Week#7 RocksDB Compaction

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1. INTRODUCTION

Run two different compactions, level-based and universal compaction each. Then compare the compaction stats. Also present the experimental results.

2. METHODS

For this experiment, run DB_Bench and compare the RocksDB stats by varying the compaction style. Run two times by differing compaction style.

3. Performance Evaluation

3.1 Experimental Setup

System setup:

Type	Specification
OS	Ubuntu 20.04.3 LTS
CPU	Intel® Core™ i3-9100F CPU @ 3.60GHz
Memory	16GB
Kernel	5.11.0-27-generic
Data Device	Western Digital WD Blue 500GB
Log Device	Western Digital WD Blue 500GB

Benchmark setup:

Type	Configuration
DB size	1GB (10 warehouse)
Buffer Pool Size	300MB (30% of DB size)
Benchmark Tool	tpcc-mysql
Runtime	1200s
Connections	8

3.2 Experimental Results

< Final compaction stat result >

Level-based (-compaction_style=0)

** Compaction Stats [default] **

Level Files Size Score Read(GB) Rn(GB) Rnp1(GB) Write(GB) Wnew(GB) Moved(GB) W-Amp Rd(MB/s) Wr(MB/s) Comp(sec) CompMergeCPU(sec) Comp(cnt) Avg(sec) KeyIn KeyDrop Rblob(GB) Wblob(GB)

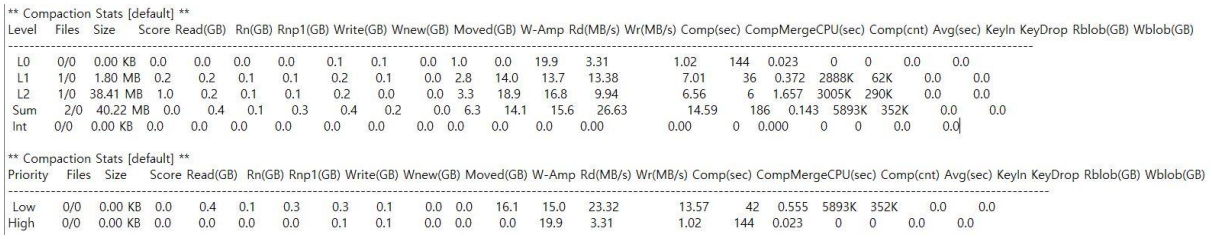
L0 0/0 0.00 KB 0.0 0.0 0.0 0.0 0.1 0.1 0.0 1.0 0.0 19.9 3.31 1.02 144 0.023 0 0 0.0 0.0

L1 1/0 1.80 MB 0.2 0.2 0.1 0.1 0.2 0.1 0.0 2.8 14.0 13.7 13.38 7.01 36 0.372 2888K 62K 0.0 0.0

L2 1/0 38.41 MB 1.0 0.2 0.1 0.1 0.2 0.0 0.0 3.3 18.9 16.8 9.94 6.56 6 1.657 3005K 290K 0.0 0.0

Sum 2/0 40.22 MB 0.0 0.4 0.1 0.3 0.4 0.2 0.0 6.3 14.1 15.6 26.63 14.59 186 0.143 5893K 352K 0.0 0.0

Int 0/0 0.00 KB 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.00 0.00 0 0.000 0 0 0.0 0.0



** Compaction Stats [default] **

Level Files Size Score Read(GB) Rn(GB) Rnp1(GB) Write(GB) Wnew(GB) Moved(GB) W-Amp Rd(MB/s) Wr(MB/s) Comp(sec) CompMergeCPU(sec) Comp(cnt) Avg(sec) KeyIn KeyDrop Rblob(GB) Wblob(GB)

L0 0/0 0.00 KB 0.0 0.0 0.0 0.0 0.1 0.1 0.0 1.0 0.0 19.9 3.31 1.02 144 0.023 0 0 0.0 0.0

L1 1/0 1.80 MB 0.2 0.2 0.1 0.1 0.2 0.1 0.0 2.8 14.0 13.7 13.38 7.01 36 0.372 2888K 62K 0.0 0.0

L2 1/0 38.41 MB 1.0 0.2 0.1 0.1 0.2 0.0 0.0 3.3 18.9 16.8 9.94 6.56 6 1.657 3005K 290K 0.0 0.0

Sum 2/0 40.22 MB 0.0 0.4 0.1 0.3 0.4 0.2 0.0 6.3 14.1 15.6 26.63 14.59 186 0.143 5893K 352K 0.0 0.0

Int 0/0 0.00 KB 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.00 0.00 0 0.000 0 0 0.0 0.0

** Compaction Stats [default] **

Priority Files Size Score Read(GB) Rn(GB) Rnp1(GB) Write(GB) Wnew(GB) Moved(GB) W-Amp Rd(MB/s) Wr(MB/s) Comp(sec) CompMergeCPU(sec) Comp(cnt) Avg(sec) KeyIn KeyDrop Rblob(GB) Wblob(GB)

Low 0/0 0.00 KB 0.0 0.4 0.1 0.3 0.3 0.1 0.0 0.0 16.1 15.0 23.32 13.57 42 0.555 5893K 352K 0.0 0.0

High 0/0 0.00 KB 0.0 0.0 0.0 0.0 0.1 0.1 0.0 0.0 0.0 19.9 3.31 1.02 144 0.023 0 0 0.0 0.0

Universal (-compaction_style=1)

** Compaction Stats [default] **

Level Files Size Score Read(GB) Rn(GB) Rnp1(GB) Write(GB) Wnew(GB) Moved(GB) W-Amp Rd(MB/s) Wr(MB/s) Comp(sec) CompMergeCPU(sec) Comp(cnt) Avg(sec) KeyIn KeyDrop Rblob(GB) Wblob(GB)

L0 0/0 0.00 KB 0.0 0.0 0.0 0.0 0.0 0.0 0.0 1.0 0.0 17.0 2.55 0.82 95 0.027 0 0 0.0 0.0

L3 1/0 1.36 MB 0.0 0.1 0.0 0.0 0.1 0.0 0.0 3.0 13.3 13.2 4.08 2.18 31 0.131 831K 4321 0.0 0.0

L4 1/0 1.80 MB 0.0 0.0 0.0 0.0 0.0 0.0 0.0 1.5 12.3 12.2 2.22 1.05 18 0.123 417K 3470 0.0 0.0

L5 1/0 12.76 MB 0.0 0.0 0.0 0.0 0.0 0.0 0.0 1.6 14.3 13.8 2.94 1.82 10 0.294 644K 23K 0.0 0.0

L6 1/0 20.23 MB 0.0 0.0 0.0 0.0 0.0 0.0 0.0 1.4 12.5 11.0 3.34 2.03 4 0.834 656K 59K 0.0 0.0

Sum 4/0 36.16 MB 0.0 0.2 0.1 0.1 0.2 0.1 0.0 4.6 11.0 13.3 15.12 7.90 158 0.096 2550K 90K 0.0 0.0

Int 0/0 0.00 KB 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
0.0 0.00 0.00 0 0.000 0 0 0.0 0.0

** Compaction Stats [default] **

Level	Files	Size	Score	Read(GB)	Rn(GB)	Rnp1(GB)	Write(GB)	Wnew(GB)	Moved(GB)	W-Amp	Rd(MB/s)	Wr(MB/s)	Comp(sec)	CompMergeCPU(sec)	Comp(cnt)	Avg(sec)	Keyln	KeyDrop	Rblob(GB)	Wblob(GB)
L0	0/0	0.00 KB	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	17.0	2.55	0.82	95	0.027	0	0	0.0	0.0
L3	1/0	1.36 MB	0.0	0.1	0.0	0.0	0.1	0.0	0.0	3.0	13.3	13.2	4.08	2.18	31	0.131	831K	4321	0.0	0.0
L4	1/0	1.80 MB	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	12.3	12.2	2.22	1.05	18	0.123	417K	3470	0.0	0.0
L5	1/0	12.76 MB	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.6	14.3	13.8	2.94	1.82	10	0.294	644K	23K	0.0	0.0
L6	1/0	20.23 MB	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	12.5	11.0	3.34	2.03	4	0.834	656K	59K	0.0	0.0
Sum	4/0	36.16 MB	0.0	0.2	0.1	0.1	0.2	0.1	0.0	4.6	11.0	13.3	15.12	7.90	158	0.096	2550K	90K	0.0	0.0
Int	0/0	0.00 KB	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0	0.000	0	0	0.0	0.0

** Compaction Stats [default] **

Priority	Files	Size	Score	Read(GB)	Rn(GB)	Rnp1(GB)	Write(GB)	Wnew(GB)	Moved(GB)	W-Amp	Rd(MB/s)	Wr(MB/s)	Comp(sec)	CompMergeCPU(sec)	Comp(cnt)	Avg(sec)	Keyln	KeyDrop	Rblob(GB)	Wblob(GB)
Low	0/0	0.00 KB	0.0	0.2	0.1	0.1	0.2	0.1	0.0	0.0	13.2	12.6	12.57	7.08	63	0.199	2550K	90K	0.0	0.0
High	0/0	0.00 KB	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.0	2.55	0.82	95	0.027	0	0	0.0	0.0

The sum of all used pages is a little bigger at level-based compaction than universal compaction. However the level goes much higher at universal compaction.

4. Conclusion

After this experiment, I can realize that the level increases over time in universal compaction. It only increases the level at which data is stored and the compaction mechanism is totally different from the level-based compaction.

5. REFERENCES

[1] https://github.com/meeeejin/SWE3033-F2021/tree/main/week-7