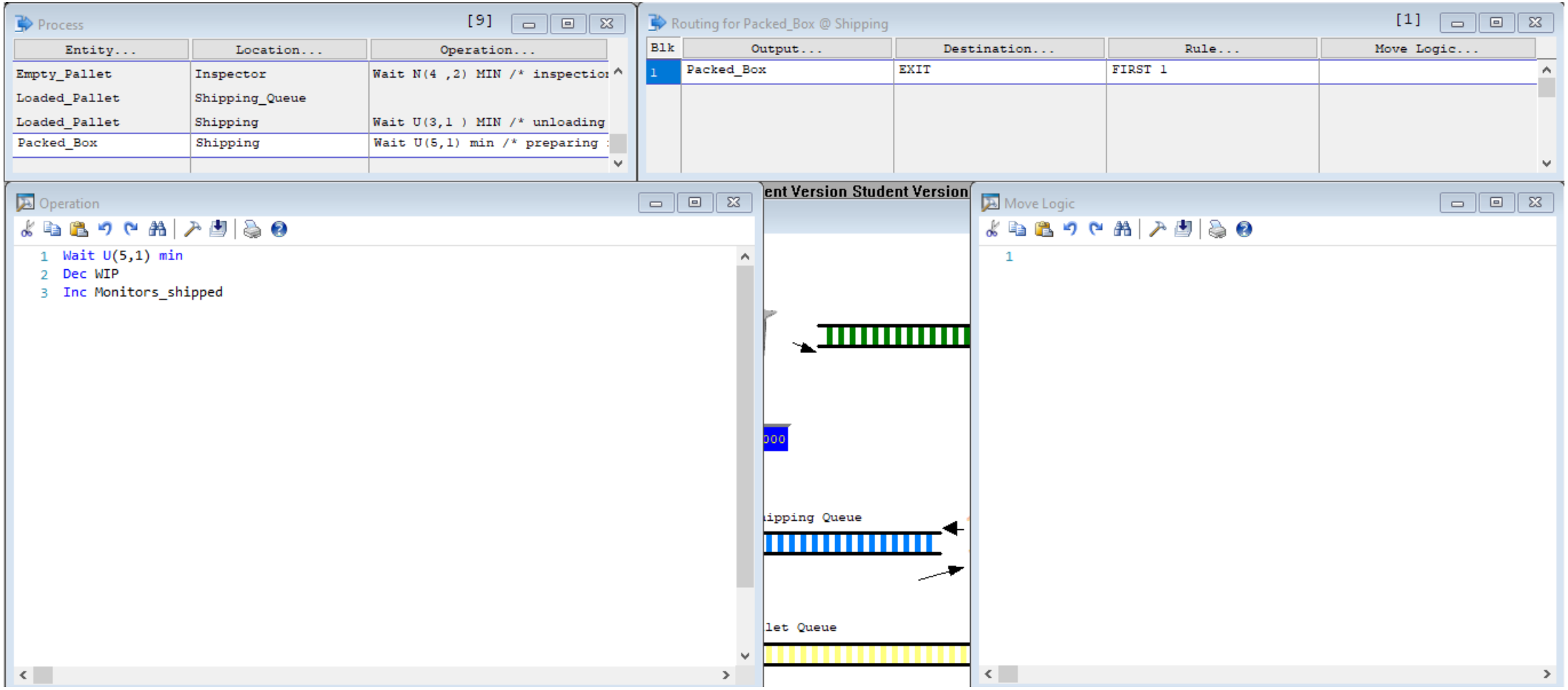
Implementation on ProModel

- Processing: Shipping → Pallet Queue



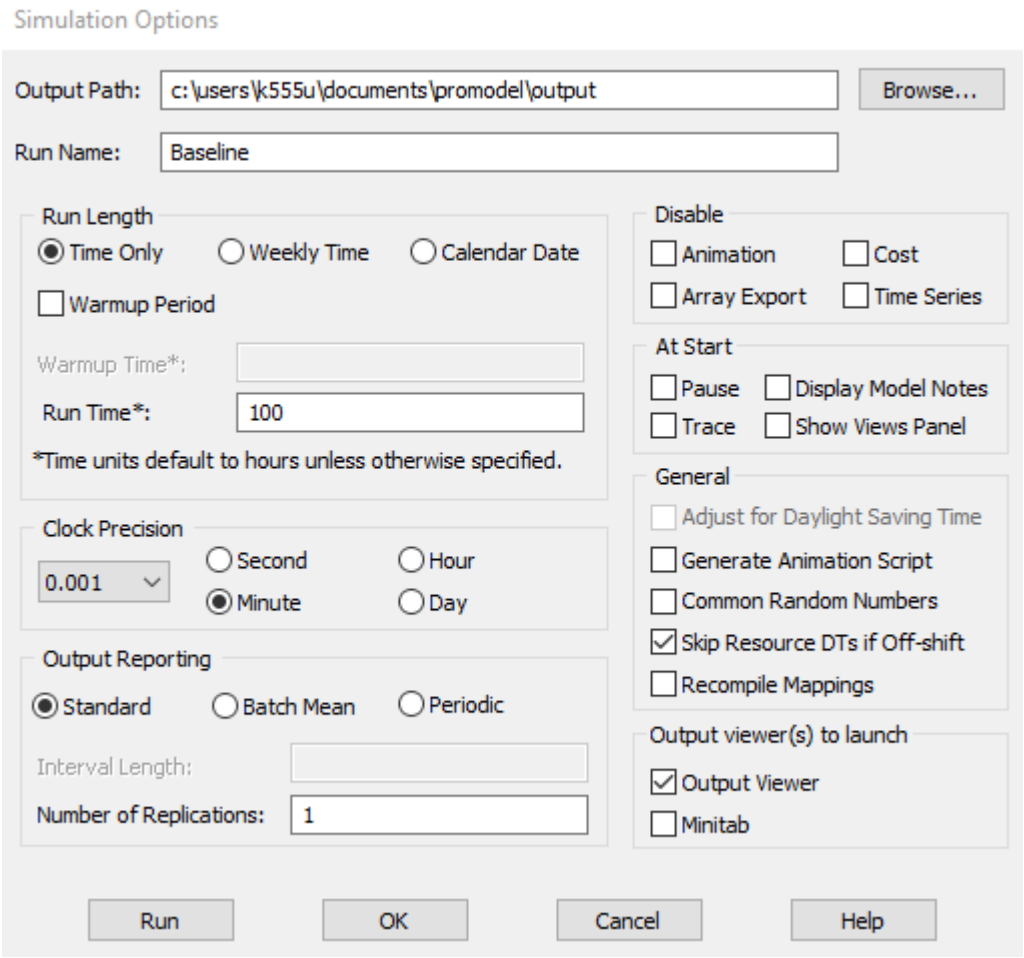
Implementation on ProModel

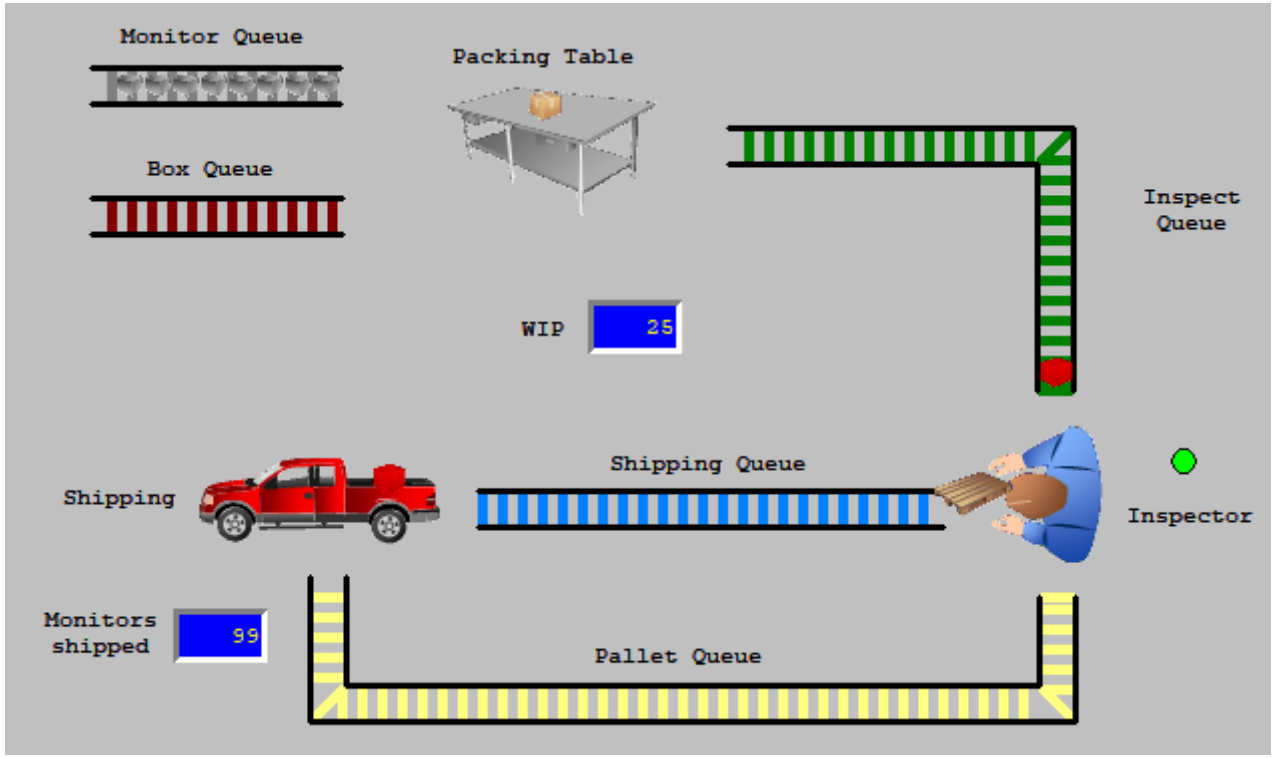
- Processing: Shipping → EXIT



Implementation on ProModel

- Run the simulation for 100 hours and get the results





Thanks!...

Questions?

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