IO efficiency (IOPS/core) over different sync IO methods

measured with FIO over set of 16 NVMe block devices (formatted with 4k sectors)

highest IOPS absolute
best IOPS efficiency
PostgreSQL IO method (=sync)

IO Concurrency 1024

ioengine	sync	psync	vsync	pvsync	pvsync2	pvsync2 +hipri
iodepth	1	1	1	1	1	1
numjobs	1024	1024	1024	1024	1024	1024
concurrency	1024	1024	1024	1024	1024	1024
iops (k)	9171	**9390**	**9196**	**9473**	**9527**	**9516**
user load (%)	7,7	9,3	8,6	9,0	9,3	2,6
system load (%)	**86,8**	**77,0**	**85,8**	**76,3**	**77,3**	**97,4**
total load (%)	94,5	86,3	94,4	85,3	86,6	100,0
iops (k) / system (%)	106	122	107	124	123	98
iops (k) / core	120	**139**	**122**	141	**140**	**111**

IO Concurrency 256

ioengine	sync	psync	vsync	pvsync	pvsync2	pvsync2 +hipri
iodepth	1	1	1	1	1	1
numjobs	256	256	256	256	256	256
concurrency	256	256	256	256	256	256
iops (k)	**4469**	**4497**	**4603**	**4737**	**4547**	9543
user load (%)	7,2	7,7	7,9	7,8	7,1	2,7
system load (%)	**74,9**	**71,9**	**73,9**	**71,2**	**72,3**	**97,3**
total load (%)	82,1	79,6	81,8	79,0	79,4	100,0
iops (k) / system (%)	60	63	62	67	63	98
iops (k) / core	**68**	**71**	**71**	**76**	**71**	**111**

IO efficiency (IOPS/core) with AIO

measured with FIO over set of 16 NVMe block devices (formatted with 4k sectors)

highest IOPS absolute
best IOPS efficiency

IO Depth 32

ioengine	libaio	libaio	libaio	libaio
iodepth	32	32	32	32
iodepth_batch_submit	8	8	8	8
numjobs	256	128	64	32
concurrency	8192	4096	2048	1024
iops (k)	**9.506**	**9.486**	**9.479**	**8.718**
user load (%)	11,5	6,7	3,4	2,4
system load (%)	**76,9**	**59,2**	**30,0**	**16,7**
total load (%)	88,4	65,9	33,4	19,1
iops (k) / system (%)	124	160	316	522
iops (k) / core	**140**	**182**	**359**	**593**

IO Depth 64

ioengine	libaio	libaio	libaio	libaio
iodepth	64	64	64	64
iodepth_batch_submit	16	16	16	16
numjobs	128	64	32	16
concurrency	8192	4096	2048	1024
iops (k)	**9.467**	**9.167**	**8.457**	**4.905**
user load (%)	6,5	3,3	2,6	1,2
system load (%)	**58,6**	**30,6**	**16,1**	**8,2**
total load (%)	65,1	33,9	18,7	9,4
iops (k) / system (%)	162	300	525	598
iops (k) / core	**184**	**340**	**597**	**680**

IO Depth 128

ioengine	libaio	libaio	libaio	libaio
iodepth	128	128	128	128
iodepth_batch_submit	32	32	32	32
numjobs	64	32	16	8
concurrency	8192	4096	2048	1024
iops (k)	**8.528**	**8.693**	**4.842**	**2.745**
user load (%)	3,2	2,7	1,3	0,6
system load (%)	**30,4**	**16,0**	**8,0**	**4,0**
total load (%)	33,6	18,7	9,3	4,6
iops (k) / system (%)	281	543	605	686
iops (k) / core	**319**	**617**	**688**	**780**

IO efficiency (IOPS/core) with XFS over MD / non-MD

XFS Performance

ioengine	sync	psync	sync	psync
RAID-0 over NVMe	no	no	yes	yes
iodepth	1	1	1	1
numjobs	1024	1024	1024	1024
concurrency	1024	1024	1024	1024
iops (k)	5398	5409	2880	2946
user load (%)	7,2	7,0	3,5	3,3
system load (%)	70,2	69,0	96,5	96,7
total load (%)	77,4	76,0	100,0	100,0
iops (k) / system (%)	77	78	30	30
iops (k) / core	87	89	34	35

Storage setup as deployed on SQL18/19