EEP-703 Computer Network Lab

Assignment6-Simulate classical queueing models like M/M/1 Using Petri Net in SHARPE tool

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April 16, 2014

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Chapter 1

PROBLEM STATEMENT

Consider a mail server of IIT Delhi with three departments have separate mail servers along with an external mail server. The external mail server receives mails from all the three department mail servers. Label the main server as node 0 and other three servers as node 1, 2 and 3. The messages, each with mean arrival rate 30 messages/sec arrive from three department servers. The capacity of each duplex link is 100kb/sec with 5ms delay. Simulate for 5 minutes to get the following performance measures. (consider M/M/1 queue between the transmitting and the receiving nodes)

1. Throughput at the central server (plot throughput versus simulation time).
2. Plot queue length vs time and also calculate average queue length. (use monitor-queue trace called qm.out)

Compare the throughput at the central server when the queue size for all the links are changed to 500 with that of default queue size provided in NS2. Give an explanation of the results obtained. (M/M/1/K i.e. limited queue size)

Chapter 2

ABSTRACT

The SHARPE GUI implements eight interchangeable modeling description techniques for reliability engineering: fault trees, Markov chains, reliability block diagrams, reliability graphs, generalized stochastic Petri nets, product queuing networks, multi-chain product form queuing networks and task graphs. future, all the modeling description techniques contained in SHARPE will be available in the GUI (phase mission, multi-components fault trees, semi-Markov chains).

Chapter 3

INTRODUCTION

A Petri net (also known as a place/transition net or P/T net) is one of several mathematical modeling languages for the description of distributed systems. A Petri net is a directed bipartite graph, in which the nodes represent transitions (i.e. events that may occur, signified by bars) and places (i.e. conditions, signified by circles). The directed arcs describe which places are pre- and/or postconditions for which transitions (signified by arrows).

Petri nets offer a graphical notation for stepwise processes that include choice, iteration, and concurrent execution. Unlike these standards, Petri nets have an exact mathematical definition of their execution semantics, with a well-developed mathematical theory for process analysis.

The SHARPE GUI implements eight interchangeable modeling description techniques for reliability engineering: fault trees, Markov chains, reliability block diagrams, reliability graphs, generalized stochastic Petri nets, product queuing networks, multi-chain product form queuing networks and task graphs. future, all the modeling description techniques contained in SHARPE will be available in the GUI (phase mission, multi-components fault trees, semi-Markov chains).

Chapter 4

SPECIFICATIONS AND ASSUMPTIONS

Specifications

1. M/M/1 Queue and M/M/1-K Queue are used as queueing models
2. Constant bit rate to be taken is 100kbps and lamda=30, mue=33.
3. Perfomance Comparison has to be done with the help of THROUGHPUT.

Assumptions

1. Arrival rate propotional to tha packet size.
2. Virtual load will be propotional to the square of the arrival rate.
3. Other throughput degradation factors have been ignored.
4. Processing was taking long time to run therefore queue length is minimized.

Chapter 5

LOGIC USED/METHODOLOGY

The methodology that is used for developing this project work is defined below:

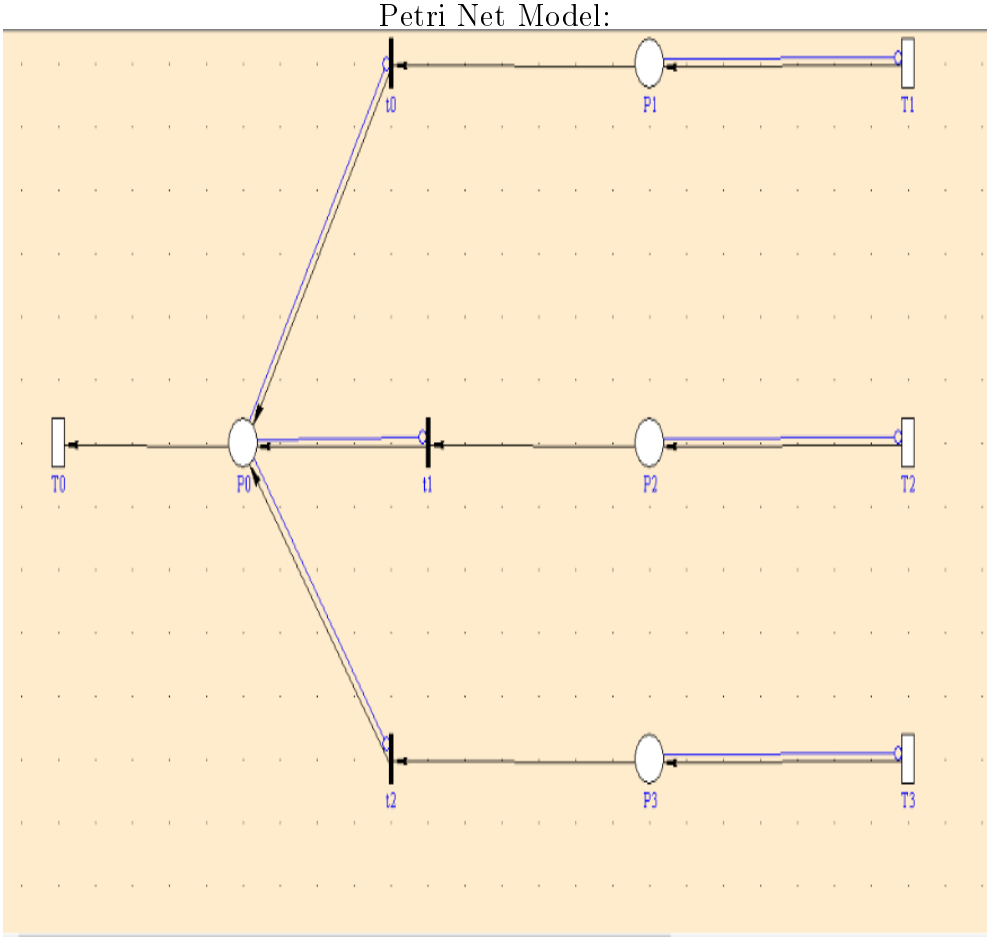
1. The entire code is drawn in rgl file format uisng Sharpe-GUI.
2. First, all the required 4 nodes are created in which node 0 acts as main server and node 1, 2, 3 are the departmental servers.
3. The tokens are created by using timed transitions with appropriate rate of generation.
4. The main server was connected to the three servers using untimed transitions.
5. The queue length was implemented using the inhibitor arc from a node to transition.
6. The various analysis graph and value were computed using the analysis tab in the menu of the Sharpe tool.
7. The required parameters were plotted.

Chapter 6

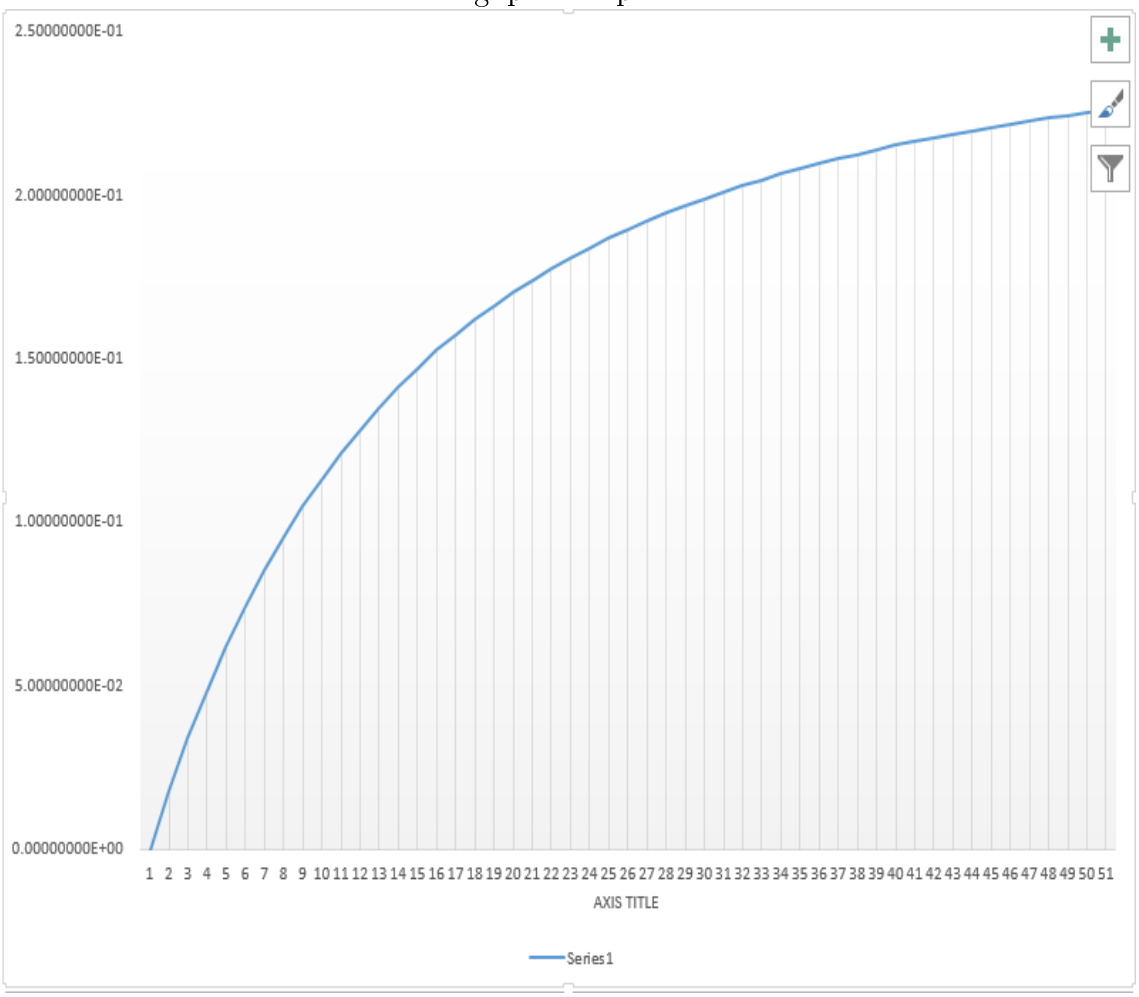
RESULTS AND CONCLUSIONS

The queueing models are designed as per the given requirements, and the simulation is working perfectly. The Graph Plotted studies the behaviour of Network under the M/M/1 queue model.

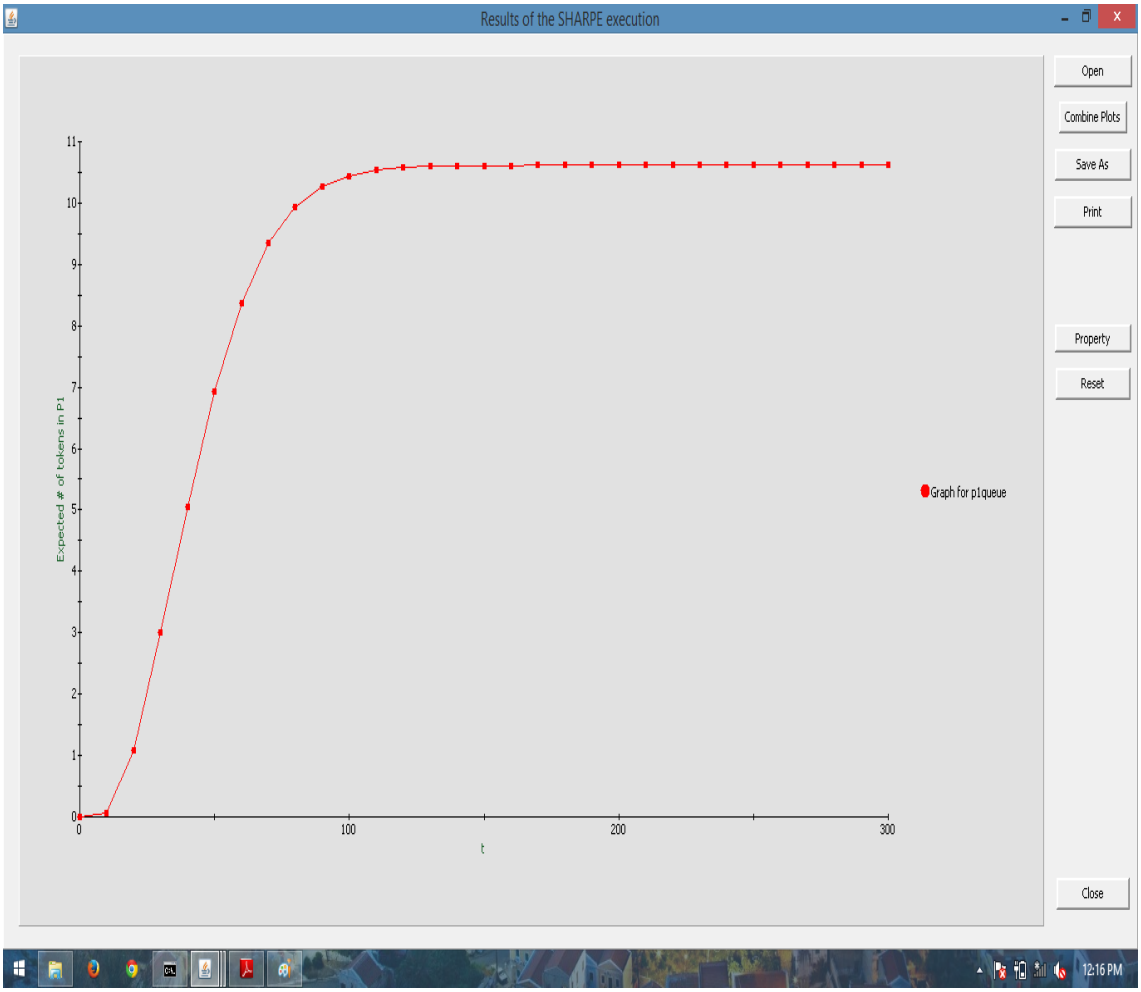
Petri Net Model:



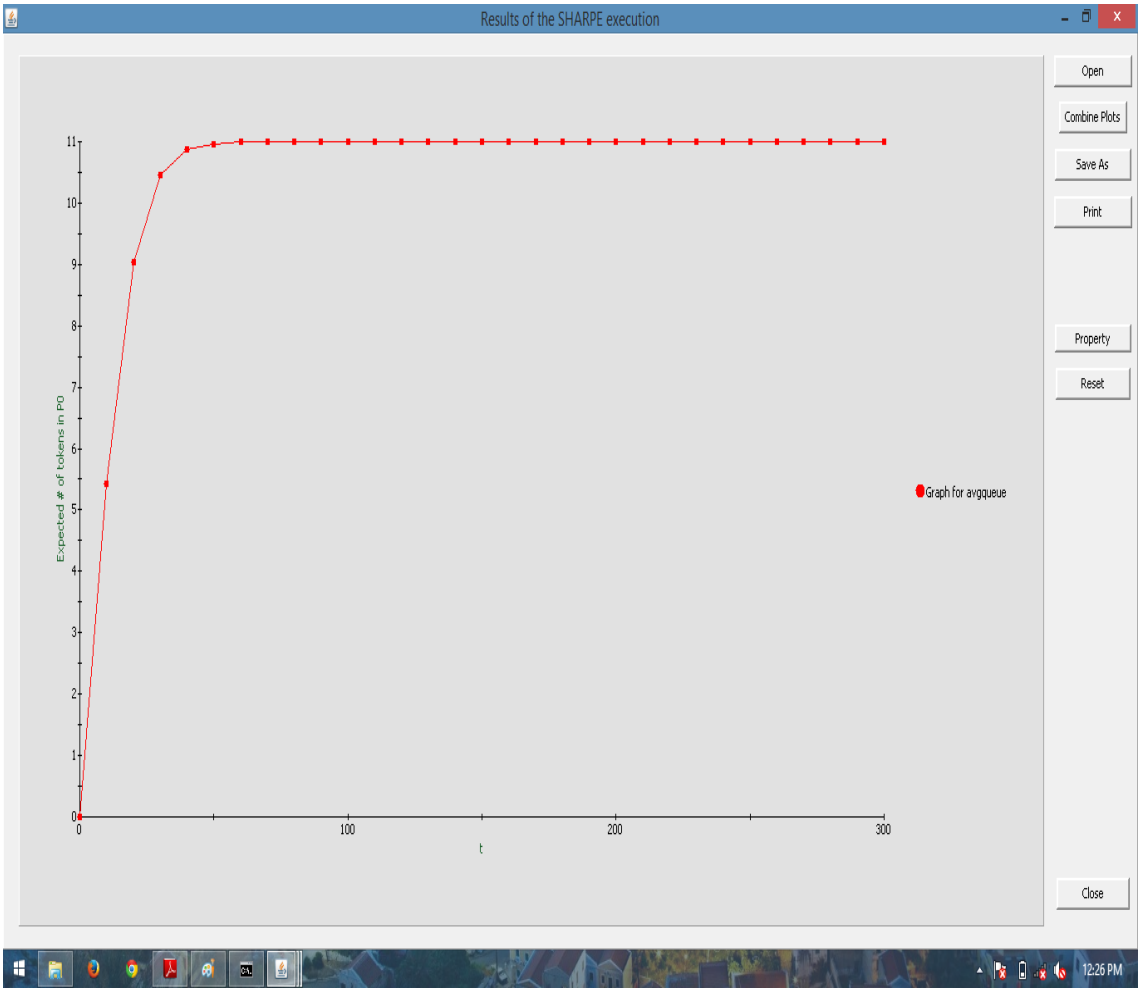
Throughput Graph



QueueLength vs Time Graph



Avg Queue Length at Central Server Graph


Results of the SHARPE execution
Open
Combine Plots
Save As
Print
Property
Reset
Close
Expected # of tokens in P0
t
Graph for avgqueue
0
100
200
300
1
2
3
4
5
6
7
8
9
10
11
12:26 PM