Project 2: Experimental Evaluation

CS8803-002 Graduate Intro to OS

Foreword

In this project, the goal is to learn about design of experiments and interpretation of experimental data. To complete the project, you will need to submit a Quiz through T-Square. The questions in the Quiz, and your answers, relate to performance evaluation of the multi-threaded GetFile server specified in Project 1. Instead of running your experiments directly, you will be able to provide us with configuration parameters for each experiment, and then we will supply you with the measured performance values. Following your experiments, you will complete a quiz provided through T-Square, labeled as Project 2 Quiz.

You do not need to provide a report, or actual experimental configurations or data. Consider this project as more of a thinking exercise of what constitutes a good experiment of a multithreaded server, and what are some typical trends that you could expect to see in such scenarios. The Flash paper will be helpful in successfully completing the project.

Using the Project 2 Experimental Sandbox

Experimental Design

All experiments can be "run" using the Project 2 Sandbox

- Instructions for using the Project 2 Sandbox are provided at the link
- You may assume that measured response values provided for experiments are an average of response values taken from previous experiment with the same configuration parameters

The experiments will measure the following performance values:

- Throughput
    - Bytes received from the server per second
- Average response time
    - Average time for the server to respond to client requests, in seconds

The experiments must specify the following configuration parameters:

- Server: Number of server worker threads
    - This will be specified as an unsigned integer value
- Workload: Request pattern
    - This will be specified as either FIXED_FILE, FIXED_SIZE, or MIXED_FILES
        - If FIXED_FILE
            - Requests will be made for a single file of a fixed file size
        - If FIXED_SIZE

            - Requests will be made for different files of a fixed file size
        - If MIXED_FILES
            - Requests will be made for different files that fall within a range of file sizes
- Workload: Request size (in bytes)*
    - This will be specified as a long long integer value
    - This value must be greater than 0
    - This will only be specified if a FIXED_FILE or FIXED_SIZE pattern is chosen*
- Workload: Request range (in bytes)*
    - This will be specified as two long long integer values
    - This range cannot start at 0
    - This will only be specified if the MIXED_FILES pattern is chosen*

Design Criteria

For questions 1-3 in the Quiz, you are asked to provide configuration parameters for a limited set of "runs". You must choose the parameters such that they adequately capture the behavior of the system and allow you to draw meaningful conclusions.

For instance, specifying 4 runs with parameters for the number of threads as 31, 32, 33 and 34 likely will not demonstrate anything interesting about the server and how its performance is affected by multithreading.

References

Relevant Lecture Material

- P2L5 Thread Performance Considerations

Suggestions

When designing your experiments and answering the quiz questions, think about the following:

- Which configuration parameter(s) affects the target metrics -- throughput and average response time?
- How does modifying a configuration parameter affects the performance values?
- Would my observations be further affected by varying other configuration parameters?
- Which configuration parameters will provide the best coverage of use cases for the web server?
- Am I varying the configuration parameters in a meaningful way? Do they allow me to make meaningful observations?

Rubric

- For full credit, you must provide correct answers to the first ~~5~~ 6 questions in the Project 2 Quiz, worth 100 points total.

- ~~Optional: An extra credit question worth 5 points is also included.~~
- ~~Also optional: You may provide additional explanations, if you wish, via the text box in Question 7.~~
- The first three questions assess your ability to design experiments. The last three questions assess your ability to interpret results.

Submission Instructions

Please submit your project by completing the Project 2 Quiz in T-Square prior to the deadline.

1. Only your responses to the T-Square Quiz will be graded.
2. You do not need to make any submission through the Project 2 Sandbox.

Questions

For all questions, please use the class forum so that TA's and other students can assist you.