

# **STUDY OF A MANUFACTURING FACILITY**

## **SYSC 5001**

### **Project Deliverable 4**

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## SYSC 5001

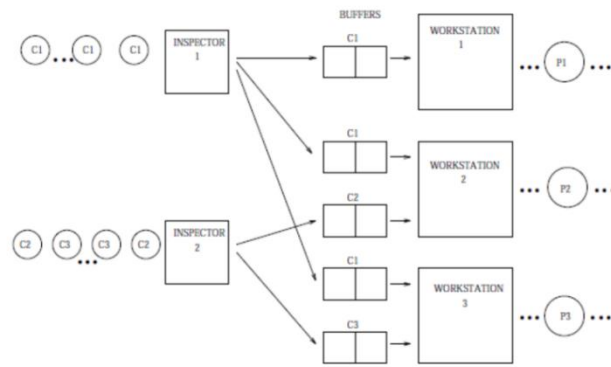
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#### Alternative Operation Policy:

#### Alternative Conceptual Model:

A manufacturing facility assembles three different types of products (P1, P2, P3) and has different components (C1, C2, C3) as follows:

- P1: C1
- P2: C1, C2
- P3: C1, C3



Two inspectors (I1, I2) clean and repair the components as follows:

- I1: C1
- I2: C2, C3 (Randomly)

The inspectors will never have to wait for components. There is an infinite inventory of them always immediately available.

There are three workstations in the facility, named W1, W2, and W3, which assemble products P1, P2, P3, respectively. After the components pass inspection, they are sent to their respective workstations. Each workstation has a buffer capacity of two components, with one buffer available for each of the component types needed. A product can begin being assembled only when components of all types required are available. If all workstation buffers for a specific type of component are full, the corresponding inspector who finished inspecting a component with the same type is considered "blocked" until there is an opening, at which time the inspector can resume processing and sending components of that type.

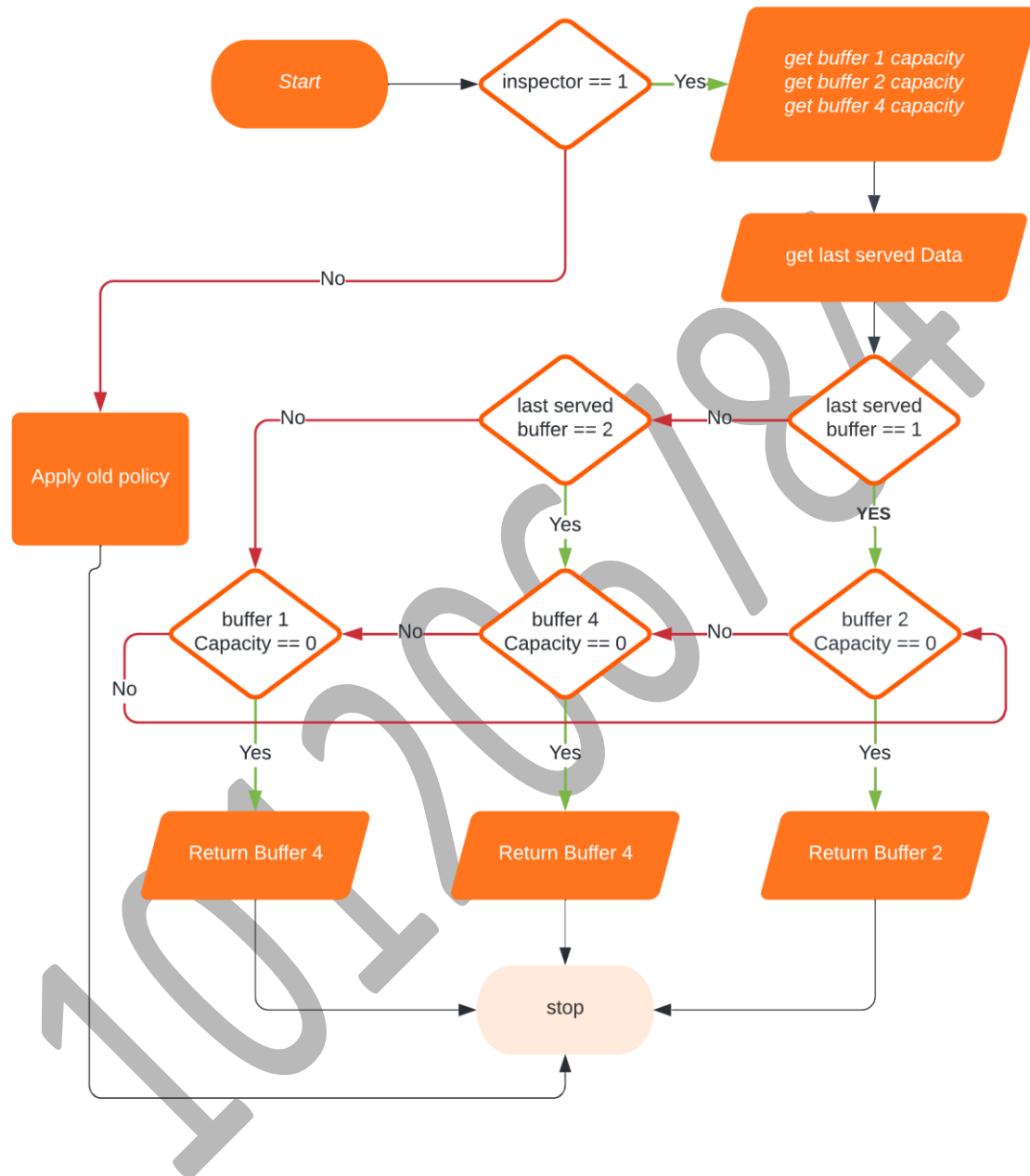
In the present mode of operation, Inspector 1 routes components C1 to the buffer with the smallest number of components in waiting (i.e., a routing policy according to the shortest queue). **In the case of a tie, apply Round Robin to make sure only Workstation 1 is not prioritized.**

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#### Alternative Design Flow Chart:



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Alternative Design Policy Production Run:  
**Stop point = 899.999 min.**

result:

Product 1 throughput: 0.05

Product 2 throughput: 0.003

Product 3 throughput: 0.014

Workstation 1 busy probability: 0.224

Workstation 2 busy probability: 0.022

Workstation 3 busy probability: 0.136

Buffer 1 average occupancy: 0.059

Buffer 2 average occupancy: 0.851

Buffer 3 average occupancy: 0.055

Buffer 4 average occupancy: 0.724

Buffer 5 average occupancy: 0.173

Inspector 1 block probability: 0.231

Inspector 2 block probability: 0.591

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#### Comparison:

	Original Policy	Alternative Policy
Product 1 throughput	0.087	0.050
Product 2 throughput	0.003	0.003
Product 3 throughput	0.002	0.014
Workstation 1 busy probability	0.422	0.224
Workstation 2 busy probability	0.022	0.022
Workstation 3 busy probability	0.037	0.136
Buffer 1 average occupancy	0.138	0.059
Buffer 2 average occupancy	0.223	0.851
Buffer 3 average occupancy	0.444	0.055
Buffer 4 average occupancy	0.005	0.724
Buffer 5 average occupancy	1.536	0.173
Inspector 1 block probability	0.000	0.231
Inspector 2 block probability	0.840	0.591

#### Consequences of Alternative Policy:

With the change in this policy, we notice a tremendous increase in the throughput of product 3 by 700%. Although there was a decrease in the throughput in product 1 by 30% which was anticipated. Overall, this new policy increased the throughput.

There is also an increase in the amount of time the workstations remain busy i.e., producing products. This is a move in the right direction.

There are more components in buffers 2 and 4 which is the ideal case. This does reduce the number of components in buffer 1 but this is good as we produce more products.

Finally, the block time for the Inspectors is reduced which is good.

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#### Conclusion:

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In conclusion, I would say that the original policy, in theory, is ideal but in implementation only sends components to workstation 1. The alternative to this is round robin which is a way better solution for inspector 1 only as it produces more products 2 and 3.

#### Final Report:

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The final merged report is in “SYSC 5001 – Final Report”. Please check that. The source code is in a separate folder and passed in the final report.