Project 1 : README File

Team Members

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Files Modified

freelist.c /home/csci550user/postgresql-16.4/src/backend/storage/buffer
buf_init.c /home/csci550user/postgresql-16.4/src/backend/storage/buffer
buf_internals.h /home/csci550user/postgresql-16.4/src/include/storage
globals.c /home/csci550user/postgresql-16.4/utils/init/globals.c (For Testing)
postgres.conf /home/csci550user/databases/postgres.conf (For Testing)

Approach

Initially, we attempted to modify the existing code by using the **nextVictimBuffer** pointer for adding and removing buffers. However, this approach resulted in non-sequential execution issues. To address this, we implemented a new FIFO data structure with dedicated **Enqueue()** and **Dequeue()** functions.

For testing, we adjusted the buffer size to 16 in globals.c and shared memory 128 KB in postgres.conf. Utilizing the GDB debugger and setting breakpoints at various code lines allowed us to observe the **buffer_id (buf_id)** values being replaced sequentially - 1 to 15 for NBuffers= 16, confirming correct FIFO behavior. We introduced a global variable **F_Head** to track the first buffer /head in the queue, along with a **flink** pointer to reference the next buffer. Additionally, we used the **refcount** variable to determine if a buffer could be evicted—buffers in use were skipped during eviction.

The switching mechanism between the Clock Sweep algorithm and the FIFO algorithm is controlled via an environment variable called **BUFFER_STRAT**.

When **BUFFER_STRAT** is set to **FIFO**, the system uses the FIFO algorithm. If it is set to **CLOCK**, it employs the Clock Sweep algorithm. If **BUFFER_STRAT** is **NULL** or unset, the system defaults to the Clock Sweep algorithm.

Commands to Run:

1. pg_ctl -D /home/csci550user/postgresql-16.4/data stop
2. export BUFFER_STRAT=”FIFO”
3. echo $BUFFER_STRAT
4. pg_ctl -D /home/csci550user/databases start -l logfile
5. psql -U csci550user -d <7477761923_Neelam> / <1476964640_Roshni>
6. select pg_backend_pid(); //get pid and attach to GDB
7. Run Buffertest1.sql and Buffertest2.sql with breakpoints to see buffer_id in call stack
8. Repeat the above commands for CLOCK SWEEP , only change is in step 2 where we set BUFFER_STRAT=”CLOCK”