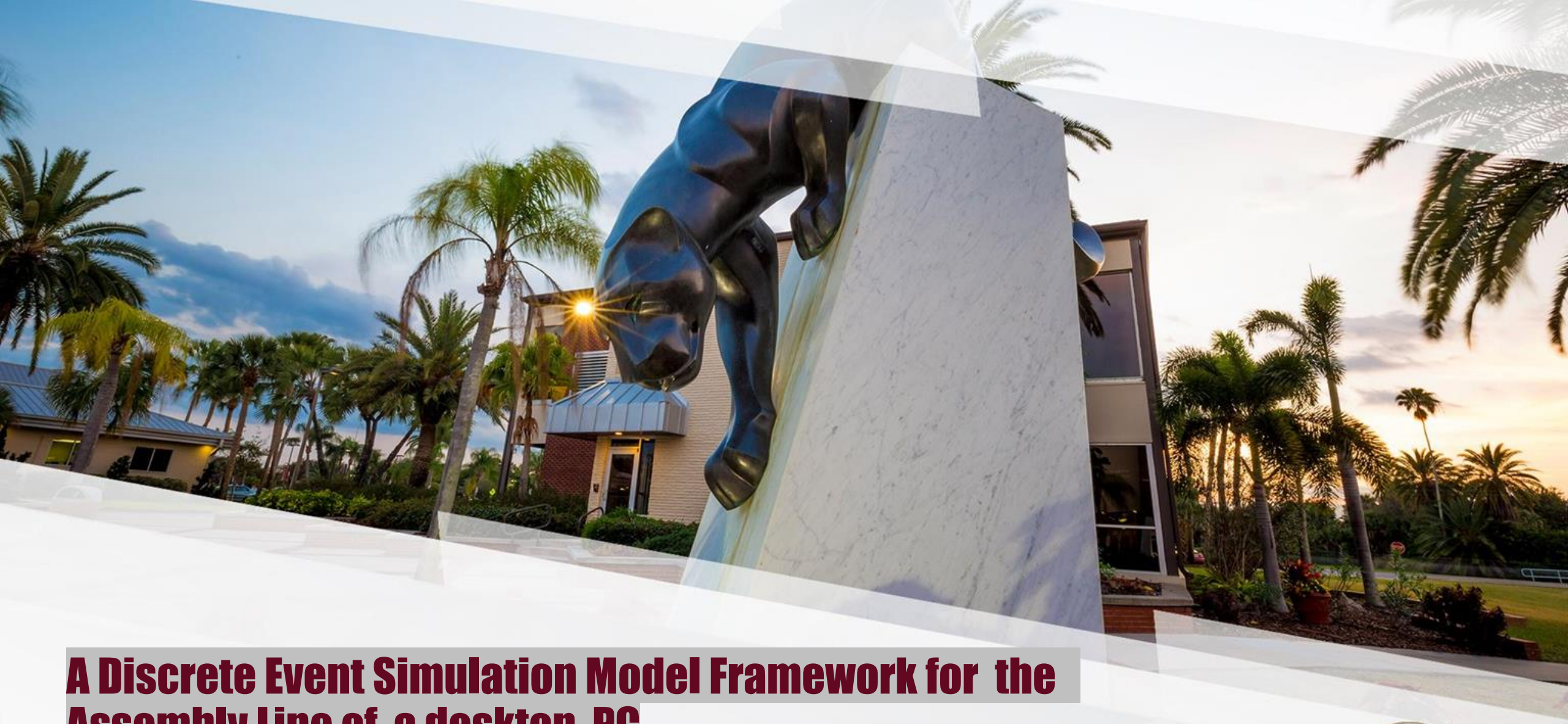

A Discrete Event Simulation Model Framework for the Assembly Line of a desktop PC

SYS 5350– System Modeling & Analysis – Hamed Al Subhi

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Agenda

1. Problem Statement

3. Assumptions

4. Introduce an Operation Scenario

5. Model Construction/ Conception

5.1. Description of the Model

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5. Conclusion

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1. Problem statement

- The focus of this paper is to develop a generalized framework for DES of the backend of an electric device assembly line, desktop PC, encounters some challenges regarding productivity and resource utilization. By utilizing the constructed framework, The interaction between the entities of the assembly line, which are heatsinks, PCBA, Brackets and screws, as well as the correspondent processes of the plant, including TIM dispense, Traceability, heatsink assembly and mechanical assembly, will be modeled and assessed in terms of this interaction's impact on the overall performance of the assembly plant. The framework will introduce effective strategies for optimization in order to minimize cycle times, highlight the bottlenecks and improve the allocation of resources and , eventually, improving the productivity of the assembly plant. Knowing that there is no data of a similar real-world system is available, adequate assumptions are to be made related to the distributions and characteristics of the entities and processes which will formulate the simulation within the framework.

3. Objectives

1) Developing a robust and comprehensive framework using DES model to analyze and simulate the assembly line of a hardware computer assembly line that would give researchers and practitioners on the field of the management of computer hardware assembly plants valuable insights, guidelines and recommendations for improving productivity and efficiency through studying various scenarios.
2) Provide insights into cycle times, allocation of resources and identifying strategies to reduce idle time.

4. Introduce an Operation Scenario of the assembly facility

Think about a real-world factory that creates electrical devices, consider specifically an assembly line that produces a desktop PC. Regular business hours for the backend assembly line are normally 8:00 AM to 5:00 PM. Depending on the production requirement, the line may operate in more than one shift, with each shift having a fixed start and finish time. The assembly operations are carried out within the allotted working time for each shift, omitting breaks and non-working hours, while also keeping track of the line's overall productivity and efficiency.

3. Assumptions:

1) Processes are dependent such that they are executed in a predefined sequence

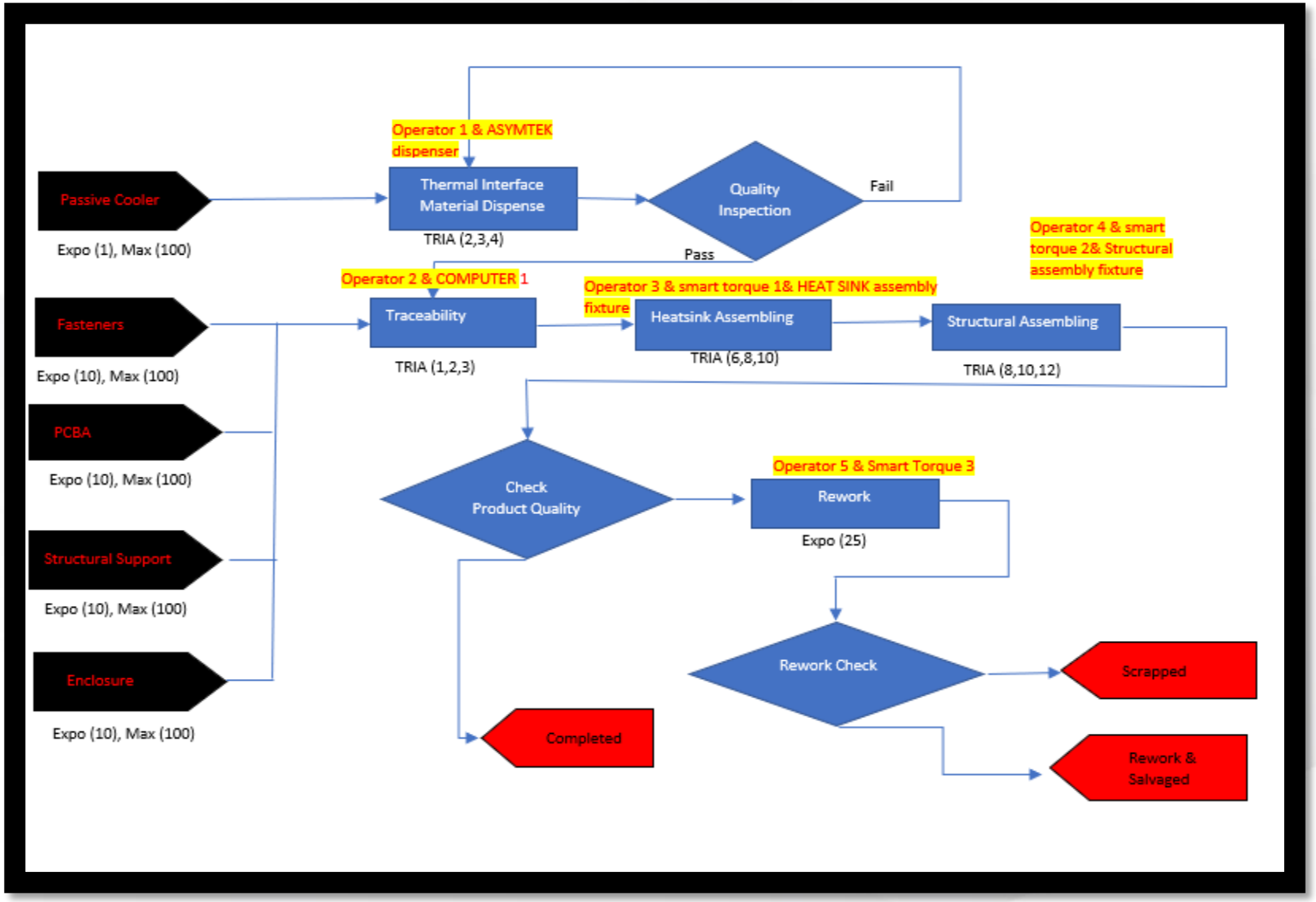
2) No Machine failures or any type of interruptions during the simulation

3) Assume there is only one backend assembly line

4) Assume homogenous processing time and behavior of the following entities: PCBA, Bracket, cover and screw

5) Assume a stationary Poisson process for the arrival entities

4. Description of Operation & Conception of the model



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5. Description of the Model

Entities:

1) **Passive Cooler:** a heatsink helps cool down the heat and dissipate it from the hardware components. It's attached to the PCBA by fasteners and thermal adhesives. The interarrival times between passive coolers are exponentially distributed with a mean of 1,wheres is the maximum number of components of time of arrival is 100
2) **PCBA** : it's referred to the Printed Circuit board Assembly, which houses various electric parts, including microchips, resistors, and capacitors. The interarrival times between PCBA parts are exponentially distributed with a mean of 10 ,whereas the maximum number of components of time of arrival is 100
3) **Structural Support:** It's typically a plastic or metal bracket that is installed on the PCBA. The interarrival times between structural support parts are exponentially distributed with a mean of 10 ,whereas the maximum number of components of time of arrival is 100
4) **Enclosure** : It's a cover that encloses and protects the internal components of t the electric hardware. The interarrival times between cover entities are exponentially distributed with a mean of 10 ,whereas the maximum number of components of time of arrival is 100
5) **Fasteners:** After the enclosure is being placed correctly over the PCBA and the internal components of the hardware, its's fastened using some type of screws. The interarrival times between fastener entities are exponentially distributed with a mean of 10 ,whereas the maximum number of components of time of arrival is 100

5. Description of the Model

Processes :

1) **TIM Dispense process :** a thermal interface material is dispensed onto the proper areas of the correct areas. It follows a triangular distribution.
2) **Traceability :** It's the process of tracking and Recording the important information about the assembly process to ensure the quality control. This process includes scanning, labeling, and associating components to a unique identifier . It follows a triangular distribution.
3) **Heatsink assembling process :** It's a process that facilitates the attachment of the heatsink onto the PCBA. It follows a triangular distribution.
4) **Structural assembling process :** It's the process where entities, structural support, fasteners and enclosure, are structured togather. It follows a triangular distribution.

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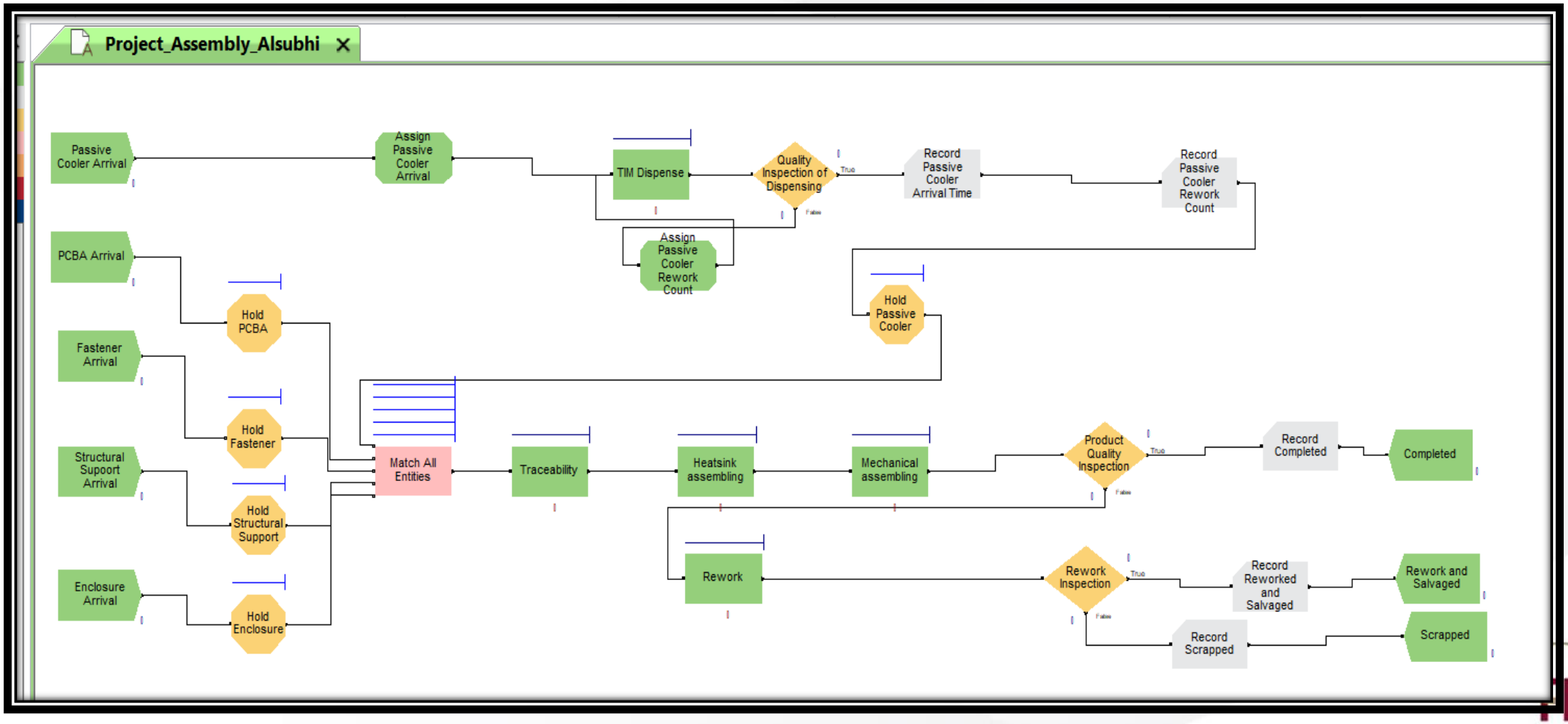
5. ARENA Model



Thank you!

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