

**MIT 2.852**  
**Manufacturing Systems Analysis**  
**Lecture 15**

*EXP2TL and CON2TL performance*

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# Exponential and Continuous Two-Machine lines

- *Exponential processing time*: exponential processing, failure, and repair time; discrete state, continuous time.
- *Continuous material, or fluid*: deterministic processing, exponential failure and repair time; mixed state, continuous time.

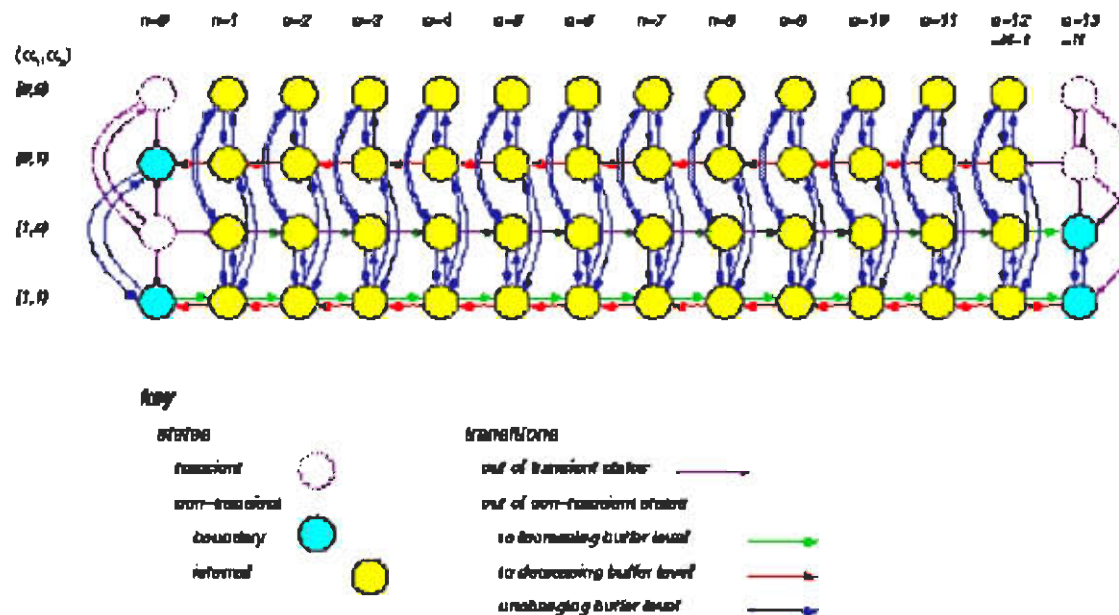
## Exponential and Continuous Two-Machine lines

*Exponential* — discrete material, continuous time

- $\mu_i \delta t$  = the probability that  $M_i$  completes an operation in  $(t, t + \delta t)$ ;
- $p_i \delta t$  = the probability that  $M_i$  fails during an operation in  $(t, t + \delta t)$ ;
- $r_i \delta t$  = the probability that  $M_i$  is repaired, while it is down, in  $(t, t + \delta t)$ ;

# Exponential and Continuous Two-Machine lines

State Transition Graph for Exponential Processing Time, Two-Machine Line



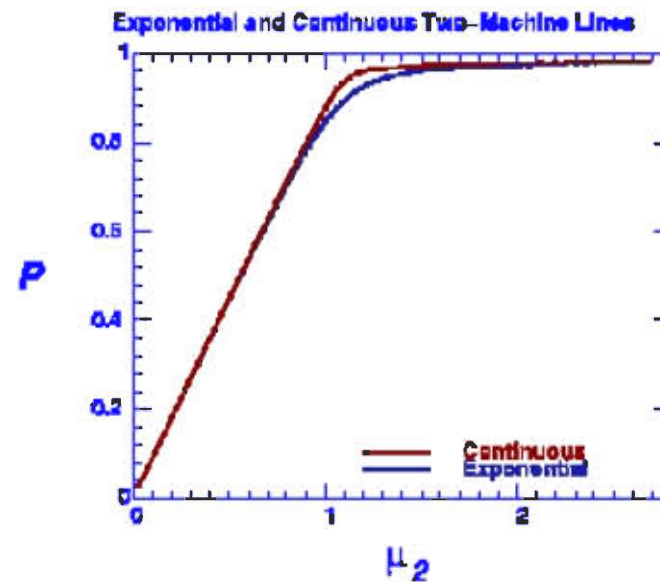
## Exponential and Continuous Two-Machine lines

*Continuous* — continuous material, continuous time

- $\mu_i \delta t$  = the amount of material that  $M_i$  processes, while it is up, in  $(t, t + \delta t)$ ;
- $p_i \delta t$  = the probability that  $M_i$  fails, while it is up, in  $(t, t + \delta t)$ ;
- $r_i \delta t$  = the probability that  $M_i$  is repaired, while it is down, in  $(t, t + \delta t)$ ;

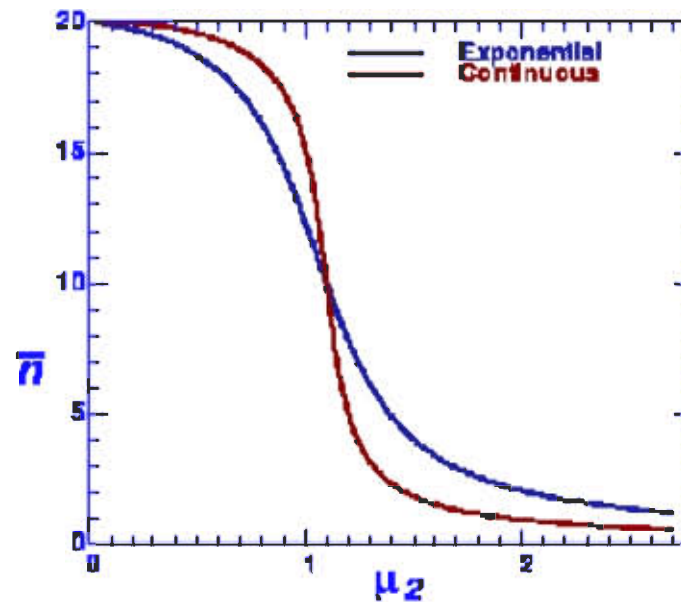
# Exponential and Continuous Two-Machine Lines

- $r_1 = 0.09$ ,  $p_1 = 0.01$ ,  $\mu_1 = 1.1$
- $r_2 = 0.08$ ,  $p_2 = 0.009$
- $N = 20$
- *Explain the shapes of the graphs.*



# Exponential and Continuous Two-Machine lines

- *Explain the shapes of the graphs.*



# Exponential and Continuous Two-Machine lines

