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MODELING AND SIMULATION FOR PERFORMANCE EVALUATION OF MODELS OF QUEUING SERVICE SYSTEMS WITH LIMITED AND UNLIMITED BUFFER IN DISTRIBUTED NETWORKS

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Abstract. Distributed networking is a distributed computing network system, said to be distributed when the computer programming and the data to be worked on are spread out across more than one computer. Usually, this is implemented over a computer network. The comparative analysis of the results of simulation models of limited and unlimited queuing service systems is reviewed. Here, when the restriction put on the time of presence of requests is violated, the loss of requests occurs. The analysis of possible situations leading to the loss in such systems is one of the important issues. The problem of choosing optimal parameters for dynamic priorities in the case of the various types of service requests with linearly decreasing function of priorities, The results of analytical and simulation models of distributed computer networks with dynamic priorities and unlimited buffer residence time requirements of the network is limited. The network constraint violation results in loss requirements. These situations occur practically in service processes of different technical systems. An experiment was conducted; results were obtained and comparatively analyzed for both cases.

Keywords: *dynamic analysis, priority in the service, unchecked buffer, distributed networking, priority.*

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1. Introduction

Distributed networking is a distributed computing network system, said to be distributed when the computer programming and the data to be worked on are spread out across more than one computer. Usually, this is implemented over a computer network. Prior to the emergence of low-cost desktop computer power, computing was generally centralized to one computer. Although such centers still exist, distribution networking applications and data operate more efficiently over a mix of desktop workstations, local area network servers, regional servers, Web servers, and other servers. One popular trend is client/server computing. This is the principle that a client computer can provide certain capabilities for a user and request others from other computers that provide services for the clients. (The Web's Hypertext Transfer Protocol is an example of this idea.) The processes for managing distributed computer networks with dynamic requirements and priorities unchecked buffer. Such services are used in the service system, in which subscribers are in moving vehicles. Under the service is understood pretreatment coordinate information and vehicle speed. The time between the arrival of the requirements of the system and the end of the service is limited to a certain value, and if this time exceeds this value, the requirements will be lost. This information received too late for the consumer, so it is useless [6, 7, 9]. In [8] studied the process of managing distributed computer networks with dynamic priorities, requirements and unlimited buffer, and it is shown that the lower limit of total losses achieved with a finite value of the queue length. Using these results solved the problem of determining the optimal characteristics of the service process in a distributed computer networks, and often it is to some extent complicates the operating system. However, the development of more advanced algorithms for the organization of the service process may allow reducing the loss of requirements, accompanied by the growth performance of the network service. A feature of the algorithmic approach is to minimize the loss of the requirements by removing the preventive part of them, without waiting for the service. A feature of these networks is to minimize the loss of claims due to the preventive removal of some of them, without waiting for the service. In order to study the functioning of such a network, it can be considered as models of queuing systems (QS).It is necessary to solve the problem of optimization of parameters determining the nature of the preventive removal requirements, resulting in minimizing their losses. It should be noted that in order to confirm analytical models developed in [2], it is necessary to develop simulation models of such networks and services to compare the results of both models. The study of service processes in service systems for dynamic priority requests (transactions) is an urgent issue in modern times. The study of two options – limited and unlimited queuing service processes in service systems for real – time dynamic priority requests with a limited time of presence in the system is reviewed. In the considered case, the restriction is put for the time of presence of requests in the system, if this restriction is violated, situations resulted in the loss of requests occur. These situations occur practically in service processes of different technical systems. Therefore, the analysis of possible situations leading to the loss in such systems is one of the important issues [1-3]. The stream of requests enter into the access to the system – queue and requests get into any operational and idle computer with the same probability in the system (queuing system (QS) suitable for everyone) on certain rules and leaves the system after receiving the service. It is assumed that there is a homogeneous stream of requests with a priori priority in the service. Dynamic priority of requests in the service process can vary depending on the situation. Service time of all requests is distributed with the same rule and it is possible for the situation to vary in two places –in queue and service during the operation in the system. The presence of requests in the system consists of two phases, waiting and service. As mentioned above, the total time of the presence of request in the system should not exceed the quantity.

2. Solution of the problem

Step 1: The input stage of the QS (Fig. 1) enters the flow requirements. Because of the requirements of the queue defined by some rule, come with equal probability for all serviceable and free from computer maintenance.

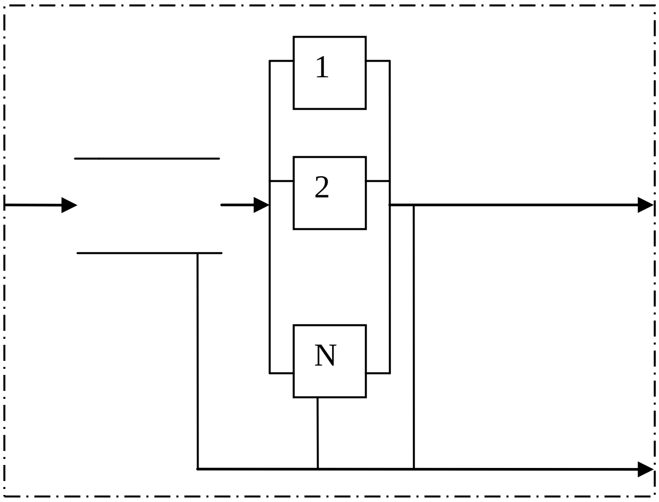


Fig.1. QS with unlimited queue

After leaving the service requirements of the system. Service assumes a uniform input stream with the requirements of equal a priori priorities. In the process of dynamic priority service requirements may vary depending on the situation. The service time of all claims distributed according to the same law. The network operation is possible if the situation changes in two places: in the queue and service. Stay requirement system consists of two phases: the expectations and service, and the total residence time requirements of the system must not exceed the maximum allowable value, ie. After leaving the service requirements of the system. Service assumes a uniform input stream with the requirements of equal a priori priorities. In the process of dynamic priority service requirements may vary depending on the situation. The service time of all claims distributed according to the same law. The network operation is possible if the situation changes in two places: in the queue and service. Stay requirement system consists of two phases: the expectations and service, and the total residence time requirements of the system must not exceed the maximum allowable value, ie. τ_s^*. On standby phase requirement is not satisfying this condition and can be removed from the system via a certain rule, and therefore there are losses in the first-order p_1. In the maintenance phase (or immediately after its completion) requirement can be removed from the system, if it stays in the system exceeds τ_s^* and these requirements are the losses of the second kind p_2. In general, the purpose of this rule is to choose a removal pending and served the requirements under which minimize the mathematical expectation value of the total loss of both kinds, that is

$$M[P(p_1, p_2)] \to \min, \quad (1)$$

$$\tau_s \le \tau_s^* \quad L_q \le m, \quad (2)$$

where $\tau_s, L_q, \tau_s^*, m -$ values residence time requirements of the system, queue length, the maximum value of the residence time requirements of the system, the maximum value of the number of seats in the waiting queue. Optimal queuing and

service to achieve maximum efficiency of the system by removing from the system before or during maintenance of those requirements which do not fulfill the conditions of $\tau_s \le \tau_s^*$. For the organization of service system in this paper based on the following two versions of the algorithm of interaction of queuing and service received results of analytical and simulation models, in which can be used for software development of such systems for various purposes:
- The line is not limited to $L_q = \infty$ and optionally measuring the residence time requirements of the system. The system has the ability to measure the residence time requirements of the system, and when servicing is not. Therefore, in the algorithm we set limit on the waiting time in the queue $\tau_q \le \tau_q^*$, and the fact of exceeding the allowable residence time requirements of the system in the algorithm just as in the first embodiment may be detected after the maintenance.
- The line is not limited to $L_q = \infty$ and in both phases is possible to measure the residence time requirements of the system. Therefore, the fact of exceeding the acceptable residence time requirements of the system $\tau_s \le \tau_s^*$ detected at either of the two phases, i.e. at the time of its occurrence.

For an exponential service time value L_q can be defined as follows [4]:

$$L_q = P\rho/(N-\rho).$$

In [4] it is shown, that finding limits of plenty enumeration for detecting optimal criterion for removing from queue in these two versions of complexity algorithm doesn’t happen.

In this formula, depending on the nature of the object, you can use the system to allow the following approximations:

$$In\rho << 1 L_q \to \rho^{N+1}/N^2$$

$$In\lambda/\mu N \to 1 L_q \to \rho/(N-\rho)$$

When famous L_q can also be defined latency requirements in the queue τ_q, the residence time requirements in the τ_s the expected number of claims in the systems

L_s :

$$\tau_q = L_q/\lambda; \quad \tau_s = L_s/\lambda; \quad \lambda/\mu N < 1; \quad L_s = L_q + \rho.$$

It should be noted that the considered options for interaction and queuing services correspond to different technical systems and they describe different in terms of effectiveness and possible interactions queuing and servicing should be noted that if the maintenance requirements and check the condition of $\tau_s \le \tau_s^*$ produced in different computers (the first option) then there is no possibility to stop service requirements, even if the condition is violated $\tau_s \le \tau_s^*$. This is the case in the first version of the algorithm (in the service has no way of measuring time τ_s).

In the case of service requirements and check the conditions of $\tau_s \le \tau_s^*$ produced in the same network home computers, demand detained and system longer than τ_s is removed from it, without waiting for the service. This situation occurs in the second embodiment (of service is possible to measure the time). These variants of the algorithm have unlimited number of locations τ_s at $L_q = \infty$ and removing them from the queue is made by the criterion of the residence time in $\tau_s \le \tau_s^*$ (it is possible to maintain the time dimension Feeder τ_s). An option that allows you to exclude from the system of "hopeless" requirement before another course is more efficient and "intelligent." Furthermore, it should be noted that each embodiment interaction queuing and service depending on the level of degradation of the system must be adjusted delete rule.

For the $m=10$ $\tau_s^* = 100$ and $(\lambda = 0.001 - 0.005, \mu = 0{,}010 - 0.022)$ $\rho = 0.1 - 0{,}9$, conducted voluminous computational experiments and numerical results are obtained. On the basis of these results the following graphs were built according to $L_q(L_s) = f(\rho)$, $\tau_q(\tau_s) = f(\lambda)$, $P = f(N)$ shown in Figure 1.

$L_q(L_s)$

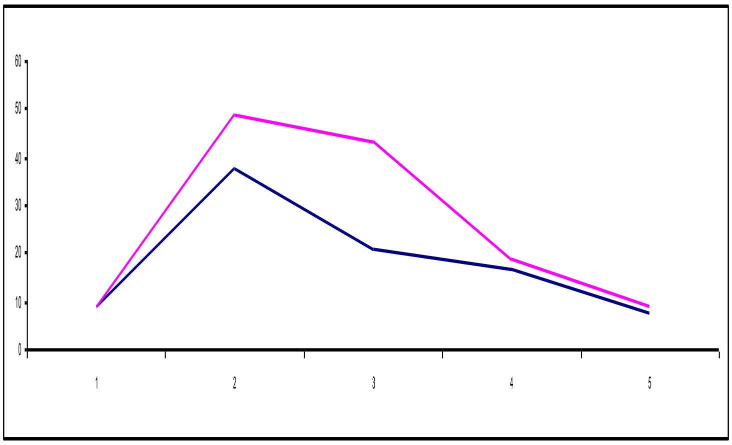
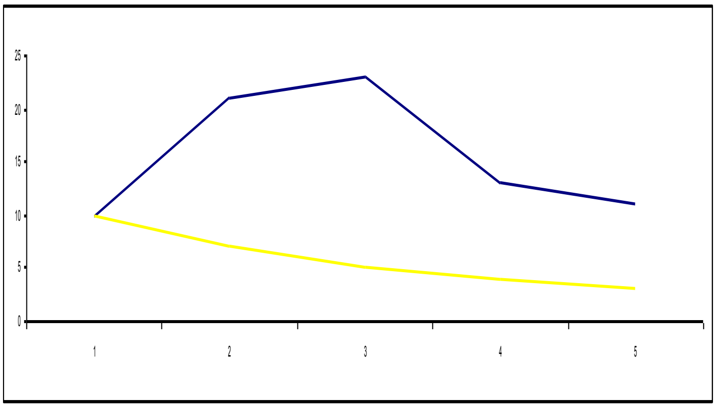


Fig.2. Dependencies $L_q(L_s) = f(\rho)$



$\tau_q(\tau_s)$

Fig.3. Dependencies $\tau_q(\tau_s) = f(\lambda)$

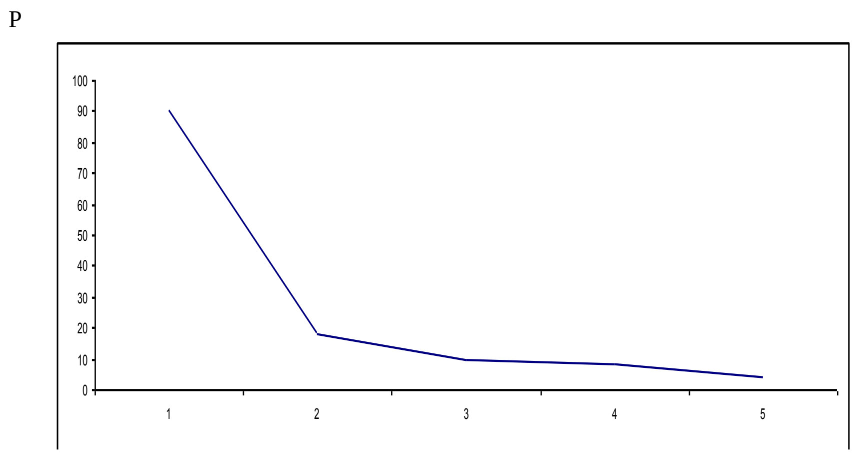


Fig. 4. Dependence $P = f(N)$

The analysis of these dependences shows that the value of the queue length and the number of customers in the system are reduced at $\rho = 0.3$. The value of the waiting time in the queue τ_q requirements, the residence time requirements in the τ_s reach its minimum value at $\lambda = 0{,}004$, and hence the minimum value of total data loss is achieved with $N \geq 3$.

As already noted, in order to confirm the adequacy of the analytical (A) model of the language GPSS (General purpose simulation system) developed model (I), run the simulation model with the following results [1-4].

Table 1. GPSS World Simulation Report - Untitled Model (1)

```
START TIME          END TIME  BLOCKS  FACILITIES
STORAGES

0.000          354.120    20       1         0


FACILITY        ENTRIES  UTIL.   AVE. TIME AVAIL.
OWNER PEND INTER RETRY DELAY

SYSTEM              1    0.957     0.021  1       0    0    0     0
0

USER CHAIN        SIZE RETRY  AVE.CONT   ENTRIES
MAX     AVE.TIME

LINE                2    0   0.00012       3     3      131.252

CEC XN   PRI         M1      ASSEM  CURRENT  NEXT
PARAMETER    VALUE

4    0        238.769      4     10      4

TSRV        31.225

FEC XN   PRI        BDT      ASSEM  CURRENT  NEXT
PARAMETER    VALUE

5    0        379.643      5      0      1
```

The results of this model shows that the utilization rate of the service channel is 0.957, the average queue length is 0.00012, taking into account all TRANSACT average waiting time of 0.021. Based on the results of both models.

3. Formulation and solution of the problem

Step 2: Queuing models, which include four cases covering two options of limited and unlimited queuing service processes, are reviewed. If we look at the first option of the simulation model, here, mainly two cases should be noted:

- Determination of the value of the presence of requests in the system (in queue and service);
- Determination of the fact that the value of the presence of requests in the system exceeding the possible maximum value (at the latest, after the removal of request from the system or service time)

Accordingly, if we'll consider the second option, here, mainly, two cases can be noted:

- Determination of the value of time for the presence of requests in the system (in queue and service);
- Determination of the fact that the value of time for the presence of requests in the system exceeding the possible maximum value (in queue and at the latest, after the removal of request from the system (in service)), that's, it can be determined when this fact occurs.

It should be noted that if the service for requests and verification of the condition is implemented in different computers of the network, (it is consistent with the first case of both options), even if total time of the presence of the request in the system doesn't meet the condition of not exceeding the quantitT_{S^*} ,there is not a chance for request to keep the service. Such a situation can occur in the first case of both options (there is no chance for requests to determine the time of presence in the system during service time).

If service for request and verification of condition is fulfilled in one computer, the request leaves the system without waiting the end of service in the case of time for the presence of requests in the system exceeding the possible maximum value set for it. Such a situation can occur in the second case of both options. (there is a chance for the determination of time for the presence of requests in the system during service time).

It should be noted that the value of the loss of second type doesn't affect the features of queue and service for the model expressing the first case of the first option, so that in any case, requests are fully served.

In contrary, the value of the loss of second type doesn't affect the features of queue for the model expressing the second case of the first option. Therefore, its general study is more complex in comparison with the model expressing the first case of the first option.

The removal of requests which have not been served until the end in the system (the second case of the first option) accelerates the passage of requests from the system (in comparison with the first case of the second option). And this enables to use the statistic results obtained for the first case of the first option and assess relevant quantities in the second case of the first option. The first and second cases of the second option have an endless queue, and the removal of request from the queue is executed on the criteria expressed with the time of presence of requests in the system (there is a chance to determine the value of time for the presence of requests in the service).

It should be noted that the determination of the selection limit of the optimum criteria for the removal from queue for both of these cases is not so difficult. The organization of interaction in terms of effectiveness in the phases of queue and service of service system in the reviewed options of the model enables to write different options. Of course, the option enabling the relatively quick removal of "unpromising" requests from the system is more effective and "intellectual". In addition, it should be noted that the procedure for the removal of requests from the system should be corrected depending on the level of degradation of the system for each case of the organization of interaction of queue and service. This system is reviewed in [5] as QS, if the main characteristics enabling to build it have been determined through an analytical model, the study of main characteristics of this system in broad values of input and output data, at the time, the verification of adequacy of the results obtained and the study of the system by the simulation method of both options for the comparative analysis of models appropriate for both options are reviewed in the research work. The system with the same type of requests and devices of the same type in N numbers is reviewed in the introduction in these models.

4. The analysis of the results of simulation models of service systems

The conducted researches indicate that the solution of matters put forward should be on the basis of statistics emerged with choosing an optimal service method from mutual movement options of formed algorithms of mutual movement of queue and service.

Transaction flux entering the entry of system – queue enters the device at system in equal assumption according to definite rules. Homogeneous transaction flux of priority of a priori enters the system. Dynamical priority of transactions in service process can be changed depending on situation. The service time of all the transactions are of the same law and the situation can be changed in 2 moments – queue and service during the activity in system. Transactions' coming to the system consists of 2 phases – waiting a queue and buying a service. It should be noted that the general time of transactions' coming to the system should not exceed the possible maximum amount defined to this time.

In the case of transactions to be out of system according to definite rule indicated in demands of formed service imitation algorithms in the waiting phase we succeed to diminish the first type loss.

And if the amount of the time of transactions' coming to the system according to the demands of formed queue imitation algorithms in the service phase exceeds the maximum amount defined to it we succeed to diminish the second type loss.

Characteristics of considered KXS model are that the limits (in waiting and service) put to the time of transactions' coming to the system are used for the final analysis of the statistic of defined parts of transactions to be out of system as a preventive measure without waiting for the end of the service.

The aim in general is to choose a rule of removal of transactions waiting in the queue and getting served in the way that the least amount out of the average price of both two type losses.

The optimal organizing of queue and service makes system maximum effective at the expense of the removing of transactions from system that don't answer the demand before the start of service or during the service time.

To organize a service in system, imitation models for the limited (model (2-1)-(2-5)) and unlimited (model (2-1)-(2-5)) buffers compatible with different versions of mutual movement algorithms of organizing the queue and service are executed and the following results are achieved:

The tendency of change of the length of queue on the realizations of simulation model of limited (blue line) and unlimited (red line) queuing service processes, time for waiting in the queue for requests and the realizations of the coefficient of use from service devices are given respectively in the Figure (5), (6), (7) on the basis of the results obtained.

Table 2. GPSS World Simulation Report - Untitled Model (2-1)

START TIME

END TIME BLOCKS FACILITIES STORAGES

0.000 354.120 20 1 0

FACILITY ENTRIES UTIL. AVE. TIME AVAIL. OWNER PEND INTER RETRY DELAY

SYSTEM 1 0.892 0.015 1 0 0 0 0 0

USER CHAIN SIZE RETRY AVE.CONT ENTRIES MAX AVE.TIME

LINE 2 0 0.00011 3 3 131.252

CEC XN PRI M1 ASSEM CURRENT NEXT PARAMETER VALUE

4 0 238.769 4 10 4

TSRV 31.225

FEC XN PRI BDT ASSEM CURRENT NEXT PARAMETER VALUE

5 0 379.643 5 0 1

Table 3. GPSS World Simulation Report - Untitled Model (2-2)\

START TIME

END TIME BLOCKS FACILITIES STORAGES

0.000 354.120 20 1 0

FACILITY ENTRIES UTIL. AVE. TIME AVAIL. OWNER PEND INTER RETRY DELAY SYSTEM 1 0.810 0.060 1 0 0 0 0 0

USER CHAIN SIZE RETRY AVE.CONT ENTRIES MAX AVE.TIME

LINE 2 0 0.00033 3 3 131.252

CEC XN PRI M1 ASSEM CURRENT NEXT PARAMETER VALUE

4 0 238.769 4 10 4

TSRV 31.225

FEC XN PRI BDT ASSEM CURRENT NEXT PARAMETER VALUE

5 0 379.643 5 0 1

Table 4. GPSS World Simulation Report - Untitled Model (2-3)

START TIME

END TIME BLOCKS FACILITIES STORAGES

0.000 354.120 20 1 0

FACILITY ENTRIES UTIL. AVE. TIME AVAIL. OWNER PEND INTER RETRY DELAY

SYSTEM 1 0.832 0.020 1 0 0 0 0 0

USER CHAIN SIZE RETRY AVE.CONT ENTRIES MAX AVE.TIME

LINE 2 0 0.00021 3 3 131.252

CEC XN PRI M1 ASSEM CURRENT NEXT PARAMETER VALUE

4 0 238.769 4 10 4

TSRV 31.225

FEC XN PRI BDT ASSEM CURRENT NEXT PARAMETER VALUE

5 0 379.643 5 0 1

Table 5. GPSS World Simulation Report - Untitled Model (2-4)

START TIME

END TIME BLOCKS FACILITIES STORAGES

0.000 354.120 20 1 0

FACILITY ENTRIES UTIL. AVE. TIME AVAIL. OWNER PEND INTER RETRY DELAY

SYSTEM 1 0.850 0.015 1 0 0 0 0 0

USER CHAIN SIZE RETRY AVE.CONT ENTRIES MAX AVE.TIME

LINE 2 0 0.00019 3 3 131.252

CEC XN PRI M1 ASSEM CURRENT NEXT PARAMETER VALUE

4 0 238.769 4 10 4

TSRV 31.225

FEC XN PRI BDT ASSEM CURRENT NEXT PARAMETER VALUE

5 0 379.643 5 0 1

Table 6. GPSS World Simulation Report - Untitled Model (2-5)

START TIME

END TIME BLOCKS FACILITIES STORAGES

0.000 354.120 20 1 0

FACILITY ENTRIES UTIL. AVE. TIME AVAIL. OWNER PEND INTER RETRY DELAY

SYSTEM 1 0.871 0.056 1 0 0 0 0 0

USER CHAIN SIZE RETRY AVE.CONT ENTRIES MAX AVE.TIME

LINE 2 0 0.00010 3 3 131.252

CEC XN PRI M1 ASSEM CURRENT NEXT PARAMETER VALUE

4 0 238.769 4 10 4

TSRV 31.225

FEC XN PRI BDT ASSEM CURRENT NEXT PARAMETER VALUE

5 0 379.643 5 0 1

Table 7. GPSS World Simulation Report - Untitled Model (2-2-1)

START TIME

END TIME BLOCKS FACILITIES STORAGES

0.000 354.120 20 1 0

FACILITY ENTRIES UTIL. AVE. TIME AVAIL. OWNER PEND INTER RETRY DELAY

SYSTEM 1 0.935 0.006 1 0 0 0 0 0

USER CHAIN SIZE RETRY AVE.CONT ENTRIES MAX AVE.TIME

LINE 2 0 0.00005 3 3 131.252

CEC XN PRI M1 ASSEM CURRENT NEXT PARAMETER VALUE

4 0 238.769 4 10 4

TSRV 31.225

FEC XN PRI BDT ASSEM CURRENT NEXT PARAMETER VALUE

5 0 379.643 5 0 1

Table 8. GPSS World Simulation Report - Untitled Model (2-2-2)

START TIME

END TIME BLOCKS FACILITIES STORAGES

0.000 354.120 20 1 0

FACILITY ENTRIES UTIL. AVE. TIME AVAIL. OWNER PEND INTER RETRY DELAY

SYSTEM 1 0.947 0.013 1 0 0 0 0 0

USER CHAIN SIZE RETRY AVE.CONT ENTRIES MAX AVE.TIME

LINE 2 0 0.00008 3 3 131.252

CEC XN PRI M1 ASSEM CURRENT NEXT PARAMETER VALUE

4 0 238.769 4 10 4

TSRV 31.225

FEC XN PRI BDT ASSEM CURRENT NEXT PARAMETER VALUE

5 0 379.643 5 0 1

Table 9. GPSS World Simulation Report - Untitled Model (2-2-3)

START TIME

END TIME BLOCKS FACILITIES STORAGES

0.000 354.120 20 1 0

FACILITY ENTRIES UTIL. AVE. TIME AVAIL. OWNER PEND INTER RETRY DELAY

SYSTEM 1 0.961 0.021 1 0 0 0 0 0

USER CHAIN SIZE RETRY AVE.CONT ENTRIES MAX AVE.TIME

LINE 2 0 0.00012 3 3 131.252

CEC XN PRI M1 ASSEM CURRENT NEXT PARAMETER VALUE

4 0 238.769 4 10 4

TSRV 31.225

FEC XN PRI BDT ASSEM CURRENT NEXT PARAMETER VALUE

5 0 379.643 5 0 1

Table 10. GPSS World Simulation Report - Untitled Model (2-2-4)

START TIME

END TIME BLOCKS FACILITIES STORAGES

0.000 354.120 20 1 0

FACILITY ENTRIES UTIL. AVE. TIME AVAIL. OWNER PEND INTER RETRY DELAY

SYSTEM 1 0.970 0.024 1 0 0 0 0 0

USER CHAIN SIZE RETRY AVE.CONT ENTRIES MAX AVE.TIME

LINE 2 0 0.00017 3 3 131.252

CEC XN PRI M1 ASSEM CURRENT NEXT PARAMETER VALUE

4 0 238.769 4 10 4

TSRV 31.225

FEC XN PRI BDT ASSEM CURRENT NEXT PARAMETER VALUE

5 0 379.643 5 0 1

Table 11. GPSS World Simulation Report - Untitled Model (2-2-6)

START TIME

END TIME BLOCKS FACILITIES STORAGES

0.000 354.120 20 1 0

FACILITY ENTRIES UTIL. AVE. TIME AVAIL. OWNER PEND INTER RETRY DELAY

SYSTEM 1 0.983 0.026 1 0 0 0 0 0

USER CHAIN SIZE RETRY AVE.CONT ENTRIES MAX AVE.TIME

LINE 2 0 0.00024 3 3 131.252

CEC XN PRI M1 ASSEM CURRENT NEXT PARAMETER VALUE

4 0 238.769 4 10 4

TSRV 31.225

FEC XN PRI BDT ASSEM CURRENT NEXT PARAMETER VALUE

5 0 379.643 5 0 1

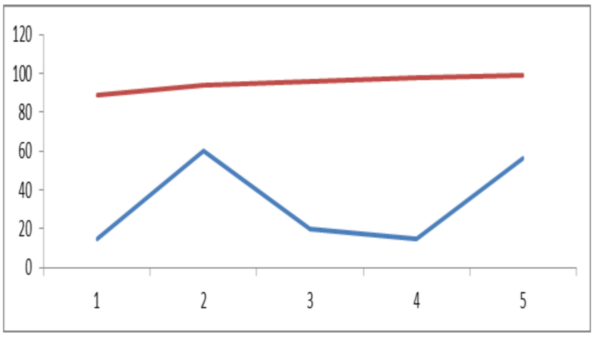


Fig. 5. The tendency of change of the length of queue on the realizations of simulation model of limited and unlimited queuing service processes

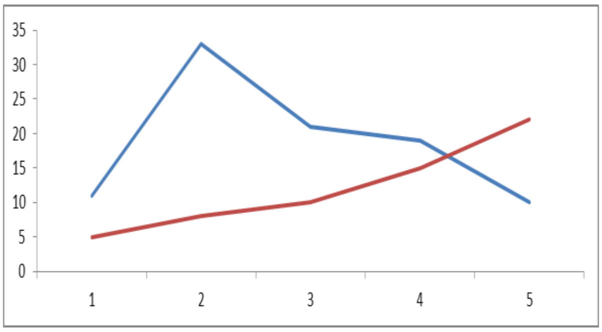


Fig. 6. The tendency of change of the time for waiting in the queue on the realizations of simulation model of limited and unlimited queuing service processes

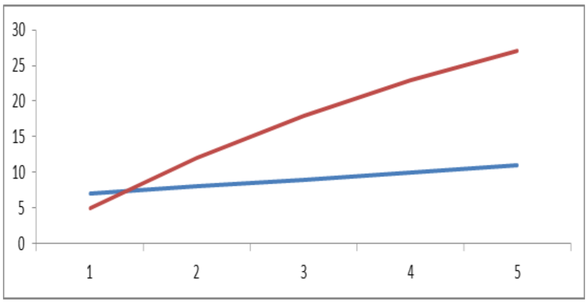


Fig. 7. The tendency of change of the coefficient of use from service devices on the realizations of simulation model of limited and unlimited queuing service processes

The analysis of these dependences shows that the values of the length of queue in limited queuing service systems is more exposed to increase and decrease in comparison with unlimited queuing service systems (Figure 5). The value of requests' waiting in the queue is mainly changed on the tendency to decrease after the second realization in limited queuing service systems and increase in unlimited queuing service systems (Figure 6). The increase in the tendency of change on the realizations of the coefficient of use of service devices is faster in unlimited queuing service systems than in limited queuing service systems and compare the results based on a formula determined by $\Delta = [|\dot{I} - A| / A] \times 100\%$. Using this formula, the tendency of the results of analytical (A) and simulation models was (2-9)%. And this confirms the consistency of analytical and simulation models with each – other. The obtained results of analytical and simulation models can be used in the development of distributed service networks of different purposes. The results obtained on the basis of the procedure and algorithm for the calculation of finding the optimum values of parameters of dynamic priorities in such system and simulation algorithms are valuable information for the system developers along with proving the adequacy of analytical model.

5. Conclusion

This paper performance evaluation the simulation models of distributed networks with limited and unlimited buffer residence time requirements of the network is limited. The network constraint violation results in loss requirements. Comparative analysis of the results of analytical and simulation methods for the problem of minimizing the loss of claims due to the preventive removal of some of them, without waiting for the service adequacy of the analytical results. Shown that the length of the class is always advisable to forcibly remove some of the requirements of the pending queue, thus reducing the load on the serving equipment, and ultimately minimizing the total loss of both Kinds. simulation models developed that enable the removal of a certain part of requests from the system as a preventive measure without waiting for the end of the service enable to minimize the loss of requests, determine the minimum value of the length of queue in terms of real time scale of requests and the rule of removal of “unpromising” requests for the system developers. In addition, this enables a reduction in the burden on service facilities and the application of more advanced software and technical support mechanisms, in turn, allows a reduction in both types of loss. It should be noted that the minimum value of total loss can be achieved with the increase in the number of service facilities. The results obtained can be used in the development of distributed service systems of different purposes.

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