



Linnéuniversitetet

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Report

PE Assignment

2DV608



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1 Task1 Calculations

Server	S(ServiceTime)	X (Throughput)	U(Utility)	V(Visits)
1- WebServer	0.03	0.25	0.0075	1
2- App Answer Manager	0.05	0.125	0.00625	1
3- Language Model Engine	0.025	0.5	0.0125	4
4- App Feedback Manager	0.35	0.375	0.13125	3
5- Database	0.2	0.25	0.025	1

Average Number of iterations of App Feedback Manager is **3**.

System:

$$C = 108000, T = 24 * 5 * 3600 = 432000$$

$$X_{\text{system}} = 108000 / 432000 = 0.25$$

Webserver:

$$U_1 = 0.0075 \quad X_1 = 0.25$$

$$S_1 = U_1 / X_1 = 0.03$$

AppAnswerManager:

$$C_2 = 108000 * 0.5 = 54000$$

$$X_2 = C_2 / T = 54000 / 432000 = 0.125$$

$$D_2 = 0.05, V_2 = 1$$

$$S_2 = D_2 / V_2 = 0.05 / 1 = 0.05$$

$$U_2 = X_2 * S_2 = 0.125 * 0.05 = 0.00625$$

LanguageModelEngine:

$$D_3 = 0.1, V_3 = 4$$

$$S_3 = D_3 / V_3 = 0.1 / 4 = 0.025$$

$$C_3 = C * V_3 = (108000 * 0.5) * 4 = 216000$$

$$X_3 = C_3 / T = 216000 / 432000 = 0.5$$

$$U_3 = X_3 * S_3 = 0.5 * 0.025 = 0.0125$$

AppFeedbackManager:

$$N_4 = 0.1512, B_4 = 56700$$

$$X_4 = N / R = 0.1512 / 0.4032 = 0.375$$

$$U_4 = B_4 / T = 56700 / (24 * 5 * 3600) = 0.13125$$

$$V_4 = X_4 / X = 0.375 / (0.25 * 0.5) = \mathbf{3}$$

$$C_4 = X_4 * T = 0.375 * 432000 = 162000$$

$$S_4 = B_4 / C_4 = 567000 / 162000 = 0.35$$

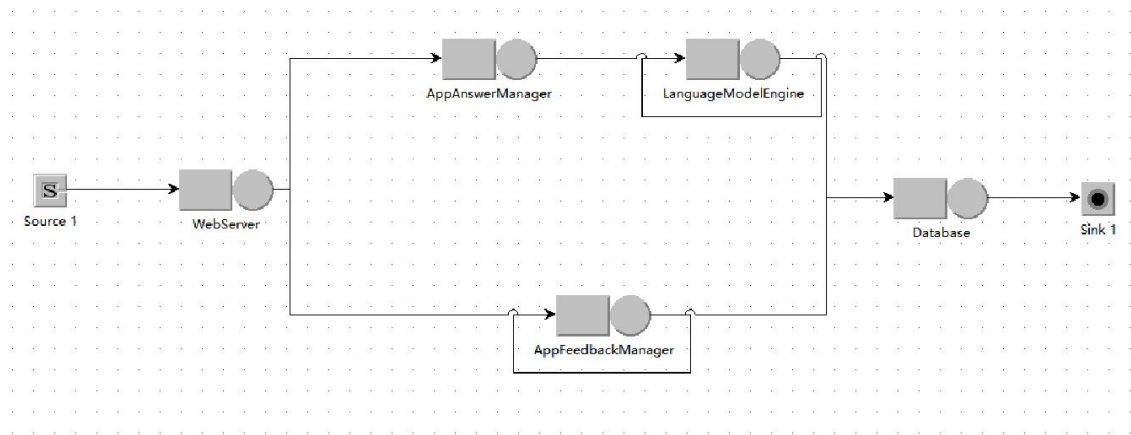
Number of iterations of it is v4, which is 3.

Database:

$$X_5 = 0.25, U_5 = 0.025, c = 2$$

$$S_5 = U_5 * 2 / X_5 = 0.025 * 2 / 0.25 = 0.2$$

2 Task2 JMT Model



2.1 Service Time

Class Arrival Rate

Editing Class1 distribution...

Selected Distribution: Exponential

Exponential $[\exp(\lambda)]$:

$$f(x) = \lambda e^{-\lambda x}$$

λ : 0.25

mean: 4

Webserver

Editing Class1 Service Time Distribution...

Selected Distribution: Exponential

Exponential $[\exp(\lambda)]$:

$$f(x) = \lambda e^{-\lambda x}$$

λ : 33.333333333333

mean: 0.03

AppAnswerManager

Editing Class1 Service Time Distribution...

Selected Distribution: Exponential

Exponential $[\exp(\lambda)]$:

$$f(x) = \lambda e^{-\lambda x}$$

λ : 20

mean: 0.05

LanguageModelEngine

Editing Class1 Service Time Distribution...

Selected Distribution: Exponential

Exponential $[\exp(\lambda)]$:

$$f(x) = \lambda e^{-\lambda x}$$

λ : 40

mean: 0.025

AppFeedbackManager

Editing Class1 Service Time Distribution...

Selected Distribution: Exponential

Exponential [exp(λ)]:
 $f(x) = \lambda e^{-\lambda x}$

λ: 2.857142857143

mean: 0.35

Database

Editing Class1 Service Time Distribution...

Selected Distribution: Exponential

Exponential [exp(λ)]:
 $f(x) = \lambda e^{-\lambda x}$

λ: 5

mean: 0.2

2.2 Number of Database Services

Editing Database Properties...

Station Name: Database

Database Parameters Definiton

Queue Section | Service Section | Routing Section

Server Configuration

Number of Servers: 2

Edit

2.3 Routing Probabilites

Webserver

Station Name: WebServer

WebServer Parameters Definition

Queue Section | Service Section | Routing Section

Class	Routing Strategy
Class1	Probabilities

Jobs are routed to stations connected to the current one according to the specified probabilities. If the sum of the routing probabilities is different from 1, the values will be scaled to sum to 1.

Destination	Probability
AppAnswerMa...	0.5
AppFeedbackM...	0.5

LanaguageModelEngine

Station Name: LanguageModelEngine

LanguageModelEngine Parameters Definiton

Queue Section | Service Section | Routing Section

Class	Routing Strategy
Class1	Probabilities

Jobs are routed to stations connected to the current one according to the specified probabilities. If the sum of the routing probabilities is different from 1, the values will be scaled to sum to 1.

Destination	Probability
LanguageMode...	0.75
Database	0.25

AppFeedbackManager

Editing AppFeedbackManager Properties...

Station Name: AppFeedbackManager

AppFeedbackManager Parameters Definition

Queue Section | Service Section | Routing Section

Class	Routing Strategy
Class1	Probabilities

Jobs are routed to stations connected to the current one according to the specified probabilities. If the sum of the routing probabilities is different from 1, the values will be scaled to sum to 1.

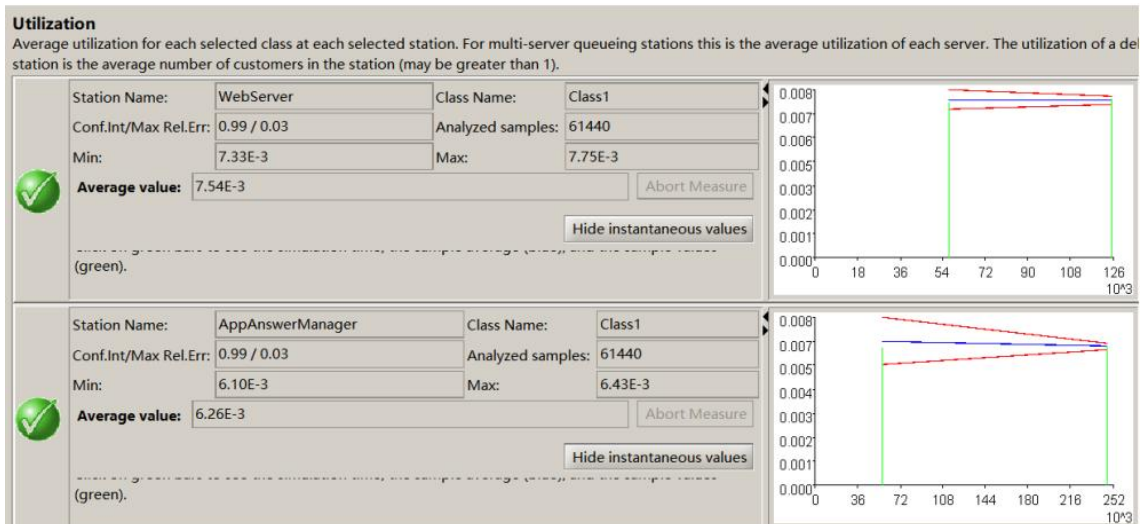
Destination	Probability
AppFeedbackM...	0.666666666666...
Database	0.333333333333...

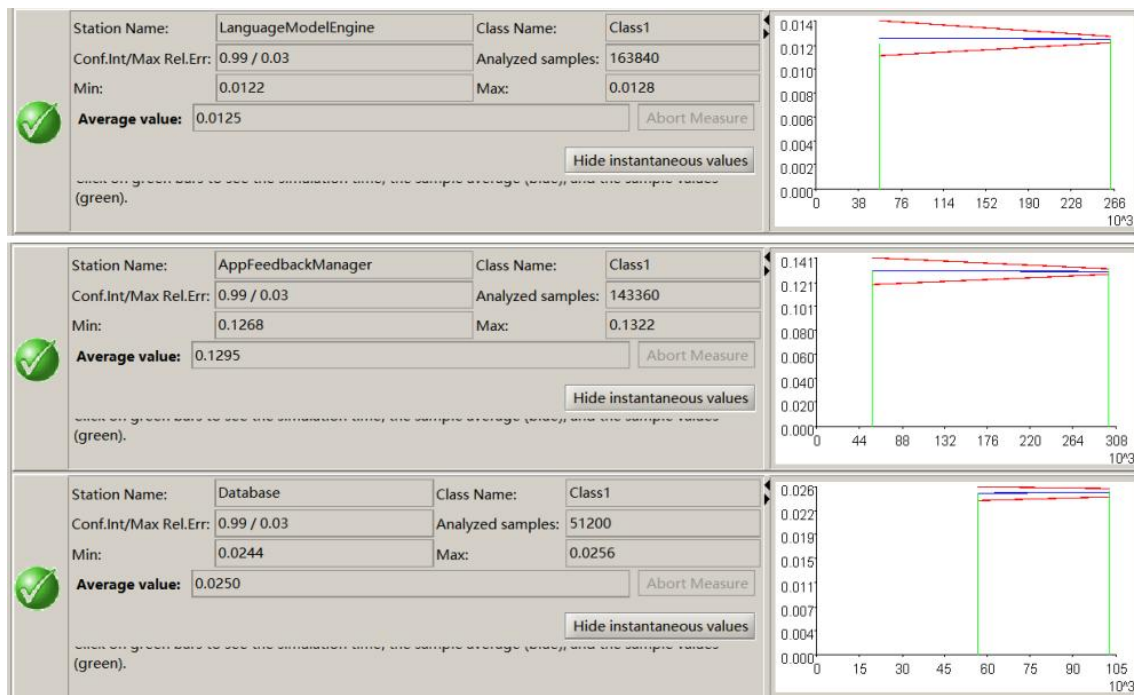
2.4 Throughput, Utilities of and System Response Time

Throughput

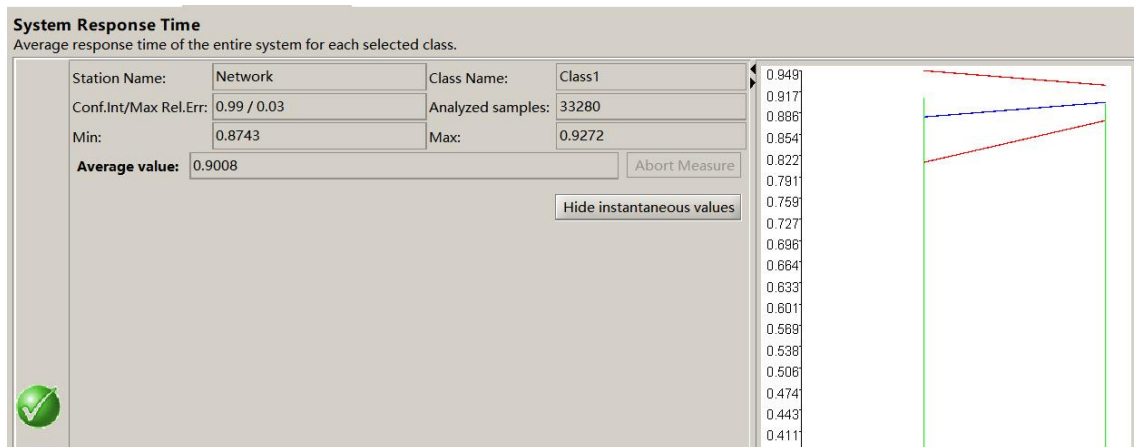


Utilization





System Response Time = 0.9008



3 Task3 Updated System

Newly Published System Parameters :

$$C_{\text{system}} = 10800000, T = 24 * 5 * 3600 = 432000$$

$$X_{\text{system}} = 10800000/432000 = 25$$

WebServer:

$$X_1 = 25, S_1 = 0.03$$

$$U_1 = X_1 * S_1 = 25 * 0.03 = 75\%$$

Hence still only **1** resource needed in WebServer.

AppAnswerManager:

$$X_2 = C * 0.9 / T = 10800000 * 0.9 / 432000 = 22.5$$

$$S_2 = 0.05$$

$$U_2 = X_2 * S_2 = 22.5 * 0.05 = \mathbf{112.5\%}$$

Hence need **2** resources in Application Answer Manager Server.

Language Model Engine:

$$S_3 = 0.025$$

$$C_3 = C * V_3 = (10800000 * 0.9) * 4 = 38880000$$

$$X_3 = C/T = 38880000 / 432000 = 90$$

$$U_3 = X_3 * S_3 = 90 * 0.025 = \mathbf{225\%}$$

Hence need **3** resources in Language Model Engine Server.

AppFeedbackManager:

$$S_4 = 0.35, V_4 = 3$$

$$X_4 = X/T * V_4 = (10800000 * 0.1) / 432000 * 3 = 7.5$$

$$U_4 = X_4 * S_4 = 7.5 * 0.35 = \mathbf{262.5\%}$$

Hence need **3** resources in Application Feedback Manager Server.

Database:

$$X_5 = 2.5, S_5 = 0.2$$

For a single server, its utility is:

$$U_5 = X_5 * S_5 = 2.5 * 0.2 = \mathbf{500\%}$$

To prevent servers fully utilized to 100%, **6** resources(**6** servers) needed in Database Server.

Update the model with newly parameters(probabilities, number of servers for each service, arrival rate, the maximum number of samples), the system response time is **0.9773** seconds.

