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:

Туре	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

** Compaction Stats [default] **

L0 0.0 0.0	3/0 28.4	2.73 MB 1.63	0.8	0.0 0.70	0.0	0.0 51	0.0	0.0	0	0.0	1.0 0.0
L1 13.8 0.0	15/0 13.0	30.11 MB 16.60	0.9	0.2 9.71	0.0	0.2 12	1.383	0.0 3684K	178K	0.0	4.9 0.0
Sum 12.6 0.0	18/0 14.4	32.83 MB 18.23	0.0	0.2 10.41	0.0	0.2 63	0.3	0.1 3684K	178K	0.0	5.6 0.0
Int 0.0 0.0	0/0 28.6	0.00 KB 0.03	0.0	0.0	0.0	0.0 1	0.0	0.0	0	0.0	1.0 0.0

 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
 1.0
 0.0
 28.4
 1.63
 0.70
 51
 0.032

 0
 0
 0.0
 0.0
 0.0
 0.0
 0.0
 13.8
 13.0
 16.60
 9.71
 12
 1.383

 3684K
 178K
 0.0
 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
 0.0
 0.0
 0.0
 5.6
 12.6
 14.4
 18.23
 10.41
 63
 0.289

 3684K
 178K
 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

 10
 0.0
 0.0

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

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 22.4		1/0 1.43	3.56	MB	0.2 0.92	(0.0 9	0.0 0.159		0.0	0	.0	0.0	0.0	1.0	0.0
L1 16.4		3/0 2.10	22.20	MB	0.7 1.41	(2	0.0 1.051).0 6 K	74K	0.0	0.0 0.0	0.0	1.2	19.4
Sum 18.8	1	4/0 3.53	25.75	MB	0.0 2.33	().0 11	0.0 0.321).0 6K	74K	.1	0.1 0.0	0.0 0.0	2.1	11.5
Int 0.0	(0/0	0.00 1	KB	0.0	0.	0	$0.0 \\ 0.000$	0.	0	0.	0	0.0	0.0	0.0	0.0
Level	Files	Stats [def Size Rblob(GB)	Score Re	ad(GB)	Rn(GB)	Rnp1(GB) Wi	rite(GB)	Wnew(GB)	Moved(GB)	W-Amp	Rd(MB/s)	wr(MB/s)	Comp(sec)	CompMergeCPU(sec)	Comp(cnt)	Avg(sec)
LO	1/0	3.56 MB 0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	22.4	1.43	0.92		0.159
0 L1 636K	3/0 74K	22.20 MB 0.0		0.0	0.0	0.0	0.0	0.0	0.0	1.2	19.4	16.4	2.10	1.41		1.051
Sum 636K	4/0 74K	25.75 MB 0.0	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
Int	0/0	0.00 KB		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0	0.000

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

< SST file size = 8MB >

^{**} Compaction Stats [default] **

** Compaction Stats [default] **

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		
** Compact	ion Stats [de	fault] **	150 100 100			100000					2 2 1 2 2

** Com	paction	Stats [de	efault)	**												
Level	Files	Size	Sco	ore 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)) Wblot	b(GB)												
LΘ	1/0	7.02	MB Θ.	.2 0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	23.6	1.49	0.98		0.297
0		0.0	0.0													
L1	2/0	22.48 N	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		1.444
430K	64K	0.0	(0.0												
Sum	3/0	29.50 N	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		0.488
430K	64K	0.0	(0.0												
Int	0/0	0.00 k	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		0.000
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