Week#9 SST file size of RocksDB

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1. INTRODUCTION

Run DB_Bench by varying the SST file size. Exactly change the SST file and memtable size to 2MB, 8MB, 16MB each. Then observe how WAF changes. Maybe it can be observed that the correlation between SST file size and WAF.

2. METHODS

For this experiment, run DB_Bench and analyze the RocksDB stats. In the RocksDB log file, we can get the stat about level. Then observe how WAF differs from level to level. After this, change the SST file size and repeat the run and analyze.

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

< SST file size = 2MB >

** Compaction Stats [default] **

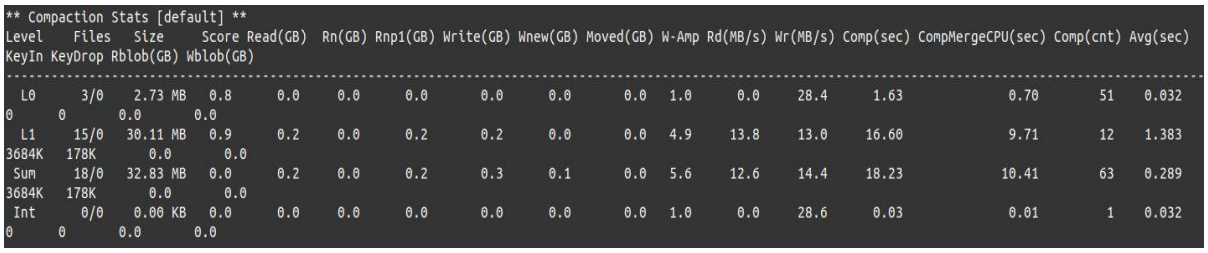
Level Files Size Score Read(GB) Rn(GB) Rnp1(GB) Write(GB) Wnew(GB) Moved(GB) W-Amp Rd(MB/s) Wr(MB/s) Comp(sec) CompMergeCPU(sec) Comp(cnt) Avg(sec) KeyIn KeyDrop Rblob(GB) Wblob(GB)

L0 3/0 2.73 MB 0.8 0.0 0.0 0.0 0.0 0.0 0.0 1.0 0.0 28.4 1.63 0.70 51 0.032 0 0 0.0 0.0

L1 15/0 30.11 MB 0.9 0.2 0.0 0.2 0.2 0.0 0.0 4.9 13.8 13.0 16.60 9.71 12 1.383 3684K 178K 0.0 0.0

Sum 18/0 32.83 MB 0.0 0.2 0.0 0.2 0.3 0.1 0.0 5.6 12.6 14.4 18.23 10.41 63 0.289 3684K 178K 0.0 0.0

Int 0/0 0.00 KB 0.0 0.0 0.0 0.0 0.0 0.0 0.0 1.0 0.0 28.6 0.03 0.01 1 0.032 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      3/0    2.73 MB   0.8      0.0     0.0      0.0       0.0      0.0       0.0   1.0      0.0     28.4      1.63              0.70        51    0.032
0      0       0.0       0.0
  L1     15/0   30.11 MB   0.9      0.2     0.0      0.2       0.2      0.0       0.0   4.9     13.8     13.0     16.60              9.71        12    1.383
3684K   178K       0.0       0.0
 Sum     18/0   32.83 MB   0.0      0.2     0.0      0.2       0.3      0.1       0.0   5.6     12.6     14.4     18.23             10.41        63    0.289
3684K   178K       0.0       0.0
 Int      0/0    0.00 KB   0.0      0.0     0.0      0.0       0.0      0.0       0.0   1.0      0.0     28.6      0.03              0.01         1    0.032
0      0       0.0       0.0
```

WAF(W-Amp) : L0 -> 1.0, L1 -> 4.9

< SST file size = 8MB >

** Compaction Stats [default] **

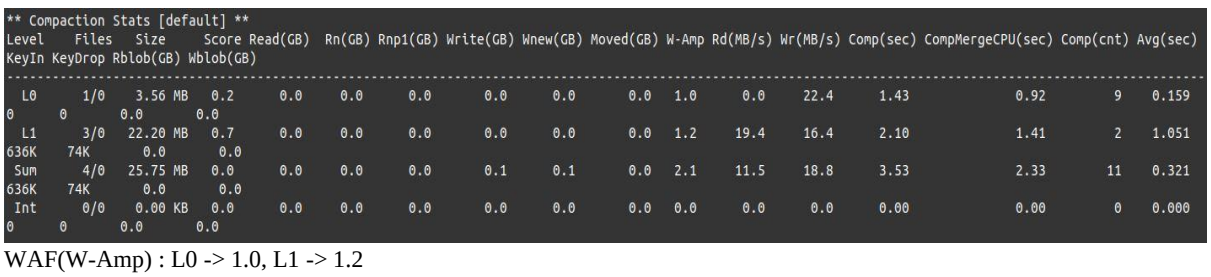
Level Files Size Score Read(GB) Rn(GB) Rnp1(GB) Write(GB) Wnew(GB) Moved(GB) W-Amp Rd(MB/s) Wr(MB/s) Comp(sec) CompMergeCPU(sec) Comp(cnt) Avg(sec) KeyIn KeyDrop Rblob(GB) Wblob(GB)

L0 1/0 3.56 MB 0.2 0.0 0.0 0.0 0.0 0.0 0.0 1.0 0.0 22.4 1.43 0.92 9 0.159 0 0 0.0 0.0

L1 3/0 22.20 MB 0.7 0.0 0.0 0.0 0.0 0.0 0.0 1.2 19.4 16.4 2.10 1.41 2 1.051 636K 74K 0.0 0.0

Sum 4/0 25.75 MB 0.0 0.0 0.0 0.0 0.1 0.1 0.0 2.1 11.5 18.8 3.53 2.33 11 0.321 636K 74K 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      1/0    3.56 MB   0.2      0.0     0.0      0.0       0.0      0.0       0.0   1.0      0.0     22.4      1.43              0.92         9    0.159
0      0       0.0       0.0
  L1      3/0   22.20 MB   0.7      0.0     0.0      0.0       0.0      0.0       0.0   1.2     19.4     16.4      2.10              1.41         2    1.051
636K    74K       0.0       0.0
 Sum      4/0   25.75 MB   0.0      0.0     0.0      0.0       0.1      0.1       0.0   2.1     11.5     18.8      3.53              2.33        11    0.321
636K    74K       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
```

WAF(W-Amp) : L0 -> 1.0, L1 -> 1.2

< SST file size = 16MB >

** 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 1/0 7.02 MB 0.2 0.0 0.0 0.0 0.0 0.0 0.0 1.0 0.0 23.6 1.49 0.98 5 0.297 0 0 0.0 0.0

L1 2/0 22.48 MB 0.7 0.0 0.0 0.0 0.0 0.0 0.0 0.8 19.4 15.6 1.44 1.03 1 1.444 430K 64K 0.0 0.0

Sum 3/0 29.50 MB 0.0 0.0 0.0 0.0 0.1 0.1 0.0 1.6 9.6 19.6 2.93 2.02 6 0.488 430K 64K 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 1/0 7.02 MB 0.2 0.0 0.0 0.0 0.0 0.0 0.0 1.0 0.0 23.6 1.49 0.98 5 0.297 0 0 0.0 0.0
L1 2/0 22.48 MB 0.7 0.0 0.0 0.0 0.0 0.0 0.0 0.8 19.4 15.6 1.44 1.03 1 1.444 430K 64K 0.0 0.0
Sum 3/0 29.50 MB 0.0 0.0 0.0 0.0 0.1 0.1 0.0 1.6 9.6 19.6 2.93 2.02 6 0.488 430K 64K 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

W-Amp : L0 -> 1.0, L1 -> 0.8

In case of L0, no matter how the SST file size changes, the value of WAF is fixed to 1.0. However, at level L1, the size of SST file increases, WAF value sharply decreases.

4. Conclusion

After this experiment, I can realize that the shape of change in WAF according to the SST file size change. Change of WAF differs from level to level.

5. REFERENCES

[1] https://github.com/meeeejin/SWE3033-F2021/tree/main/week-9