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:

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:

Туре	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 >

** Compaction Stats [default] **

 $\label{eq:local_continuous_cont$

0.0 19.9 3.31 1.02 144 0.023 0 0 L1 1/0 1.80 MB 0.2 0.2 0.1 0.1 0.2 0.1 0 14.0 13.7 13.38 7.01 36 0.372 2888K 62K 0.0 L2 1/0 38.41 MB 1.0 0.2 0.1 0.1 0.2 0.0 0 18.9 16.8 9.94 6.56 6 1.657 3005K 290K 0.0 Sum 2/0 40.22 MB 0.0 0.4 0.1 0.3 0.4 0.2 14.1 15.6 26.63 14.59 186 0.143 5893K 352K 0.0 10.0 0.00 0.																						
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18.9 16.8 9.94 6.56 6 1.657 3005K 290K Sum 2/0 40.22 MB 0.0 0.4 0.1 0.3 0.4 0.2 14.1 15.6 26.63 14.59 186 0.143 5893K 352K 0.0 Int 0/0 0.00 KB 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.00 0.00 0 0.000 0 0 0.0 0.0 0.00 0 0.000 0 0	0.0 2.8 0.0	0.0	62K				0.37							0.2	В					1		14.0
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	0.0 0.0	0.0	0				0.00			0.0	0.00			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 Rbloi L0 0/0 0.00 KB 0.0 0.0 0.0 0.0 0.1 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 **Compaction Stats [default] ** Priority Files Size Score Read(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 Rb 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				0.0 0.0 0.0 0.0 0.0 0.0 0.0	0.0 2K 0.0 0K 0.0 352K 0. 0.0 0	0 0 2888K 62 005K 290 5893K 0 0	0.023 0.372 2 1.657 30 86 0.143 0.000 0	144 36 6 0 (sec) (1.02 7.01 6.56 14.59 0.00 Wr(MB/s) Com	3.31 13.38 9.94 6 26.63 0.00	19.9 13.7 16.8 15.6 0.0	0.0 14.0 18.9 14.1 0.0	0.0 1.0 0.0 2.8 0.0 3.3 0.0 6.3 0.0 0.0	0.1 0.1 0.0 0.2 0.0	0.1 0.2 0.2 0.4 0.0	0.0 0.1 0.1 0.3 0.0	0.0 0.1 0.1 0.1 0.0	0.0 0.2 0.2 0.4 0.0	0.0 3 0.2 B 1.0 MB 0.0 0.0 lefault] ³ Score	0.00 KE 1.80 M 38.41 M 40.22 0.00 KB in Stats [instance]	0/0 1/0 1/0 2/0 0/0 paction	Level L0 L1 L2 Sum Int ** Com Priority

Universal (-compaction_style=1)

** Compaction Stats [default] **

L0 17.0	0/0 2.55	0.00 KB	0.0 0.82	0.0 95	0.0 0.027	0.0	0.0	0.0 0.0	0.0	1.0	0.0
L3 13.2	1/0 4.08	1.36 MB	0.0 2.18	0.1 31	0.0 0.131	0.0 831K	0.1 4321	0.0 0.0	0.0	3.0	13.3
L4 12.2	1/0 2.22	1.80 MB	0.0 1.05	0.0 18	0.0 0.123	0.0 417K	0.0 3470	0.0 0.0	0.0	1.5	12.3
L5 13.8	1/0 2.94	12.76 MB	0.0 1.82	0.0 10	0.0 0.294	0.0 644K	0.0 23K	$0.0 \\ 0.0$	0.0 0.0	1.6	14.3
L6 11.0	1/0 3.34	20.23 MB	0.0 2.03	0.0 4	0.0 0.834	0.0 656K	0.0 59K	$0.0 \\ 0.0$	0.0	1.4	12.5
Sum 13.3	4/0 15.12	36.16 MB	0.0 7.90	0.2 158	0.1 0.096	0.1 2550K	0.2 90K	0.1 0.0	0.0	4.6	11.0

Int		0/0	0	0.	00 F	ΚB	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	(0.00)	0	0)	0	0.		0.	0		
** Con Level	pactio Files	n Stats [de Size S			Rn(GE	8) Rnp1(0	GB) Write	e(GB) Wr	new(GB)	Move	d(GB) W	/-Amp F	Rd(MB/s) V	Vr(MB/s) Comp(s	ec) Co	mpMerge	eCPU(se	c) Com	np(cnt) A	Avg(sec	Keyln Key	Drop Rblob(GB)	Wblob(GB)
LO	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 M	B 0.0	0.2	0.1	0.1	0.2	0.1	0.0	4.6	11.0	13.3	15.12	7.90	15	0.09	6 2550	K 90	OK (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			
** Con	pactio	n Stats [de	efault] *	k																			
Priority	File	s Size	Score	Read(G	B) Rn(GB) Rnp1	I(GB) Wr	ite(GB) \	Vnew(G	B) Mo	ved(GB)	W-Amp	Rd(MB/s)	Wr(MB/s) Comp	(sec)	CompMer	geCPU(sec) Co	omp(cnt)	Avg(s	ec) Keyln K	eyDrop Rblob(G	B) 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