Performance Analysis of Client-Server-System considering Interactions among System Component

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Abstract

In this paper, the behavior of distributed file system is analyzed by simulation. The distributed file system is composed by clients and a server. To make a special traffic model for NFS, the arrival interval of Ethernet LAN pakets are measured. The model of network protocols for each layers and the model of the server considering CPU processing throughput and disk access throughput are composed. The simulator is constructed with the traffic model, the network protocol model and the server model.

1 Introduction

BY widespread computer networks, large scale client server systems become extensivlly popular. The distributed file system is one of client server system. This enables transparent fail accesses from a terminal by a client server system. The servers show a tendency to concentrate into a single machime, because of ease to administ and low cost by sharing resource. However, in this network configration, degradation of the file server performance caused by some reasons raises retransmission and congestion, and brings the total system performance degradation.

The purpose of this research is to analyze how the performance fluctuation of network components affects the whole network system, and to give the optimum configration.

Many performance evaluation methods and evaluation tools have been proposed in network researches. These, however, treat protocols for each layers and do not include the server performance.

2 Outline of Simulator

The simulator consists of three parts. The first is the user traffic model, the second is the server model and the last is the network model. The following items are considered to make each models.

- User Traffic Model
  - Time Out
  - Retransmit Algorithm(for NFS hard mount)
- Server Model
  - Process mechanism
  - CPU Occupation Time
  - Disk Access Time
- Netowrk Model
  - Flagment and Reassemble
  - Routing
  - CSMA/CD of Ethernet

3 User Traffic Model

An outbreak of user traffic is considered to make user traffic model.

The user traffic model is produced paket at random and is assumed the poasson distribution to bo the incidence interval. However,Traffic of NFS is not assumed the poasson distribution to be the the incidence interval by the nature of NFS protocol. In this simulater,the user traffic model propose combining the normal distribution and the probability transition matrix. To make this user traffic model,the real LAN paket are measurad.

4 Server Model

The server model wait a fixed time by NFS request from client and this model return a reply a client.

4.1 Server Sub Model

The server sub model is constructed with the process management, CPU shard time on each NFS request. This model simulate the processing time that the NFS request is processd by CPU. To make this model, A real CPU shard time on each NFS request are measured.

4.2 Disk Device Sub Model

The disk device sub model is constructed with the disk access time. All NFS requests access disk device. However, this simulater assuming that the read request and the write requet access only disk.

5 Network Model

The Network model is constructed with the exchanging a paket from clients or a server. This simulater simulate faithfully the behavior of each layer protocols, and simulate faithfully the exchanging a paket.

5.1 IP Sub Model

IP do the fragment, reassemble and routing. IP sub model is constructed with the fragment, reassemble and routing. As IP sub model simulate routing,the network that form any segments can be analyzed by simulation.

5.2 Ethernet Sub Model

Ethernet sub model is constructed with 10 Mbit/sec Ethernet. Ethernet use an access method called CSMA/CD, which stands for Carrier Sense, Multiple Access With Collision Detection. This simulater simulate this action and transmit a paket.

6 Experiment

The simulation experiment was done with a made simulator. As for the composition of the network of the simulation, two or more clients are connected with one server in a single segment. It'network assumed and experimented on such a situation.

7 Conclusion

To see the interaction between the network composition elemnts, the simulator was made. The model specialized to NFS in the traffic generation part is made and the simulator has been extracted from the measurement value to the decision of the parameter of each model.

The packet generation of the client was able to be seen for the performance decrease because of the server processing saturation to be fed back to the client as response time of the interval because the packet switching of NFS was done by a synchronous type and to be limited consequentially though the interaction between each composition elements was not able to be seen in the simulation experiment with this simulator.