

Performance effects of building Ztocs with different values of span size

Summary

This document presents the results of running the performance test from the benchmarking framework for container images having several Soci indices built with different span size configurations. Based on <https://github.com/awslabs/soci-snapshotter/commit/1628d6eac6cb9383f9538d0bb85de8a007b4f9a3>, the initial span size was set to 4 MiB. There was a question if that's enough. This document tries to answer this question. For that, we look at the span sizes of 4, 8, 16 and 32 MiB to see if increasing the span size positively affects the total time to run the container workload to ready line.

The data was collected in the following way:

1. For every image in the Benchmarking results table 3 additional indices were built with span sizes 8, 16 and 32 MiB respectively.
2. For each image and span size, the performance test was executed using 10 samples (`make benchmarks`).

Looking at the data from next section it is evident, that for most of the workloads increasing the span size to 8 MiB is beneficial and improves the mean time to get to ready line by 1.75-10% (exceptions: `gchellocompile` and `rabbitmq`) and max time to get to ready line by 1.85-26% (exceptions: `gchellocompile`, `mongo`, `glassfish`, `rabbitmq`).

`gchellocompile` appears to be an extreme case, where increasing span size negatively affect the performance (the difference is under 2s for 8MiB).

`tensorflow cpu` is the only image, where increasing the span size all the way to 32MiB shows the biggest gains.

Therefore, we can conclude that increasing the default span size to 8MiB will benefit most of the workloads with minimal harm to `gchellocompile`, `mongo`, `glassfish`, `rabbitmq`.

For `tensorflow` image only it can be recommended to build an index with span size of 32MiB, since it produces the most benefits (29.3% improvement in mean time to ready line and 25.18% improvement in max time to ready line).

Benchmarking results

Following table represents the collected data when running `soci snapshotter`'s performance test outlined in the above section:

	A	B	C		D	E	F	G	H	I
1	image	image size, MB	span size, MB	mean total time, s	mean total time diff, %	min total time, s	max total time, s	max total time diff, %	soci index sha	
2	tomcat	252	4	6.19	0.00%	5.76	7.01	0.00%	sha256:f6fab4c6b0142401062e50b02b7d22c37c3a3cd5551ecee6893e440bd84aa	
3			8	5.86	5.33%	5.57	6.18	11.84%	sha256:62d96589fcd8cc4eaa714d43c9bbe68d06c086458592852cf778d98e0c4eb4	
4			16	6.35	-2.58%	6	7.29	-3.99%	sha256:bc15ca01ebdedb5246356b1dc7520d2adff02d3cd5247b0e0b399e126ac3372b	
5			32	7.35	-18.74%	7.01	9.08	-29.53%	sha256:6ec9cefca8c8f97daac5a10f66e14b18b51c3c4d5b18b1052dda7561b25e29d	

6			4	2.23	0.00%	1.99	3.53	0.00%	sha256:50fa6303f78dabc586d0bcac240195909ea005309284d9ad9d0c3f1a4f9687
7	rethinkdb	48	8	2.1	5.83%	1.94	2.58	26.91%	sha256:0a957f0e69545b2459bd837f8667204243b1a0552880271519fcd4f56c913d
8			16	2.03	8.97%	1.89	2.42	31.44%	sha256:94b38ca920a9436b663e6361291741d136e17b163049bd8b33849d5492cd5d
9			32	2.23	0.00%	2.11	2.87	18.70%	sha256:e7b9a7bb83556a0efcc3258984dfd0c4a2bc782a184cdab0085c23a304f
10	python	352	4	3.07	0.00%	2.74	4.58	0.00%	sha256:fdde13a373d92092c3208538103c7cdebe0b09aaa2b60c580e387fe3e37318
11			8	2.99	2.61%	2.79	3.45	24.67%	sha256:49d1944e69d21cd17b617999151961e3356a776b78fcecac1a330ba48a891e
12			16	3.31	-7.82%	3.07	4.28	6.55%	sha256:3f6e6c3cd0d7b0f9f1dad7396a0d440de62286cc627959a0e07b8890c55e2d
13	mongo	232	32	4.03	-31.27%	3.74	4.91	-7.21%	sha256:65dd368dc36ebcc2f28d5d57e635a925ed0cf17eb12101f6408b79a9ab12
14			4	5.36	0.00%	5.19	5.55	0.00%	sha256:a58e81941726547c22560c177103887131b9528141c93b7a1aa38a0a949006b
15			8	5.01	6.53%	4.79	5.91	-6.49%	sha256:e3d0f47cb58ed4fc792af04294ce37e91be7f20a85de35eb1502ae2db2820c2
16	jenkins	290	16	4.67	12.87%	4.51	5.06	8.83%	sha256:569b1680be222121e24e42e3ec58a7c9587f166243c053bf10d89a92a8a
17			32	4.53	15.49%	4.41	4.84	12.79%	sha256:076c966caa12a08529f5842c018ea35a1184140c236392861f56eac699ea
18			4	6.62	0.00%	6.07	10.18	0.00%	sha256:9b9a777ac59528f8ead964438740d3c3b32a73916233f1cd94e472d90490969a3
19	jetty	256	8	6.34	4.23%	5.98	7.52	26.13%	sha256:8d69f58b7be185b0b7022e69a15a09c1037a33bc32a4a59819aa1e1888b0f
20			16	6.71	-1.36%	6.43	7.87	22.89%	sha256:f51bbe50488422b08362d99e58f66c1189c31cb3b9ce131dd40ea3c337a42
21			32	7.67	-15.86%	7.28	9.25	9.14%	sha256:c1502b141e965cb12c3e3bed1aa189a948d2747b42794d90e7e9e282e7b
22	glassfish	351	4	12.6	0.00%	11.9	15.03	0.00%	sha256:bb376434db440493b673ec51a51f17638ae052212feddc013c23413d16b83
23			8	12.25	2.78%	11.76	13.11	12.77%	sha256:b692624103f906b79463f96d8a0d0c38466f00d247afad3cb210495ce6
24			16	12.16	3.49%	11.86	13.07	13.04%	sha256:f5057084c150087a01e9905d930d2ca262453c6ddabbda906711525600
25	ghost	158	32	12.68	-0.63%	12.39	13.66	9.12%	sha256:6ccb0c3d324ae7d03697c3a0c3a0ca0e979e2cd1e105600c42c3b1b4f3
26			4	10.35	0.00%	10.13	10.79	0.00%	sha256:6c17b83d053d055b6e6d8bcd94517a0532c0b2c589b98b53f0d973da40
27			8	10.09	2.51%	9.53	10.86	-0.65%	sha256:18bb64e2843ea80b0e09a4dc211f4d0666cdeeca73456b72cbe6ed16219ba4
28	gocchellocompile	449	16	10.57	-2.13%	10.21	11.91	-10.38%	sha256:5a29fcb8aef40596d036c31f919733f824d9b4893491ca8e5159362905ecd
29			32	10.31	0.39%	9.99	11.26	-4.38%	sha256:53f14aa8a1341f05d0cb027eaf0c5448fca4eef026aa9f5d349896077c
30			4	11.46	0.00%	10.52	12.79	0.00%	sha256:3ec28440ef7f8699d325973acc3b1425deb6993144964d95282b64561afa70
31	tensorflow	451	8	11.26	1.75%	10.46	12.53	2.03%	sha256:1acc0cc28121ed5a4b66daf918cf5d486ea29bd06e11624cc0b13d0eab29428
32			16	11.15	2.71%	10.52	13.47	-5.32%	sha256:1f3cd5f1865c00c4530c3c1363c4e456688a7c20e75042b0088c1c5c5d10
33			32	10.7	6.63%	10.43	11.79	7.82%	sha256:9c3e6e700bd29ff4e5e4837cedd5f42e5105085060b0ca162b66732ee081a
34	drupal	189	4	3.89	0.00%	3.72	4.08	0.00%	sha256:381093aa887aceb856199d96abada88ac0828483ca64f5db66d703ca888e
35			8	4.43	-13.88%	4.2	5.65	-38.48%	sha256:381093aa887aceb856199d96abada88ac0828483ca64f5db66d703ca888e
36			16	5.02	-29.05%	4.69	6.22	-52.45%	sha256:a71680da0a10255e1b51ad916dbf76e6a8cb67d9998d45697a5074a12815f
37	rabbitmq	101	32	7.55	-94.09%	6.92	9.66	-136.76%	sha256:a08cb2e92c08a878f0c0caeb1cc5f48d89c4fd204b1e12a064616e7457
38			4	19.73	0.00%	18.21	27.44	0.00%	sha256:ca132c22829668f70d70e790e860b55cda1af58353d3d80ee69bcb678e
39			8	17.72	10.19%	17.01	18.87	31.23%	sha256:9b2975a67542aa482ab2a2e9cbe8f03c3b320fa302c08b2cb2c2c9f8d64e58
40	redis	42	16	17.25	12.57%	16.65	19.72	28.13%	sha256:9b59adc8232c4443f216b5c028e544457e630a06a8a942eb7322bd5c886a163
41			32	13.95	29.30%	12.93	20.53	25.18%	sha256:143f021c08b18b2c748b01ab0a444ebf9778c0b55b98aac5240771d621944c3
42			4	4.48	0.00%	4.14	5.41	0.00%	sha256:75ce50d1b5e2a27248d909d82ba153d165ad7e8d193a79b9b50c0a52f6bc93
43	rethinkdb	48	8	4.2	6.25%	3.98	5.31	1.85%	sha256:d856714680d104e20d84a5c35a6e1f375857b7903d9ac90028f3f1e142a72d
44			16	4.53	-1.12%	4.34	5.22	3.51%	sha256:80f334437a6a105a66c898c390415966b4668c72a203ca01423ad829ec7cc
45			32	5.1	-13.84%	4.79	5.9	-9.06%	sha256:56474d6288ada1679708c51e9ada97f0310cafa618e0f94a7903c5f38b8797cc
46	rabbitmq	101	4	1.79	0.00%	1.65	2.45	0.00%	sha256:5f9889b7b82296187dfab6c27d9997190ee35ecd22ad27d4c7e6461d569b715
47			8	1.71	4.47%	1.61	1.85	24.49%	sha256:9df57765a8a540d425c62288c79d50db2894652025b3328930c8687cbe47
48			16	1.75	2.23%	1.63	2.01	17.96%	sha256:3b71643ecd985621a14f92a57a1cabc53b19df12a404fbc448250648bd14d5
49	rethinkdb	48	32	1.72	3.91%	1.63	1.82	25.71%	sha256:4e6f6dbbaa89d71c2b39ec05d921476403d94e0c3d7e0c041be155e7e63e2
50			4	13.8	0.00%	13.59	14.16	0.00%	sha256:0f58d241425162f5382a60d24dc070e0d04b33a5935c41e142c5e647b0426
51			8	13.83	-0.22%	13.37	15.67	-10.66%	sha256:5afa71493ac32dbae0e20af5712664d4e7955579ad7729249d7360e570bd730eb
52	rethinkdb	48	16	13.41	2.83%	13.12	14.19	-0.21%	sha256:bd98c6a3259a52c96125482bf14c8113640735a74b0712b4a93603eb46dd7
53			32	13.54	1.88%	13.37	14.16	0.00%	sha256:a83ccbd8de54f5cf1e10bbd888b35096f12b7472e3ad3baabb314734a16c9a

Appendix A. Configuration for the benchmarking environment

The benchmarking was run on the dev desktop with the following configuration:

- Host type: m4.2xlarge
- RAM: 32GiB
- snapshotter's commit id: 192f026b6267a08241cfe7e9e9f1346b81a49ccc

Contents of soci_config.toml:

```
image_service_path = "/tmp/containerd-grpc/containerd.sock"
[cri_keychain]
enable_keychain = true
```