CacheKV: Redesigning High-Performance Key-Value Stores with Persistent CPU Caches

Yijie Zhong
Xiamen University
yjiezhong@stu.xmu.edu.cn

Zhirong Shen
Xiamen University
shenzr@xmu.edu.cn

Zixiang Yu
Xiamen University
yuzixiang23@foxmail.com

Jiwu Shu
Tsinghua University, Xiamen University
shujw@tsinghua.edu.cn

Experiment 1

Sequential writes bandwidth(MB/s)	value size=16B	64B	256B
NoveLSM	19	46.3	134
NoveLSM-cache	34.1	82.9	197.6
SLM-DB	4.3	9.7	23.5
SLM-DB-cache	29.5	57.2	103.3
PCSM	51.6	132.2	411.5
PCSM+LIU	91.3	224.8	517
CacheKV	86.7	207.5	488.5
Random writes bandwidth(MB/s)	**value size=16B**	**64B**	**256B**
NoveLSM	7.3	16.1	46.5
NoveLSM-cache	8.9	20.1	57.5
SLM-DB	2.8	6	16.5
SLM-DB-cache	4.8	9.3	23.4
PCSM	33.9	96.6	325
PCSM+LIU	54.6	143.9	406.8
CacheKV	54.5	129.1	380.9

Experiment 2

Sequential reads bandwidth(MB/s)	value size=16B	64B	256B
NoveLSM	345.7	863.4	2333
NoveLSM-cache	448.4	1116.9	2132
SLM-DB	102.5	232.9	680.3
SLM-DB-cache	227.3	535.9	1483.6
PCSM	114.7	1155.3	1984.1
PCSM+LIU	103.3	1029.9	1915.7
CacheKV	477.2	1194.6	1958.7
Random reads bandwidth(MB/s)	**value size=16B**	**64B**	**256B**
NoveLSM	8.9	18.9	51.5
NoveLSM-cache	9.1	19.8	57.1
SLM-DB	4.3	9.4	22
SLM-DB-cache	4.5	9.3	20.4
PCSM	3.5	3.1	6.3
PCSM+LIU	3.1	7.1	22.4
CacheKV	6.3	15.4	50.9

Experiment 3

Random reads bandwidth(MB/s)	UserThread-1	UserThread-2	UserThread-4	UserThread-8
NoveLSM	18.9	17	33.5	51.1
NoveLSM-cache	19.8	17	33	48.9
SLM-DB	9.4	13.7	3.1	2.9
SLM-DB-cache	9.3	18.9	46	70.2
CacheKV	15.4	26.8	54.8	94.9
Random writes bandwidth(MB/s)	**UserThread-1**	**UserThread-2**	**UserThread-4**	**UserThread-8**
NoveLSM	16.1	6.1	2.9	2.6
NoveLSM-cache	20.1	6.9	3.4	2.8
SLM-DB	6	5.3	3.4	3.2
SLM-DB-cache	9.3	7.3	5.2	4.1
CacheKV	129.1	135	152.1	138.3

Experiment 4

YCSB(KOPS)	LOAD	A	B	C	D	F
NoveLSM	157	181	200.7	175.8	203.6	137.6
NoveLSM-cache	157.1	186.4	207.5	205.8	217	149.8
SLM-DB	10.5	14.1	39.9	51.8	56.3	23.4
SLM-DB-cache	47.3	25.4	38.4	38.8	46	42.1
CacheKV	489.5	212.6	220.1	221.4	211.4	150.1

Experiment 5

bandwidth(MB/s)	UserThread-1	UserThread-2	UserThread-4	UserThread-6
BackgroundThread-1	131.8	147.8	157.9	163.1
BackgroundThread-2	217.1	240.2	267.5	278
BackgroundThread-3	220.8	290.6	355.6	369.6
BackgroundThread-4	224	291.8	432	445.4
BackgroundThread-5	220	294.6	439.7	489.2
BackgroundThread-6	221.4	296.7	428.3	504.3

Experiment 6

Random reads bandwidth(MB/s)	sub-MemTable Size=0.25MB	0.5MB	1MB	2MB
sub-MemTable Pool Size=12MB	39.9	51.4	62.7	72.5
Random writes bandwidth(MB/s)				
sub-MemTable Pool Size=12MB	230.4	321.6	326.5	286.7

Experiment 7

Random reads bandwidth(MB/s)	sub-MemTable Pool Size=3MB	6MB	12MB	24MB	30MB
sub-MemTable Size=1MB	61.4	58.8	57.6	51	49.9
Random writes bandwidth(MB/s)					
sub-MemTable Size=1MB	246.4	297.9	307.1	329.3	333.7