DEPARTMENT OF COMPUTER SCIENCE, HANYANG UNIVERSITY

(DOCUMENT VERSION 1.0)

Make Buffer Pool Initialization Scalable

Concurrent Programming

Programming Project #4

Final due date: Dec 15, 2019 (HARD DEADLINE)

1 TASK OVERVIEW

Make InnoDB's buffer pool initialization faster than the current version using multiple threads.

2 TASK DETAILS

Database systems usually cache data pages in the in-memory structure, often called buffer pool, to achieve reduced disk I/O. Our target storage engine, InnoDB, also manages the buffer pool, and initialize it in the boot-up phase of the MariaDB server. The buffer pool consists of multiple buffer chunks, each of which is contiguous memory. The chunk consists of multiple buffer control blocks, and all of the control blocks are initialized by one

single thread regardless of the number of blocks. The goal of this project is to make the buffer pool initialization faster by using concurrent programming techniques.

Requirements:

- For buffer pool initialization, use the same number of threads as the number of available CPU cores, which can be retrieved by calling *sysconf(_SC_NPROCESSORS_ONLN)*
- You can change the buffer pool size yourself by adjusting the configuration parameter *innodb_buffer_pool_size* in the my.cnf file. Do not change other parameters.

Your report should includes:

1. Overall layout of the buffer pool you have analyzed.
2. Detail design rationale and nontrivial issues for preserving correctness if any.
3. Performance analysis of the new version.

3 TEST PROTOCOL

We are going to apply your *patchfile* to the MariaDB v10.5. We are going to measure the initialization time of the new version with the size of the buffer pool up to (~500 GiB) and verify the code changes by running various kinds of sysbench workloads and reviewing the code changes.

4 SUBMISSION

You should upload your project into the **project4** directory of the "hconnect" repository. Do not upload the entire MariaDB project. Instead, upload a *patchfile* generated by using the same command described in the lecture note of the lab class. You also need to upload a project report in the Gitlab wiki page of your hconnect project. Please set a name of the wiki page as project4.

Please enjoy the final project and have fun !!