Lab 4: Simulation with Arena

Your task in this lab is to simulate and animate a model of a two-station queueing system in the simulation modeling environment Arena. Read the description below before starting the lab.

The Situation Leviathan Limited, a very large enterprise indeed, maintains a repair facility that reconditions certain expensive products when they fail. The repair facility consists of a repair station, an inspection station and a combined repair-and-inspection station. The repair station makes the first attempt to repair a product. The product then moves to the inspection station to verify that the repairs have been successful. Products that pass inspection are shipped back to their owner. The small number of products that fail inspection move to the combined repair-and-inspection station where they are repeatedly repaired and inspected until they work properly. The original vision for this configuration was to exploit the efficiency of specialized repair and inspection stations for most products, and have a general-purpose station for the particularly difficult cases.

Regrettably, profits have not been good for Leviathan Ltd., so management is searching for ways to make more efficient use of resources. An industrial engineer (IE) has noticed that the combined repair-and-inspection station is not heavily utilized; she speculates that this station can be eliminated by sending products that fail inspection back to the primary repair station. For this to be a viable option it must not lead to excessive delays, so the IE must predict the impact of the change to support her proposal.

Some rough estimates are available. Products arrive at a rate of about 5 per day, can be repaired at a rate of about 6 per day, and are inspected at a rate of about 8 per day. Roughly 10 % of parts fail inspection, even if they have been repaired several time already. Simulate the proposed system for 30 days to estimate the average cycle time for repaired parts. Approximate all times as exponentially distributed.