

به نام خدا

گزارش تمرین شماره ۱ شبیه سازی JMT

حسام تاج بخش

۹۳۷۲۵۱۰۲

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زمستان ۹۳

Part A:

Service demand of transaction at each resource:

jMVA Model Details

Classes

Name	Type	Population	Arrival Rate
Class1	open		5.0

Stations

Name	Type
CPU	Load Independent
Disk1	Load Independent
Disk2	Load Independent

Service Demands

	Class1
CPU	0.02
Disk1	0.03
Disk2	0.06

System throughput and throughput of each resource:

jMVA Solutions		
Throughput	Number of Customers	Residence Times
Utilization	System Power	Synopsis
Throughput		
Throughput for each class at each station.		
*	Aggregate	Class1
Aggregate	5.000000	5.000000
CPU	50.000000	50.000000
Disk1	15.000000	15.000000
Disk2	30.000000	30.000000

Utilization of each resource:

jMVA Solutions

Throughput | Number of Customers | Residence Times | **Utilization** | System Power | Synopsis

Utilization
Utilization of a customer class at the selected station. The utilization of a delay station is the average number of customers in the station (it may be greater than 1)

*	Aggregate	Class1
-	-	-
CPU	0.100000	0.100000
Disk1	0.150000	0.150000
Disk2	0.300000	0.300000

Residence time of transaction at each resource and system response time (aggregate response time) :

jMVA Solutions

Throughput | Number of Customers | **Residence Times** | Utilization | System Power | Synopsis

Residence Times
Total time spent by each customer class at each station. Note that the aggregate values are weighted by relative per-class throughput. The global aggregate is the system response time.

*	Aggregate	Class1
Aggregate	0.143231	0.143231
CPU	0.022222	0.022222
Disk1	0.035294	0.035294
Disk2	0.085714	0.085714

Number of transaction at system and each resource:

jMVA Solutions

Throughput | **Number of Customers** | Residence Times | Utilization | System Power | Synopsis

Number of Customers
Average number of customers for each class at each station.

*	Aggregate	Class1
Aggregate	0.716153	0.716153
CPU	0.111111	0.111111
Disk1	0.176471	0.176471
Disk2	0.428571	0.428571

Part B:

b) N' = Number of transaction is being served

$$N' = \sum_i X_i = U_i \rightarrow \begin{cases} N'_{cpu} = 0.1 \\ N'_{d_1} = 0.15 \\ N'_{d_2} = 0.3 \end{cases} \rightarrow N'_{\text{aggregate}} = 0.1 + 0.15 + 0.3 = 0.55$$

$$\text{Queue Length} = N - N' \rightarrow \begin{cases} Q.L_{cpu} = 0.011 \\ Q.L_{d_1} = 0.026 \\ Q.L_{d_2} = 0.228 \end{cases} \rightarrow N_{\text{waiting}} = 0.265$$

$$\text{Waiting Time} = \text{Residence Time} - \text{Demand} \Rightarrow \begin{cases} W.T_{cpu} = 0.022 - 0.02 = 0.002s \\ W.T_{d_1} = 0.035 - 0.03 = 0.005s \\ W.T_{d_2} = 0.085 - 0.06 = 0.025s \end{cases}$$

$$\text{Waiting Time of System} = R_{\text{sys}} - D_{\text{sys}} = 0.143 - (0.02 + 0.03 + 0.06) = 0.033 (s)$$

Part C:

Scenario 1:

Service Demand: No change in service demand. Similar to Part A.

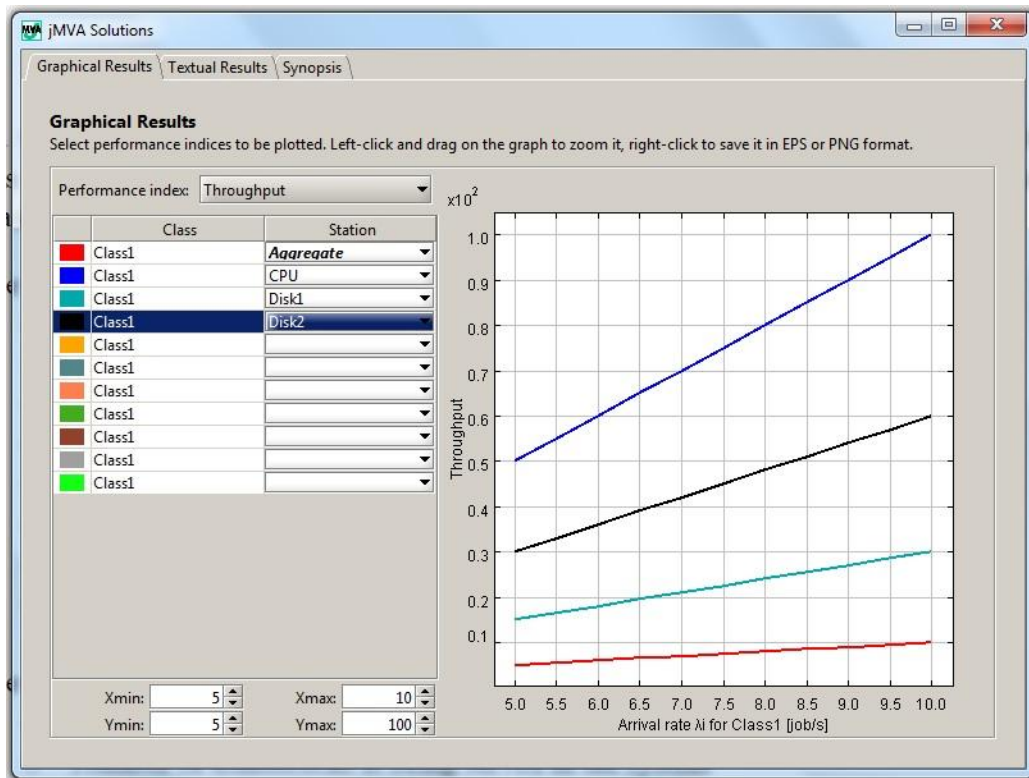
jMVA Model Details

Classes			
Name	Type	Population	Arrival Rate
Class1	open		5.0

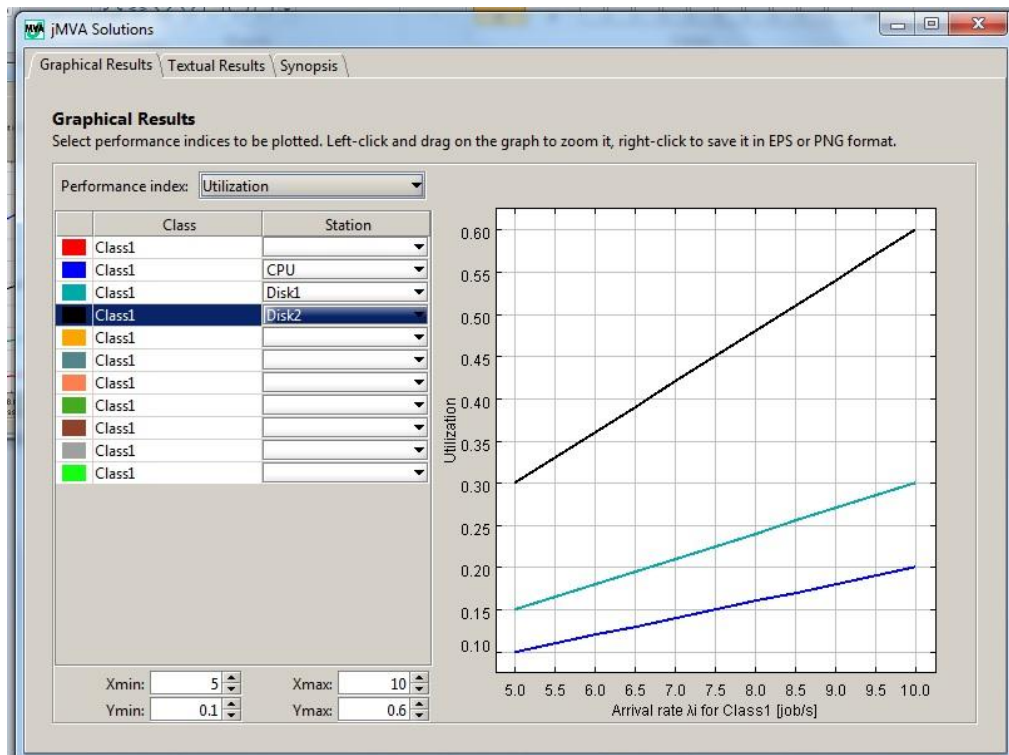
Stations	
Name	Type
CPU	Load Independent
Disk1	Load Independent
Disk2	Load Independent

Service Demands	
	Class1
CPU	0.02
Disk1	0.03
Disk2	0.06

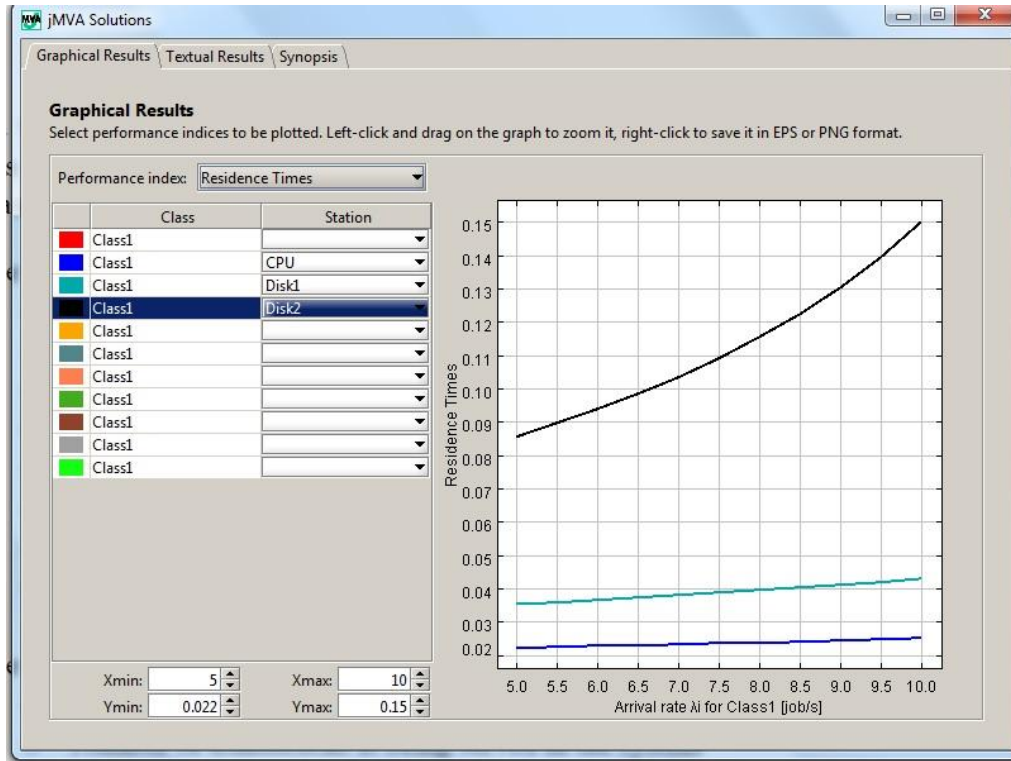
System Throughput and Throughput of each resource:



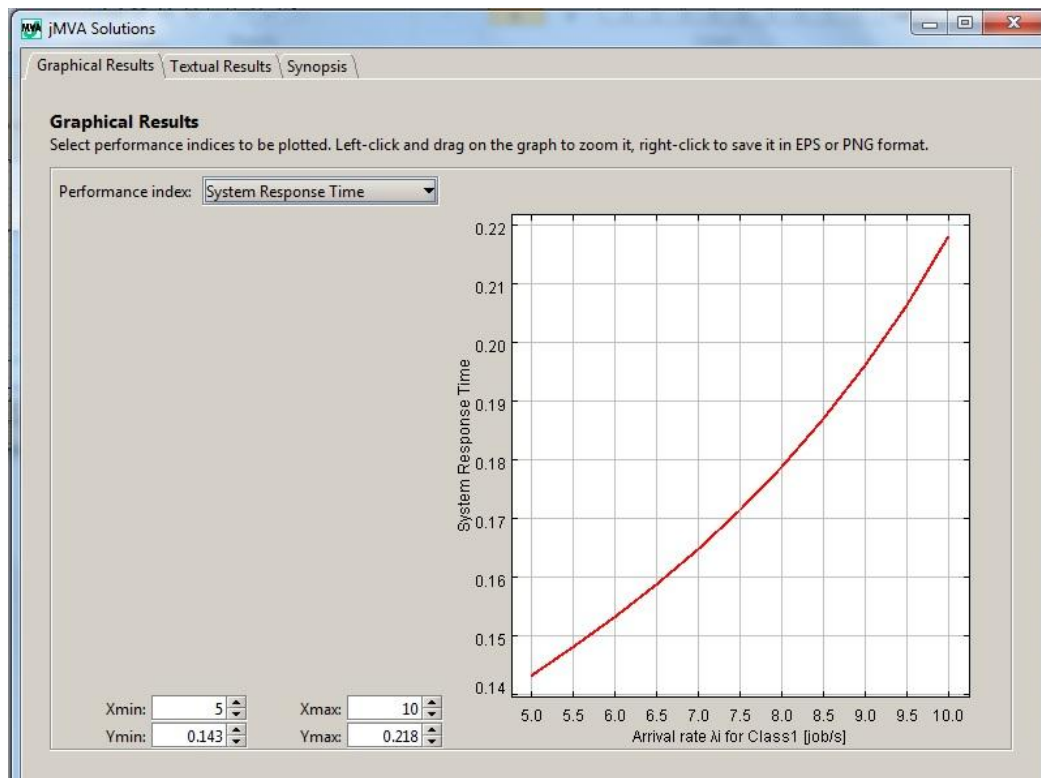
Utilization of each resource:



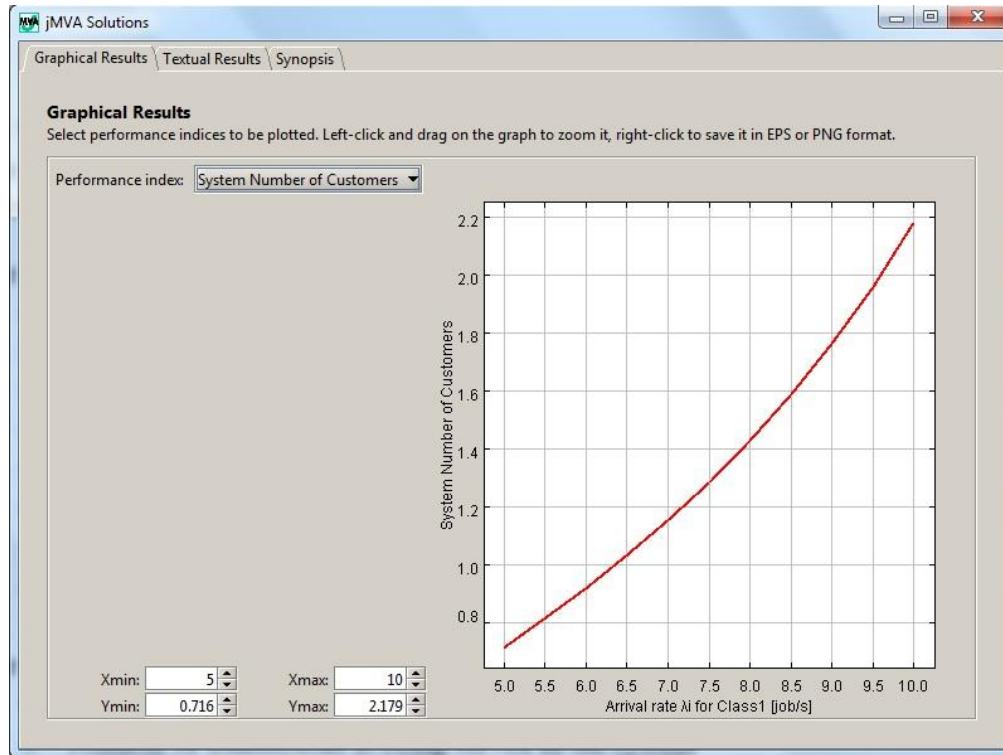
Residence time of transaction at each resource:



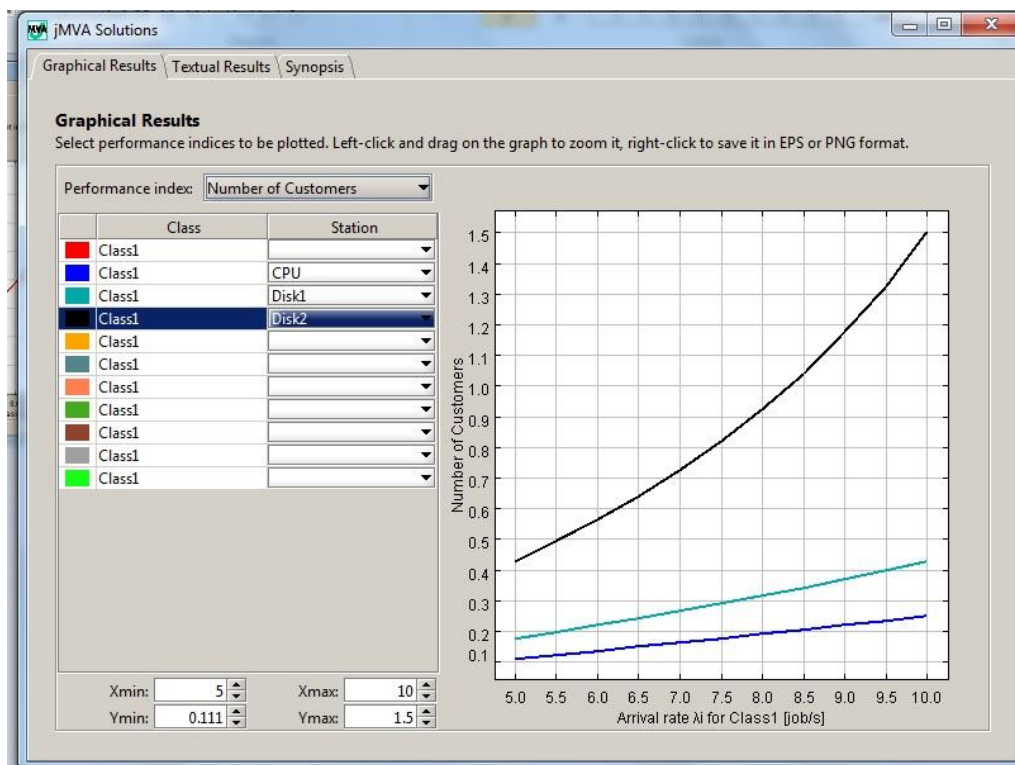
System response time:



Number of transaction at system:



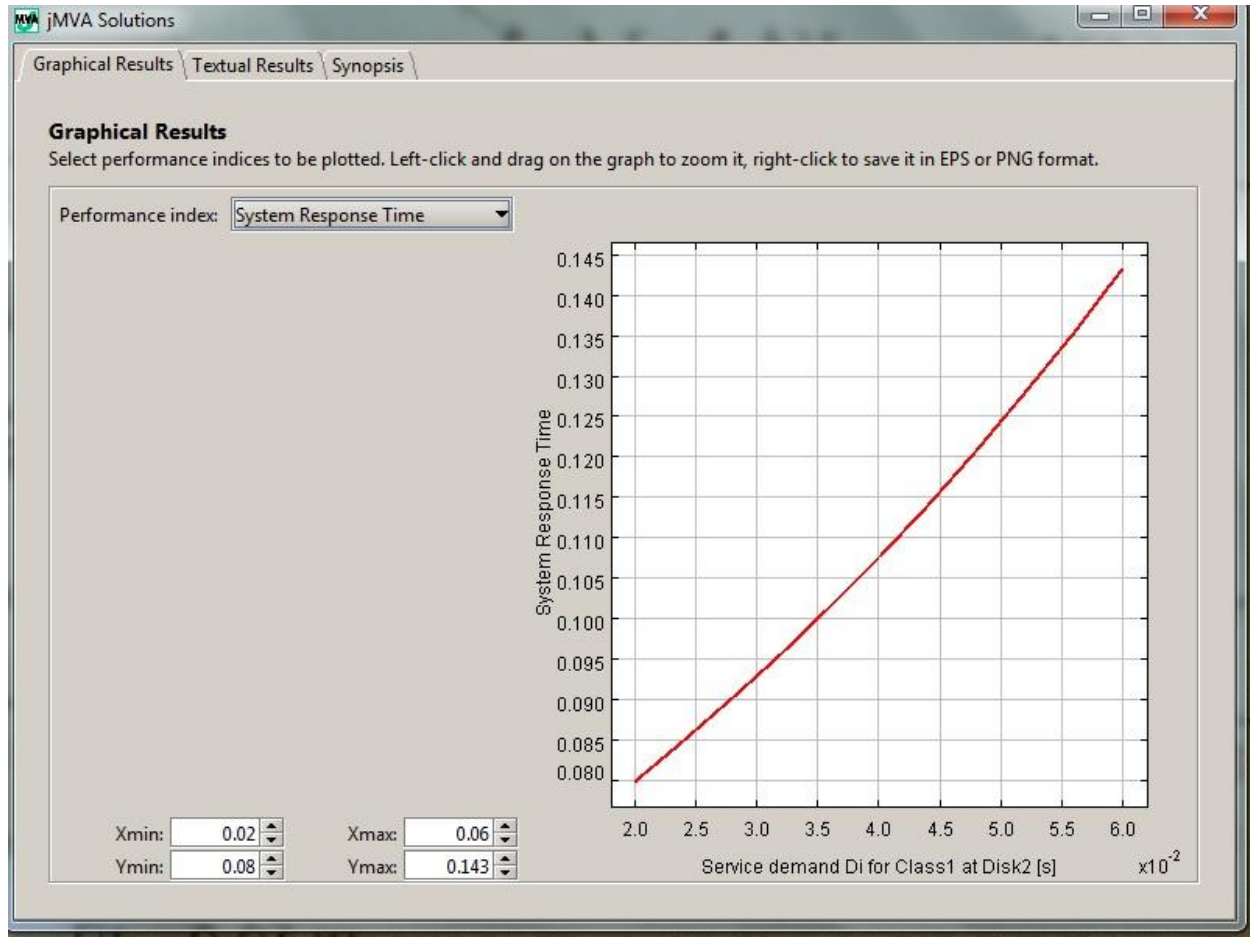
Number of transaction at each resource:



Scenario 2:

Disk2 is replaced by one that is three times faster, means new demand is one third.

Response Time:



$$\begin{aligned} Residence Time_{new} = 0.079 &\Rightarrow \frac{\Delta Residence Time}{Residence Time_{old}} \\ &= \frac{0.079 - 0.143}{0.143} \times 100 \approx -44\% Reduction \end{aligned}$$

Scenario 3:

Service demand of each resource:

jMVA Model Details

Classes

Name	Type	Population	Arrival Rate
Class1	open		5.0

Stations

Name	Type
CPU	Load Independent
Disk1	Load Independent
Disk2	Load Independent
Station5	Load Independent

Service Demands

	Class1
CPU	0.02
Disk1	0.03
Disk2	0.03
Station5	0.03

Residence Time (Aggregate response time) :

Residence Times

Total time spent by each customer class at each station. Note that the aggregate values are weighted by relative per-class throughput. The global aggregate is the system response time.

*	Aggregate	Class1
Aggregate	0.128105	0.128105
CPU	0.022222	0.022222
Disk1	0.035294	0.035294
Disk2	0.035294	0.035294
Disl3	0.035294	0.035294

$$\begin{aligned}
 \text{Residence Time}_{\text{new}} &= 0.128 \Rightarrow \frac{\Delta \text{Residence Time}}{\text{Residence Time}_{\text{old}}} \\
 &= \frac{0.128 - 0.143}{0.143} \times 100 \approx -10 \% \text{ Reduction}
 \end{aligned}$$