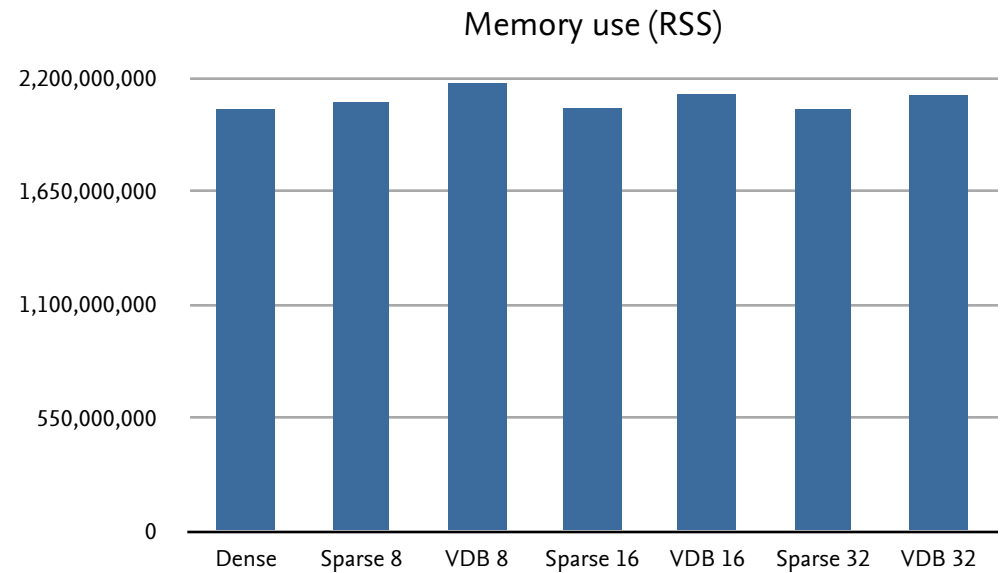
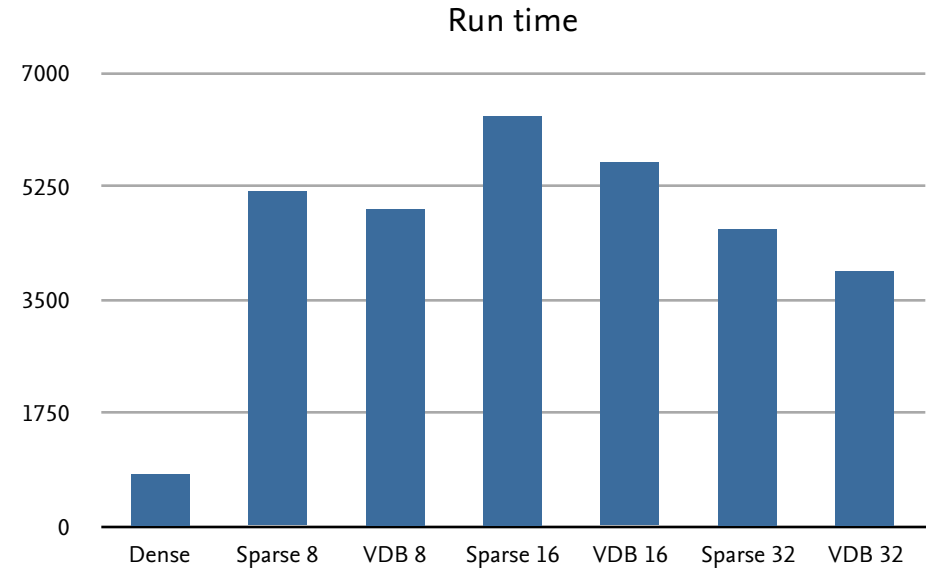


Contiguous write access 800³

Data structure	(ms)	(bytes)
Dense	814	2,048,204,800
Sparse 8	5177	2,080,235,520
VDB 8	4904	2,172,227,584
Sparse 16	6339	2,052,349,952
VDB 16	5623	2,120,822,784
Sparse 32	4594	2,048,884,736
VDB 32	3945	2,113,699,840

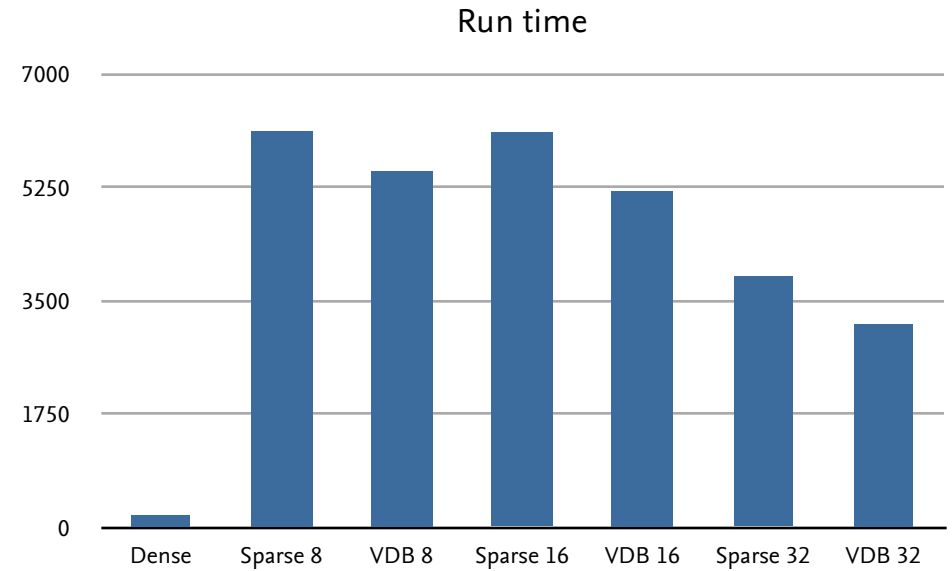
About the test:

This test writes to memory in a linear fashion, and does not make any attempts to access data in a cache-friendly way. It is representative of traversing the buffer naïvely.



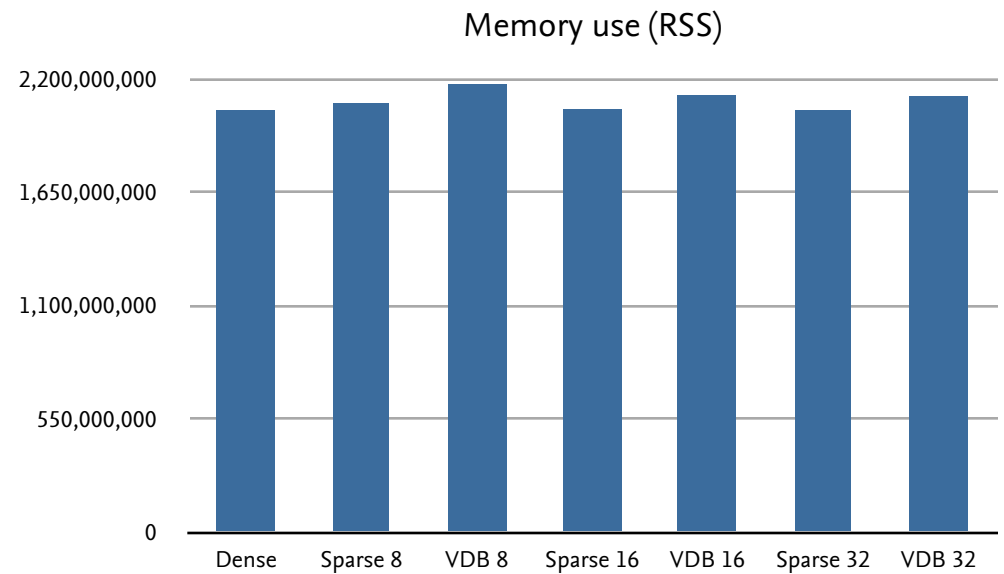
Contiguous write access 800³ (Preallocated)

Data structure	(ms)	(bytes)
Dense	193	2,048,819,200
Sparse 8	6127	2,080,415,744
VDB 8	5506	2,172,313,600
Sparse 16	6102	2,052,435,968
VDB 16	5198	2,120,896,512
Sparse 32	3875	2,048,958,464
VDB 32	3141	2,113,769,472



About the test:

Same as the previous test, but pre-allocates the memory used, so that only the traversal time is measured. It is representative of traversing the buffer naïvely.



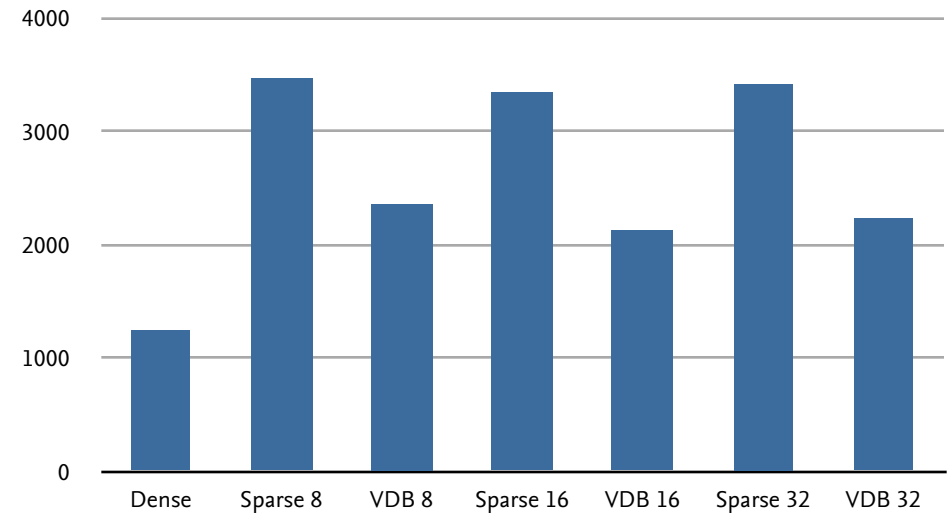
Contiguous read access 800³

Data structure	(ms)	(bytes)
Dense	1247	2,049,114,112
Sparse 8	3470	2,080,477,184
VDB 8	2359	2,172,358,656
Sparse 16	3347	2,052,481,024
VDB 16	2129	2,120,921,088
Sparse 32	3422	2,048,983,040
VDB 32	2231	2,113,781,760

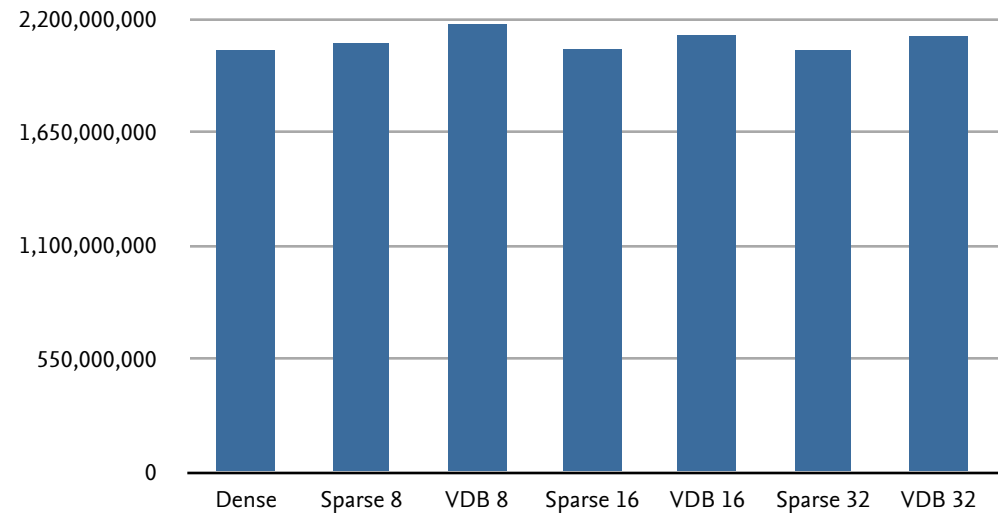
About the test:

This test reads from memory in a linear fashion, and does not make any attempts to access data in a cache-friendly way. It is representative of traversing the buffer naïvely.

Run time



Memory use (RSS)

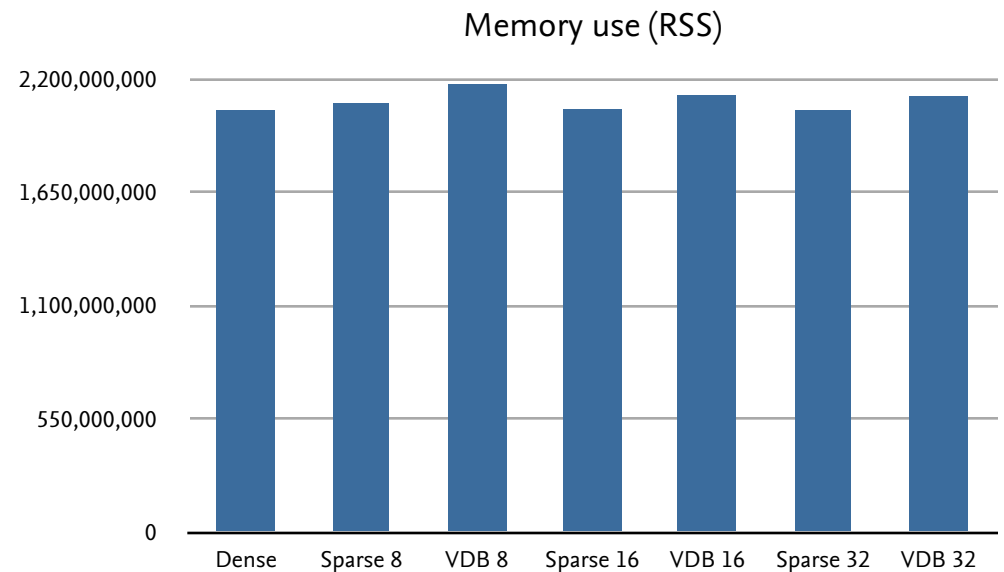
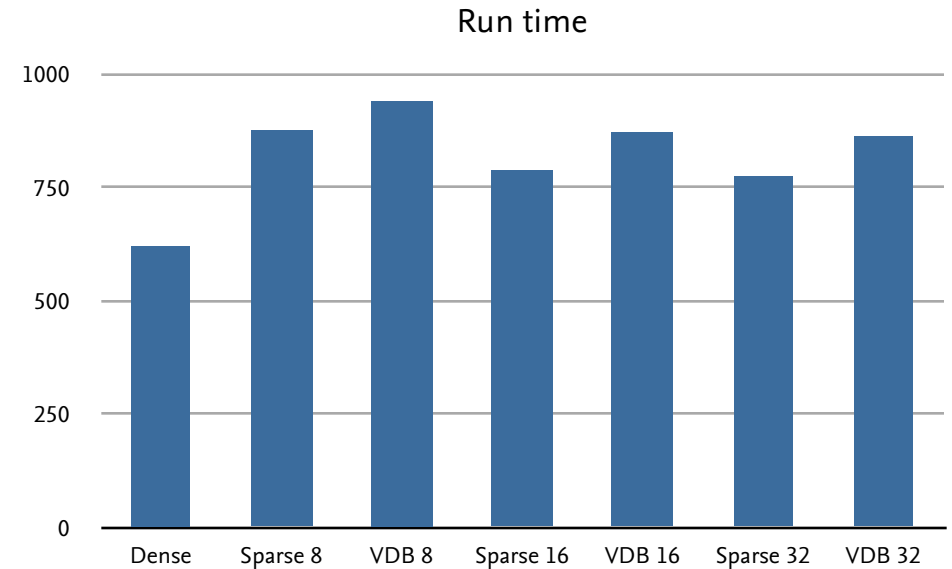


Memory coherent write access 800^3

Data structure	(ms)	(bytes)
Dense	621	2,049,122,304
Sparse 8	876	2,080,497,664
VDB 8	941	2,172,370,944
Sparse 16	788	2,052,497,408
VDB 16	871	2,120,937,472
Sparse 32	774	2,049,003,520
VDB 32	863	2,113,798,144

About the test:

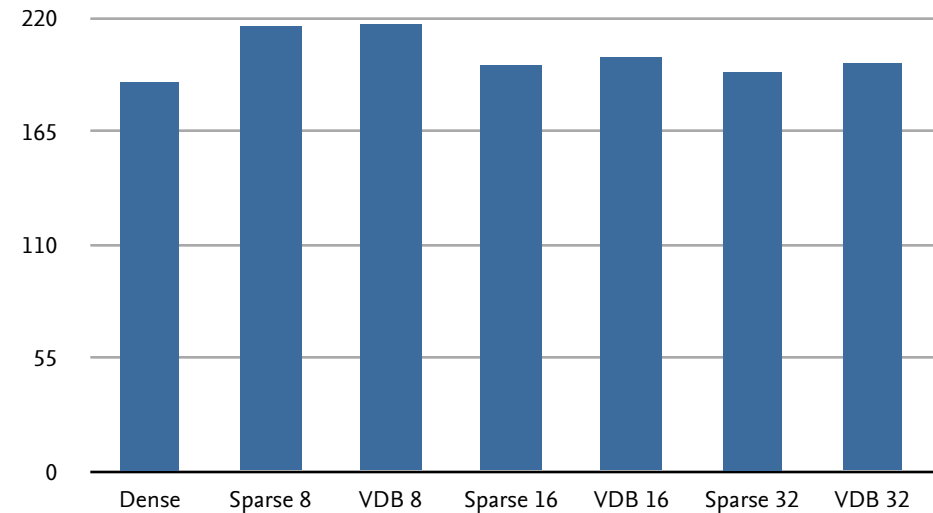
This test measures the time it takes to write the value from each voxel in a freshly allocated buffer and includes both allocation and traversal time. It traverses the voxels in the order that is most efficient for each data structure. It is representative of the max speed that one could write the value of each voxel if a buffer needs to be allocated.



Memory coherent write access 800³ (Preallocated)

Data structure	(ms)	(bytes)
Dense	189	2,049,142,784
Sparse 8	216	2,080,505,856
VDB 8	217	2,172,387,328
Sparse 16	197	2,052,513,792
VDB 16	201	2,120,957,952
Sparse 32	194	2,049,024,000
VDB 32	198	2,113,814,528

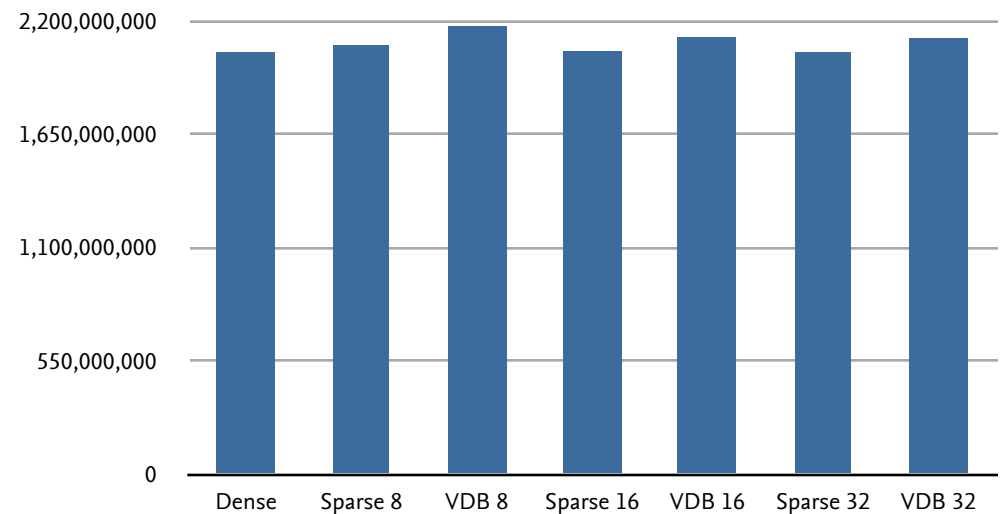
Run time



About the test:

This test measures the time it takes to write the value from each voxel in an existing buffer. It traverses the voxels in the order that is most efficient for each data structure. It is representative of the max speed that one could write the value of each voxel if a buffer already exists in memory.

Memory use (RSS)

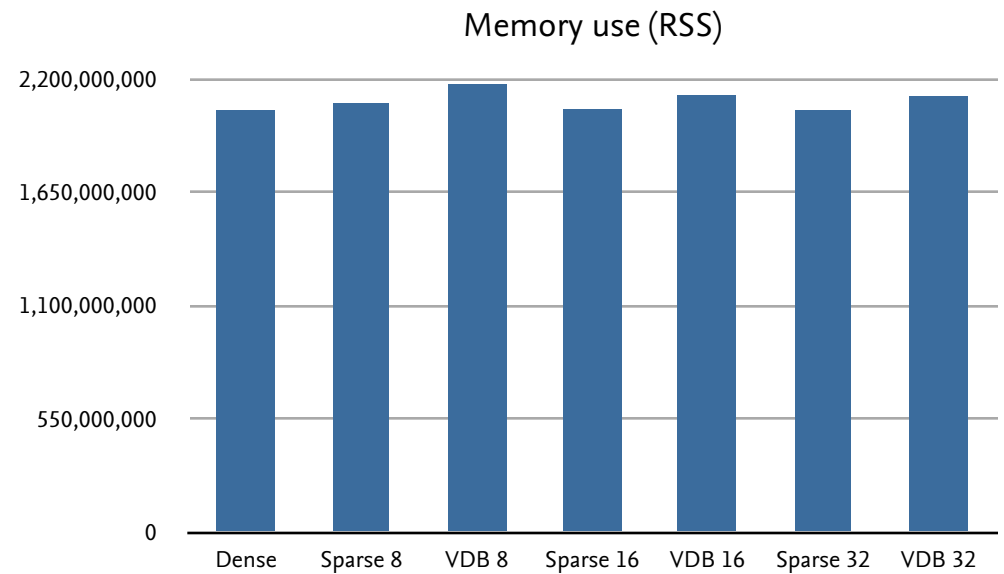
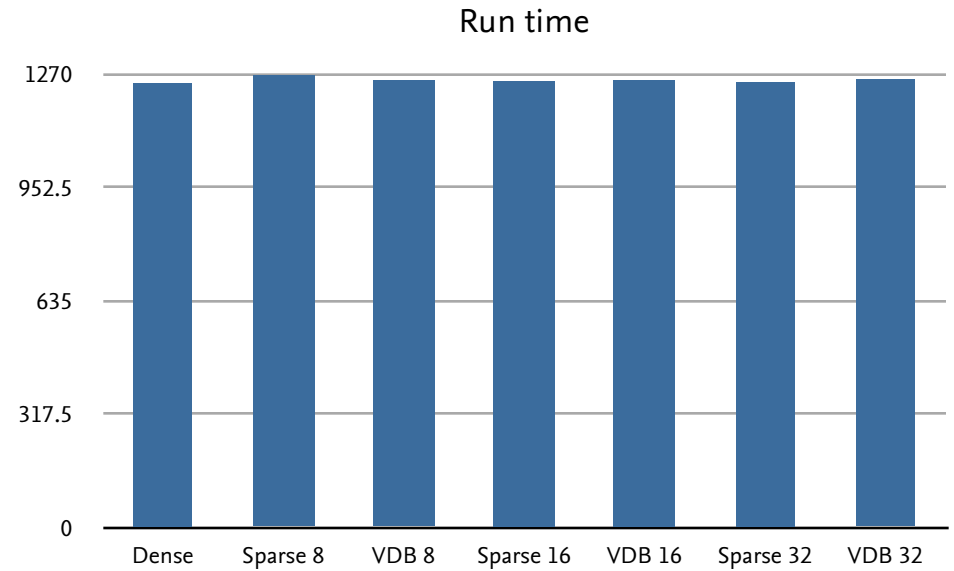


Memory coherent read access 800³

Data structure	(ms)	(bytes)
Dense	1245	2,049,159,168
Sparse 8	1267	2,080,522,240
VDB 8	1252	2,172,395,520
Sparse 16	1251	2,052,521,984
VDB 16	1254	2,120,957,952
Sparse 32	1248	2,049,024,000
VDB 32	1255	2,113,818,624

About the test:

This test measures the time it takes to read the value from each voxel. It traverses the voxels in the order that is most efficient for each data structure. It is representative of the max speed that one could read the value of each voxel.

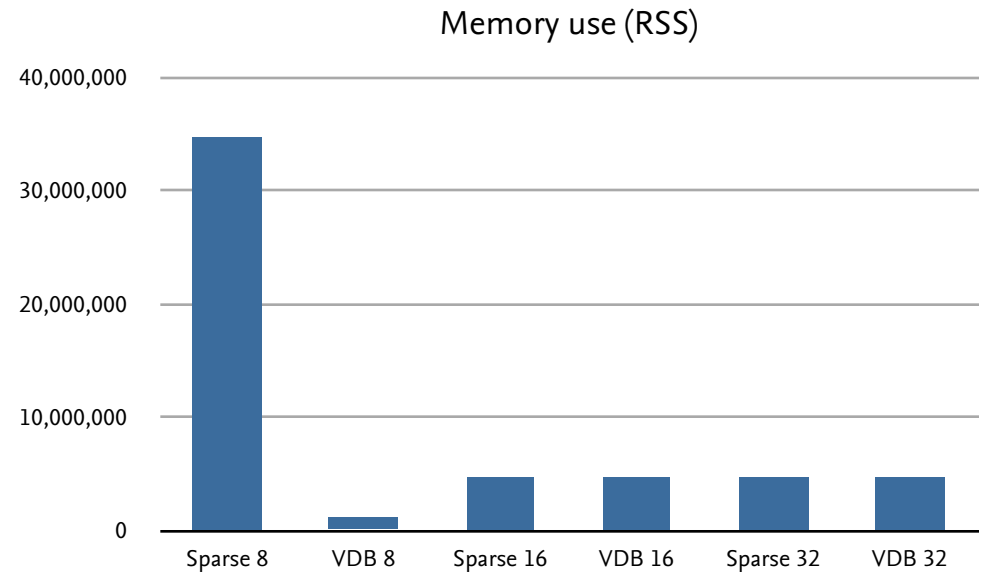
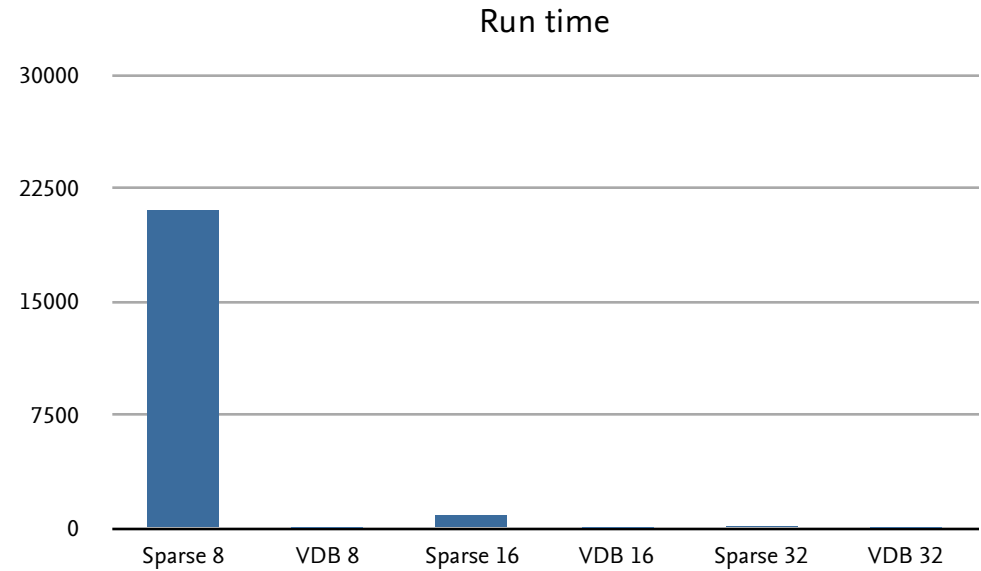


Sparse fill 1000³

Data structure	(μ s)	(bytes)
Sparse 8	21056	34,721,792
VDB 8	37	1,163,264
Sparse 16	831	4,726,784
VDB 16	33	4,726,784
Sparse 32	102	4,726,784
VDB 32	33	4,726,784

About the test:

This test measures the time it takes to fill an entire voxel buffer with “background values”. It is representative of setting the coarse “far” values of a narrow band levelset.

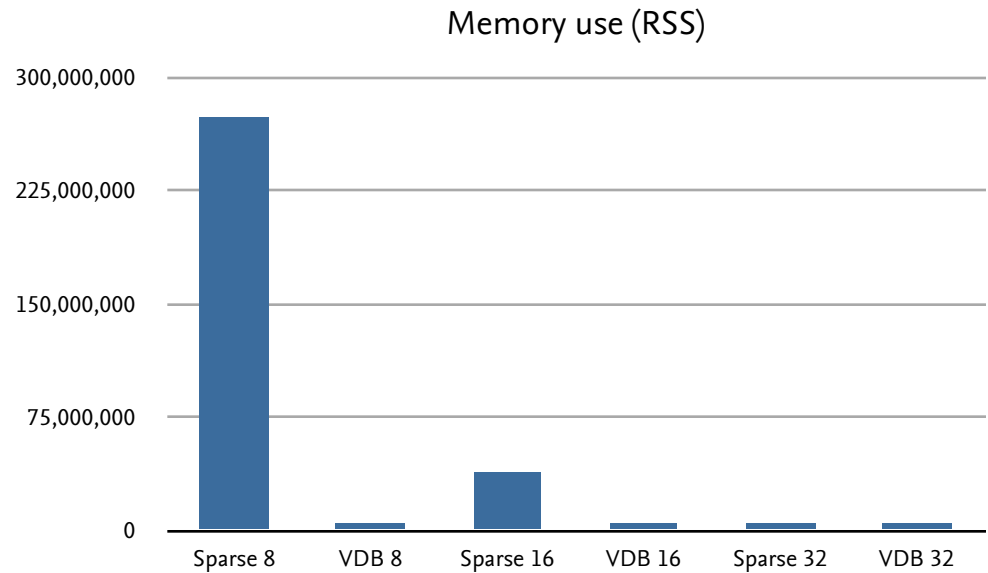
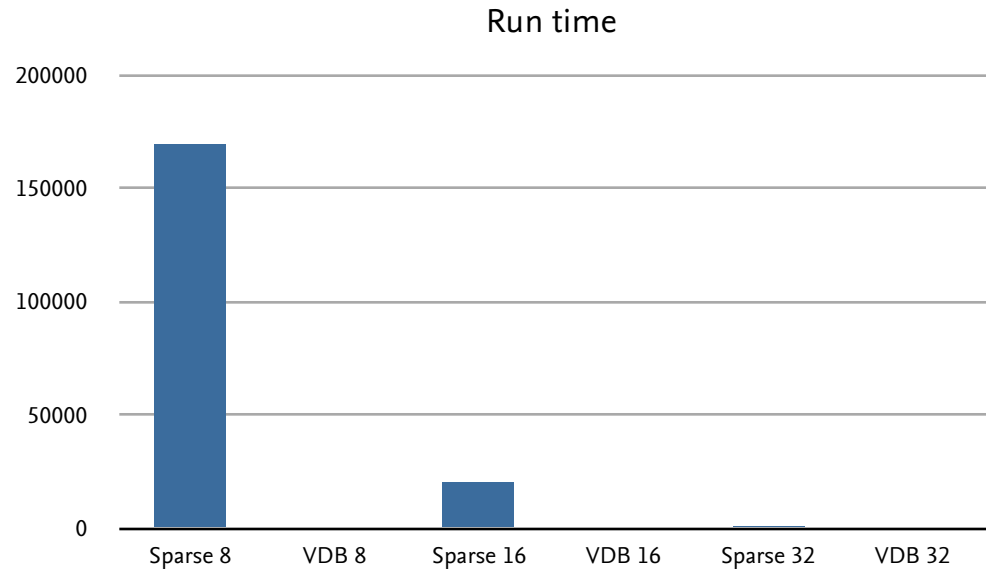


Sparse fill 2000³

Data structure	(μ s)	(bytes)
Sparse 8	169206	273,166,336
VDB 8	61	4,726,784
Sparse 16	20121	38,285,312
VDB 16	36	4,726,784
Sparse 32	831	4,726,784
VDB 32	33	4,726,784

About the test:

This test measures the time it takes to fill an entire voxel buffer with “background values”. It is representative of setting the coarse “far” values of a narrow band levelset.

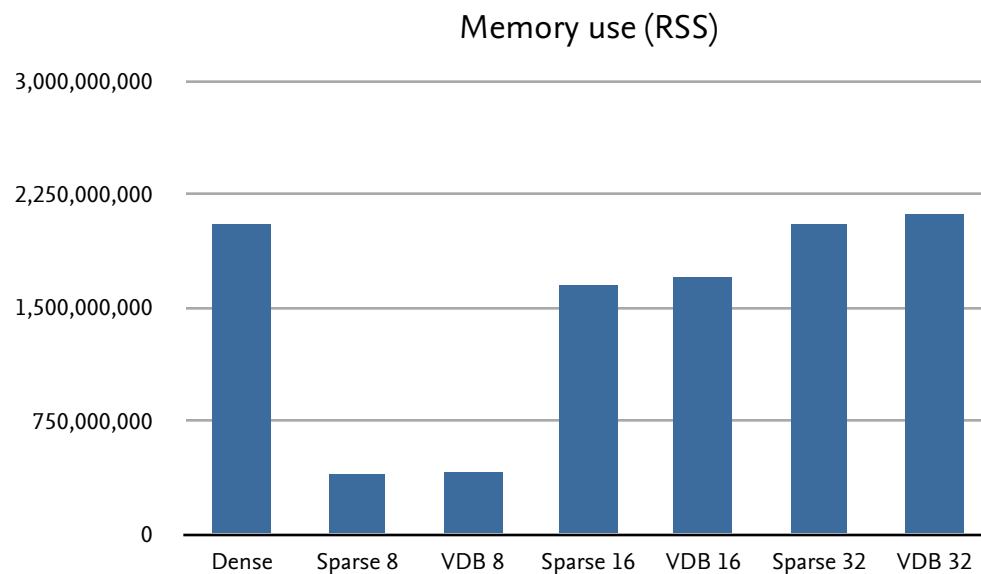
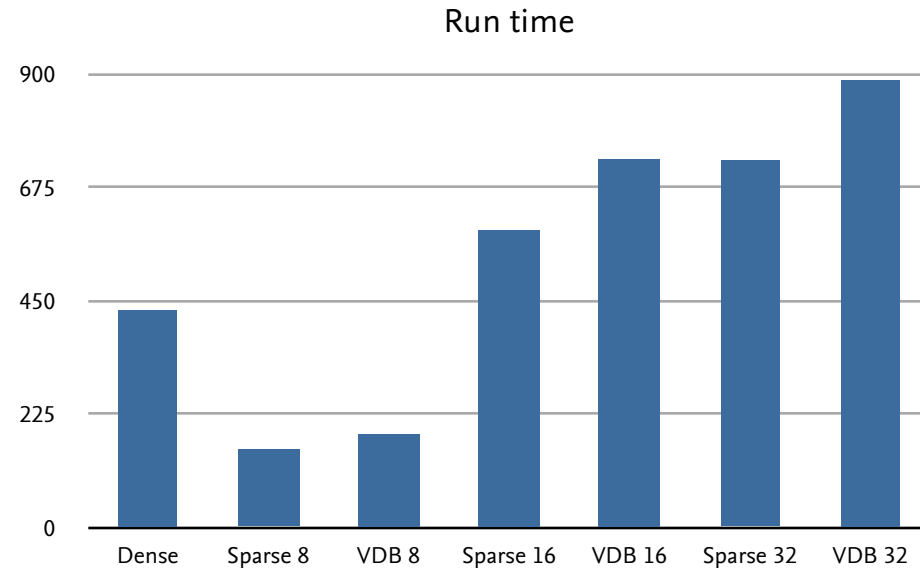


Random incoherent write access: 200,000 points into 800^3

Data structure	(ms)	(bytes)
Dense	432	2,052,759,552
Sparse 8	155	393,469,952
VDB 8	186	406,765,568
Sparse 16	591	1,644,130,304
VDB 16	732	1,698,942,976
Sparse 32	729	2,051,473,408
VDB 32	889	2,116,263,936

About the test:

This test measures the time it takes to write 200,000 voxel values without interpolation from randomly selected positions. There is no coherency to the sampling. It is representative of splatting a point cloud to newly created buffer using a box filter.

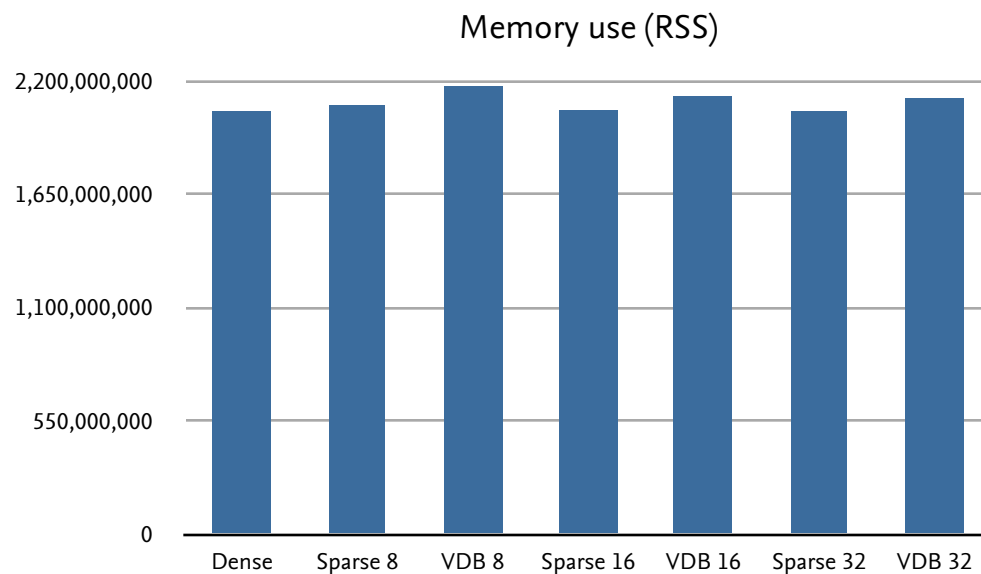
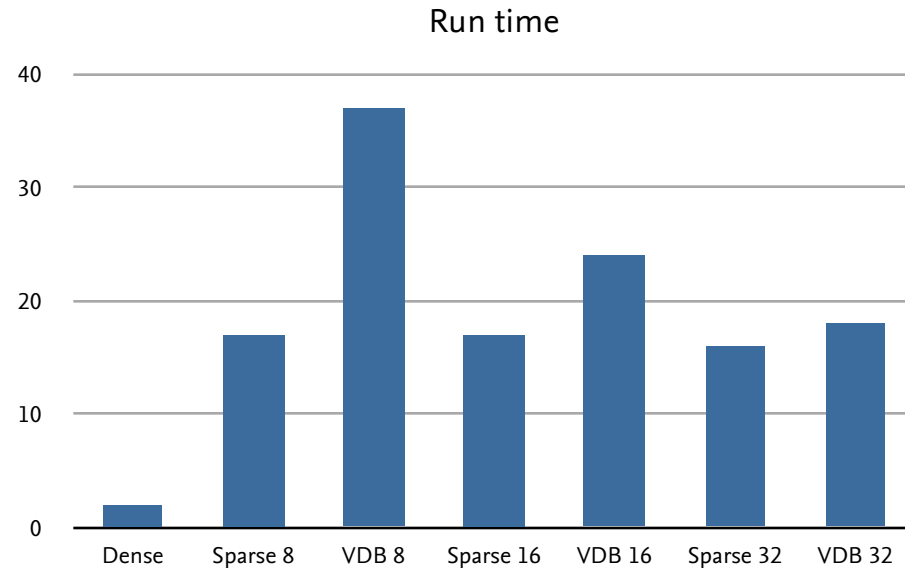


Random incoherent write access: 200,000 points into 800^3 (Preallocated)

Data structure	(ms)	(bytes)
Dense	2	2,053,402,624
Sparse 8	17	2,082,971,648
VDB 8	37	2,174,844,928
Sparse 16	17	2,054,971,392
VDB 16	24	2,123,407,360
Sparse 32	16	2,051,473,408
VDB 32	18	2,116,263,936

About the test:

This test measures the time it takes to write 200,000 voxel values without interpolation from randomly selected positions. There is no coherency to the sampling. It is representable of splatting a point cloud to an existing buffer using a box filter.

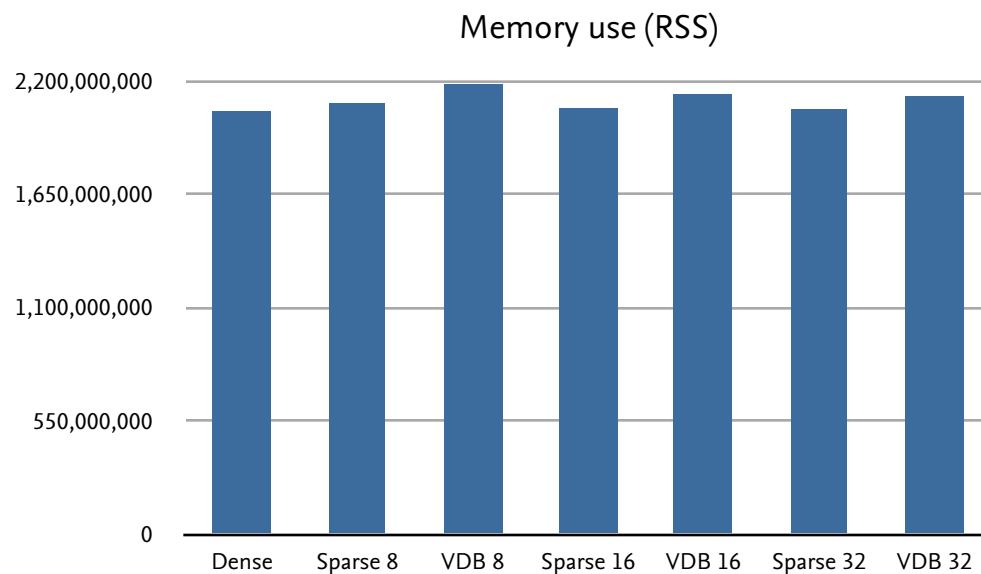
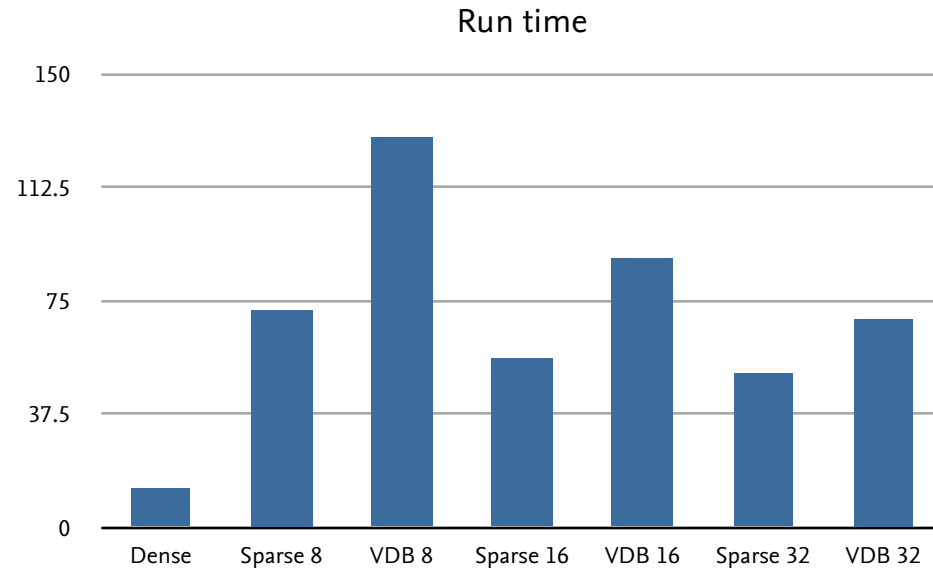


Random incoherent read access: 200,000 points from 800^3

Data structure	(ms)	(bytes)
Dense	13	2,052,907,008
Sparse 8	72	2,092,580,864
VDB 8	129	2,184,454,144
Sparse 16	56	2,064,580,608
VDB 16	89	2,133,016,576
Sparse 32	51	2,061,082,624
VDB 32	69	2,125,873,152

About the test:

This test measures the time it takes to read 200,000 voxel values from randomly selected positions. There is no coherency to the sampling. It is representative of looking up positions from a point cloud in the voxel buffer, using nearest neighbor interpolation.

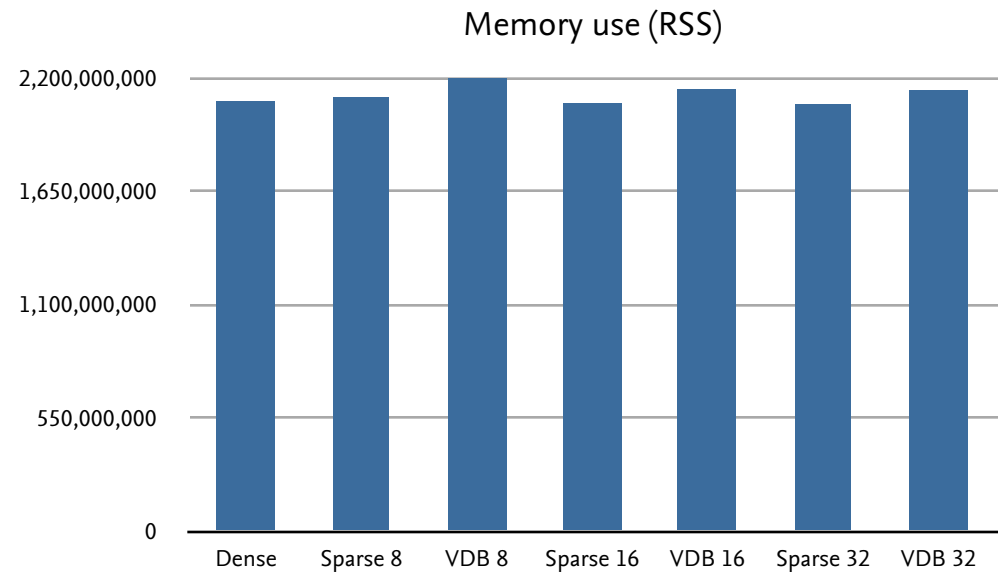
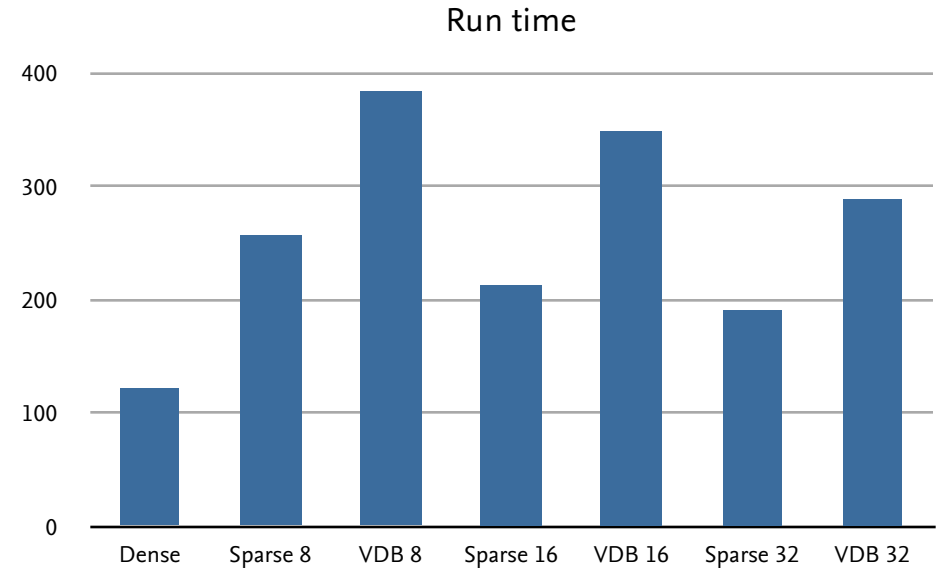


Random incoherent interpolation: 200,000 points from 800^3

Data structure	(ms)	(bytes)
Dense	122	2,085,240,832
Sparse 8	257	2,104,606,720
VDB 8	384	2,196,484,096
Sparse 16	213	2,076,610,560
VDB 16	349	2,145,050,624
Sparse 32	191	2,073,112,576
VDB 32	289	2,137,915,392

About the test:

This test measures the time it takes to interpolate 200,000 values from randomly selected positions. There is no coherency to the sampling. It is representative of looking up positions from a point cloud in the voxel buffer, using linear interpolation.

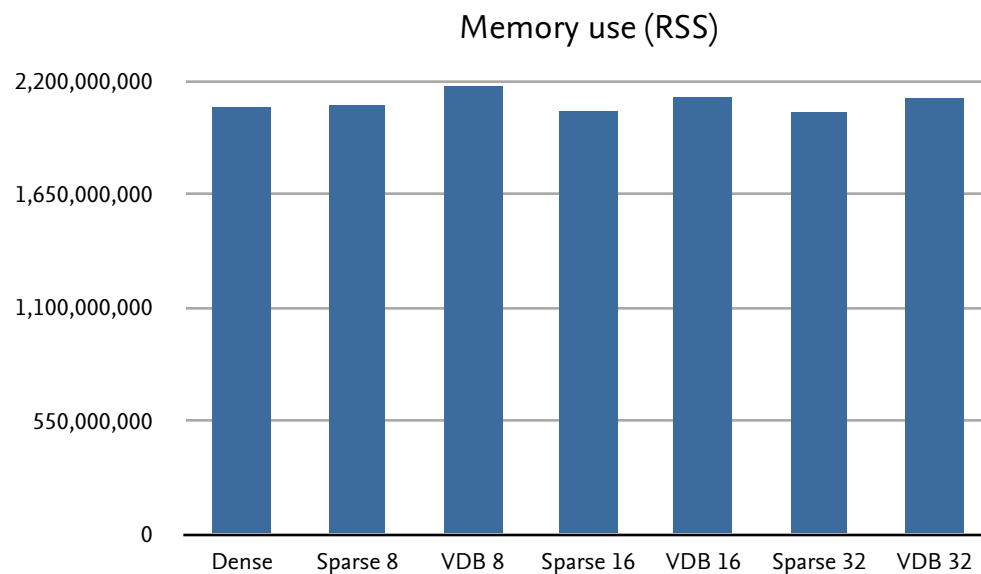
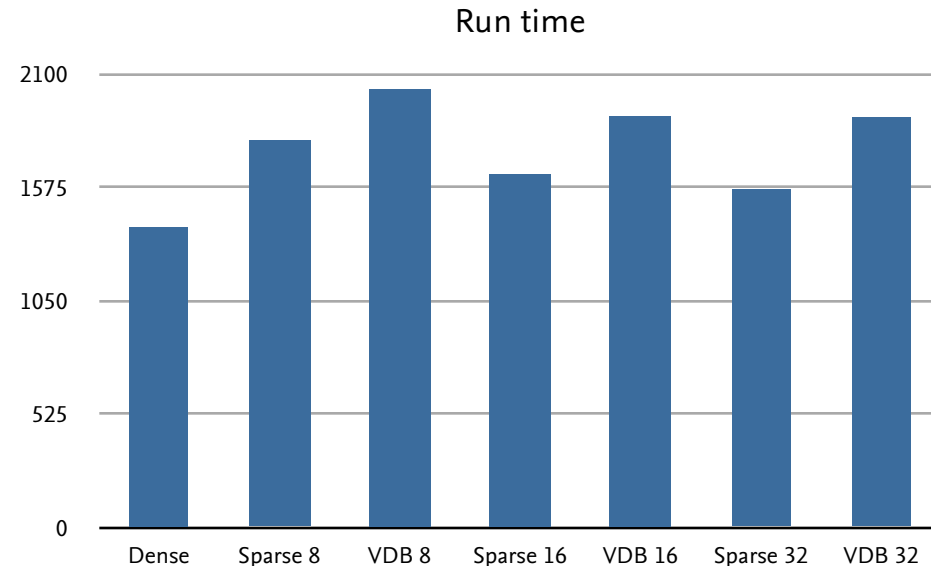


Uniform raymarching 800^3 , 10,000 rays

Data structure	(ms)	(bytes)
Dense	1392	2,073,300,992
Sparse 8	1792	2,080,661,504
VDB 8	2032	2,172,538,880
Sparse 16	1638	2,052,661,248
VDB 16	1906	2,121,101,312
Sparse 32	1566	2,049,163,264
VDB 32	1899	2,113,961,984

About the test:

This test measures the time it takes to interpolate values along a number of rays shot through the voxel buffer. It allows for each library to take advantage of potential cache coherency as the sampling pattern is somewhat ordered.

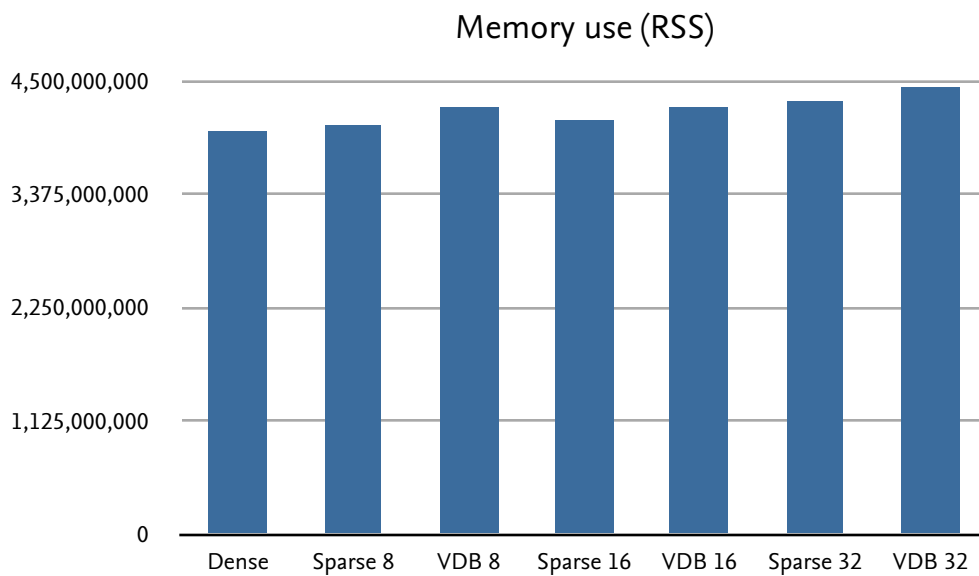
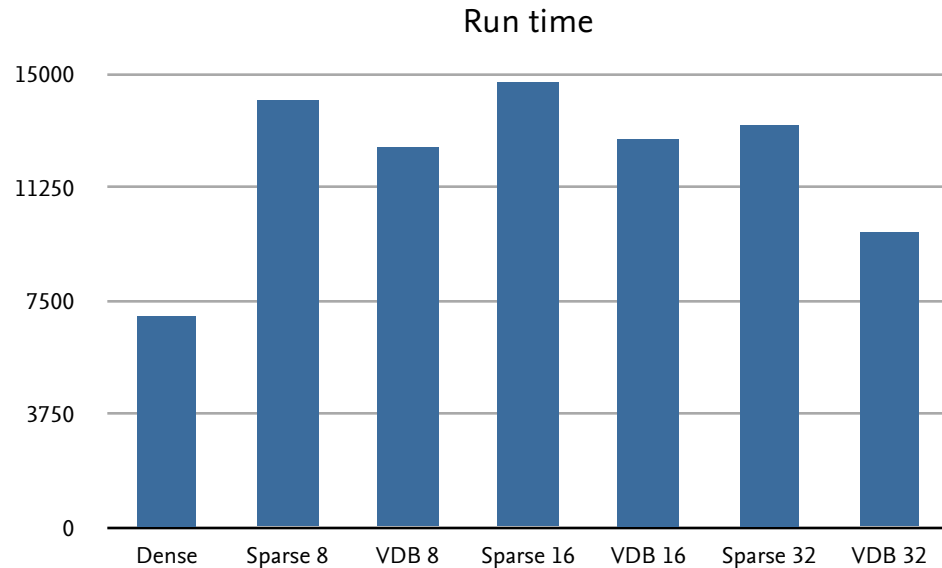


Dense level set sphere 1000³

Data structure	(ms)	(bytes)
Dense	7007	4,001,300,480
Sparse 8	14131	4,063,166,464
VDB 8	12580	4,237,012,992
Sparse 16	14735	4,105,441,280
VDB 16	12854	4,239,904,768
Sparse 32	13322	4,296,687,616
VDB 32	9759	4,431,974,400

About the test:

This test measures the time it takes and the memory used when creating a full (i.e. every voxel populated) level set of a sphere.

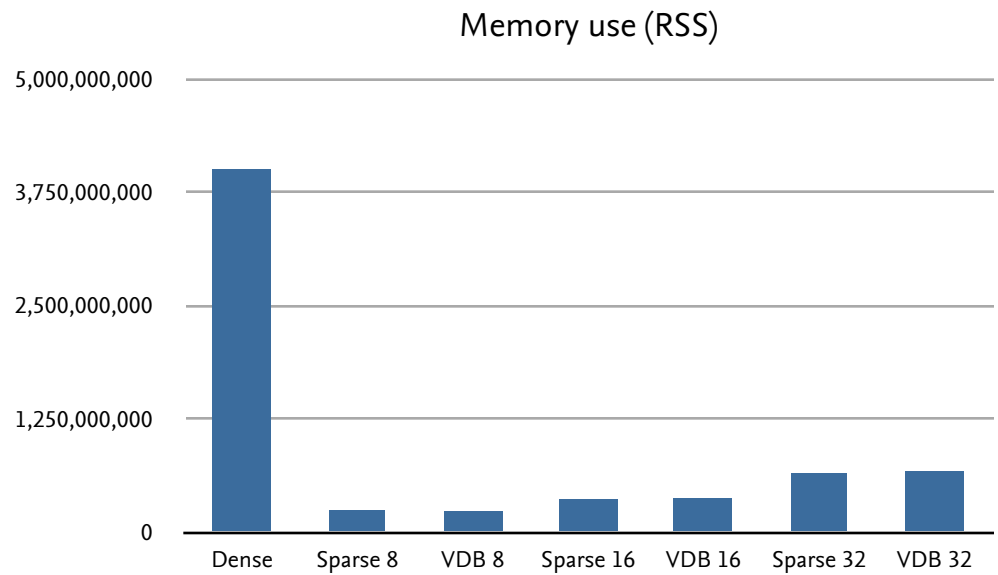
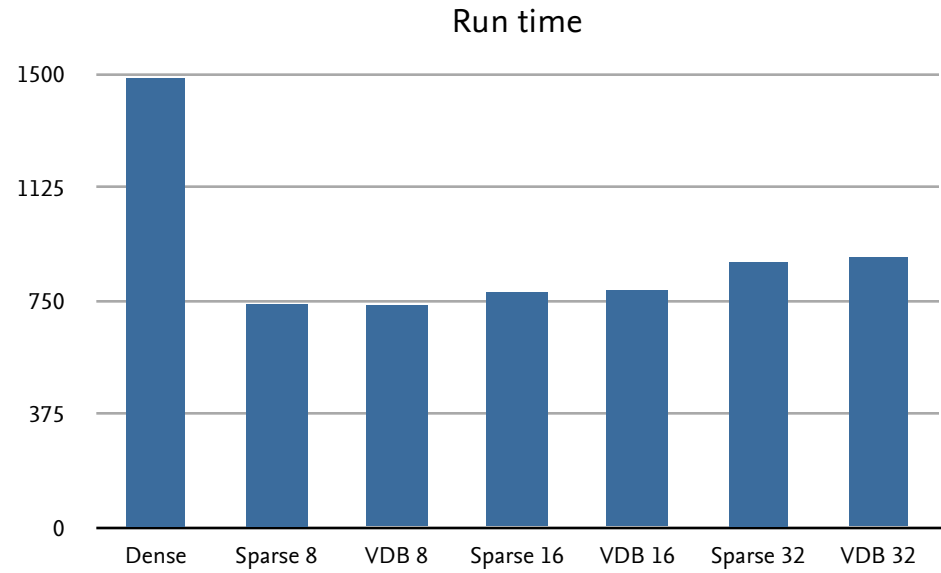


Narrow band levelset 1000³

Data structure	(ms)	(bytes)
Dense	1488	4,001,075,200
Sparse 8	740	237,608,960
VDB 8	734	225,603,584
Sparse 16	778	358,555,648
VDB 16	785	368,463,872
Sparse 32	878	654,282,752
VDB 32	893	674,873,344

About the test:

This test measures the time it takes and the memory used when creating a simple narrow band levelset of a sphere.

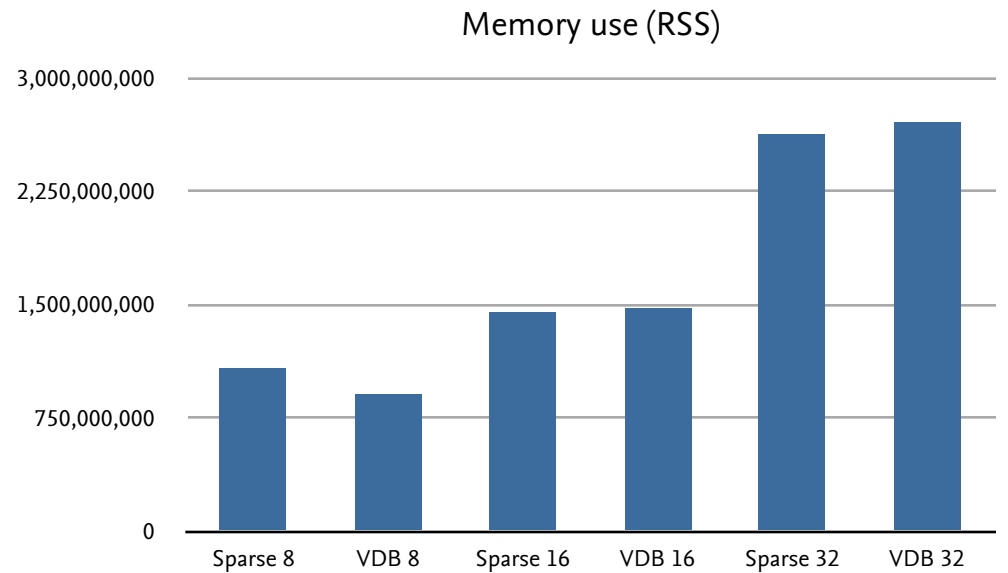
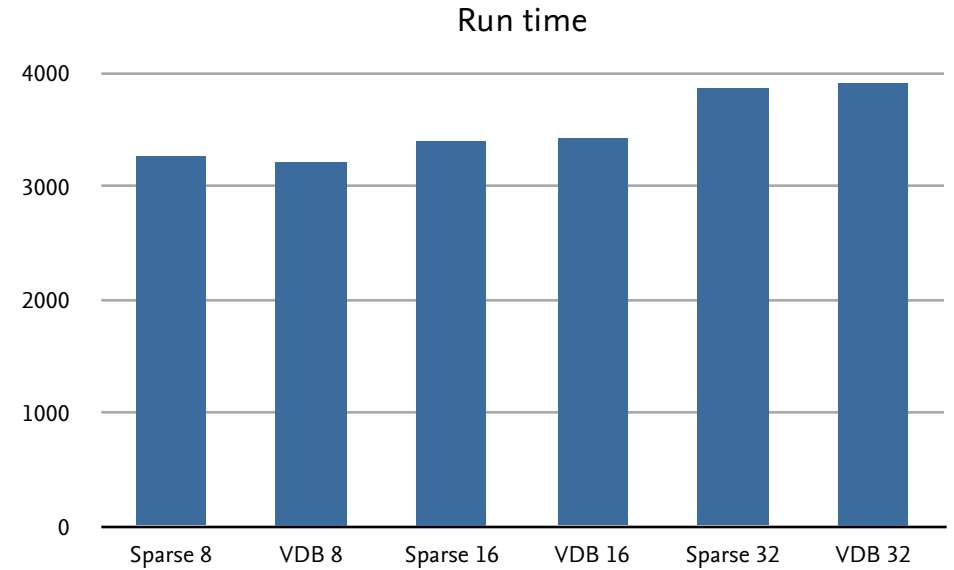


Narrow band levelset 2000³

Data structure	(ms)	(bytes)
Sparse 8	3267	1,080,627,200
VDB 8	3219	908,431,360
Sparse 16	3403	1,450,844,160
VDB 16	3426	1,476,337,664
Sparse 32	3865	2,625,261,568
VDB 32	3916	2,705,952,768

About the test:

This test measures the time it takes and the memory used when creating a simple narrow band levelset of a sphere.

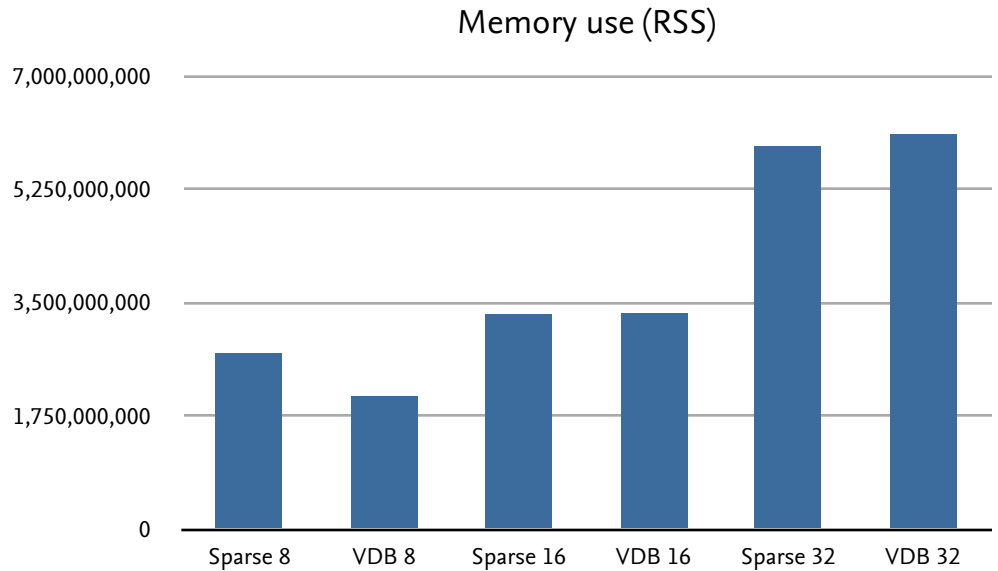
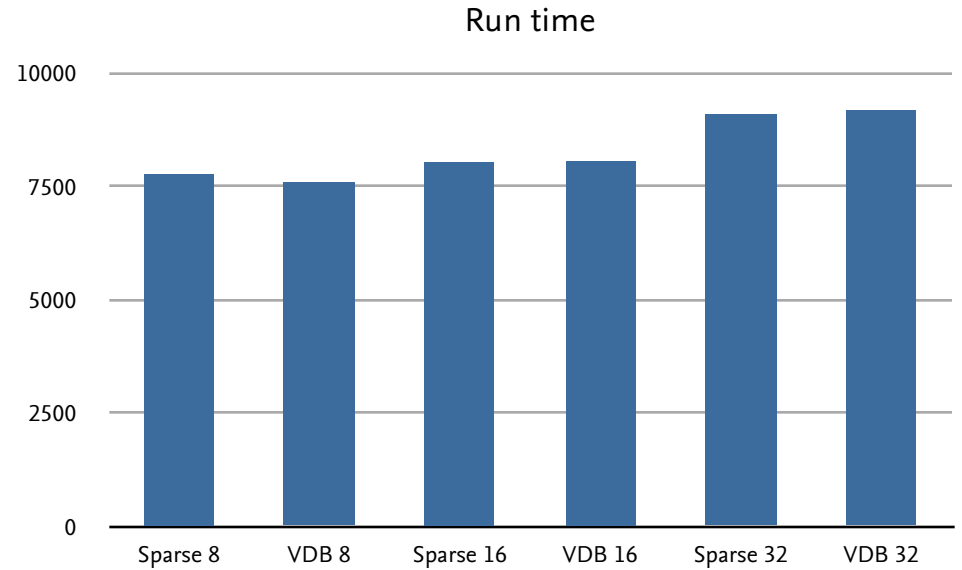


Narrow band levelset 3000³

Data structure	(ms)	(bytes)
Sparse 8	7776	2,714,550,272
VDB 8	7591	2,046,099,456
Sparse 16	8042	3,317,821,440
VDB 16	8067	3,339,866,112
Sparse 32	9088	5,914,374,144
VDB 32	9174	6,092,304,384

About the test:

This test measures the time it takes and the memory used when creating a simple narrow band levelset of a sphere.



Narrow band levelset 4000³

Data structure	(ms)	(bytes)
Sparse 8	14355	5,330,575,360
VDB 8	13894	3,643,482,112
Sparse 16	14812	5,953,753,088
VDB 16	14775	5,931,925,504
Sparse 32	16573	10,479,644,672
VDB 32	16726	10,786,873,344

About the test:

This test measures the time it takes and the memory used when creating a simple narrow band levelset of a sphere.

