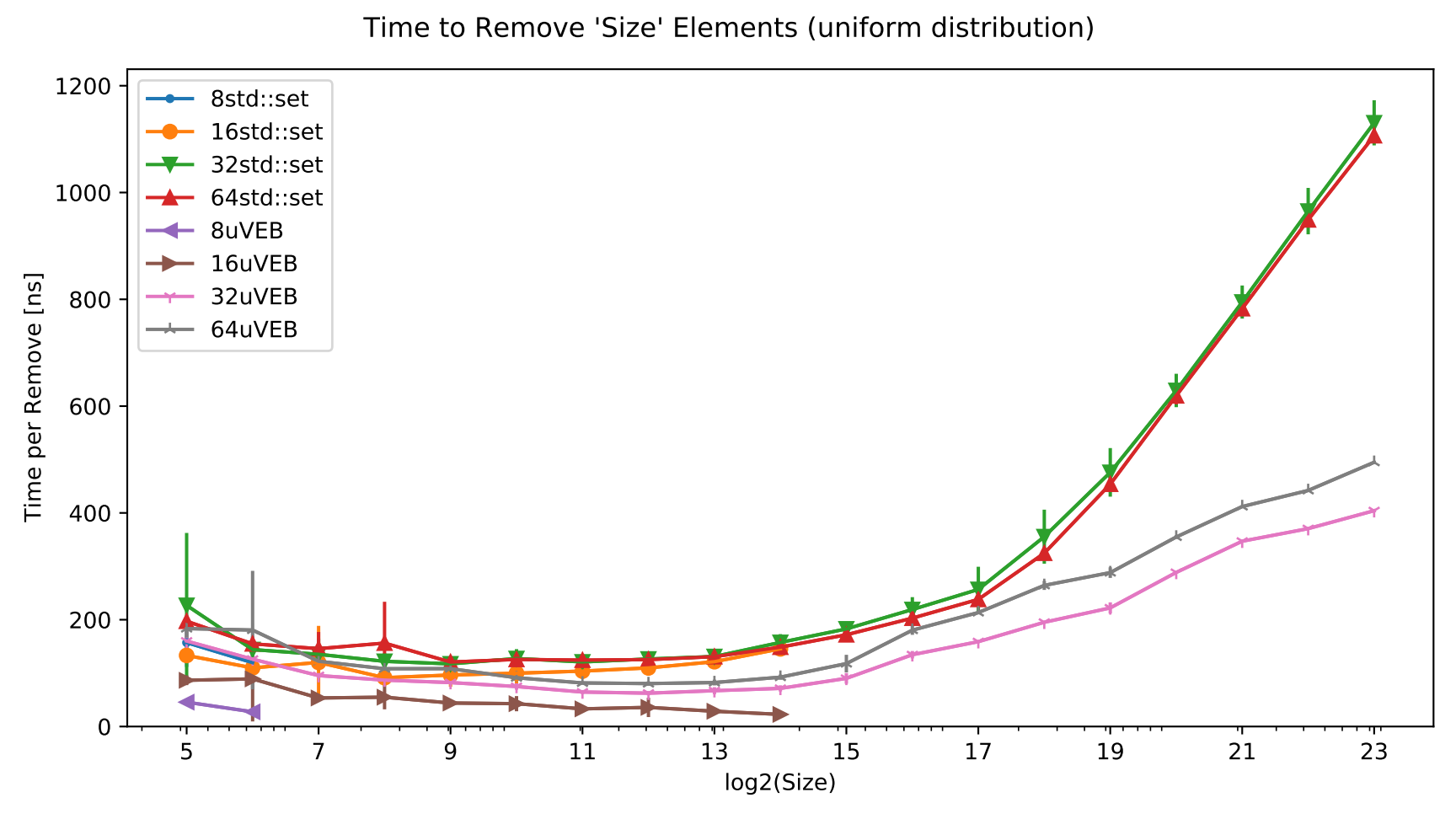
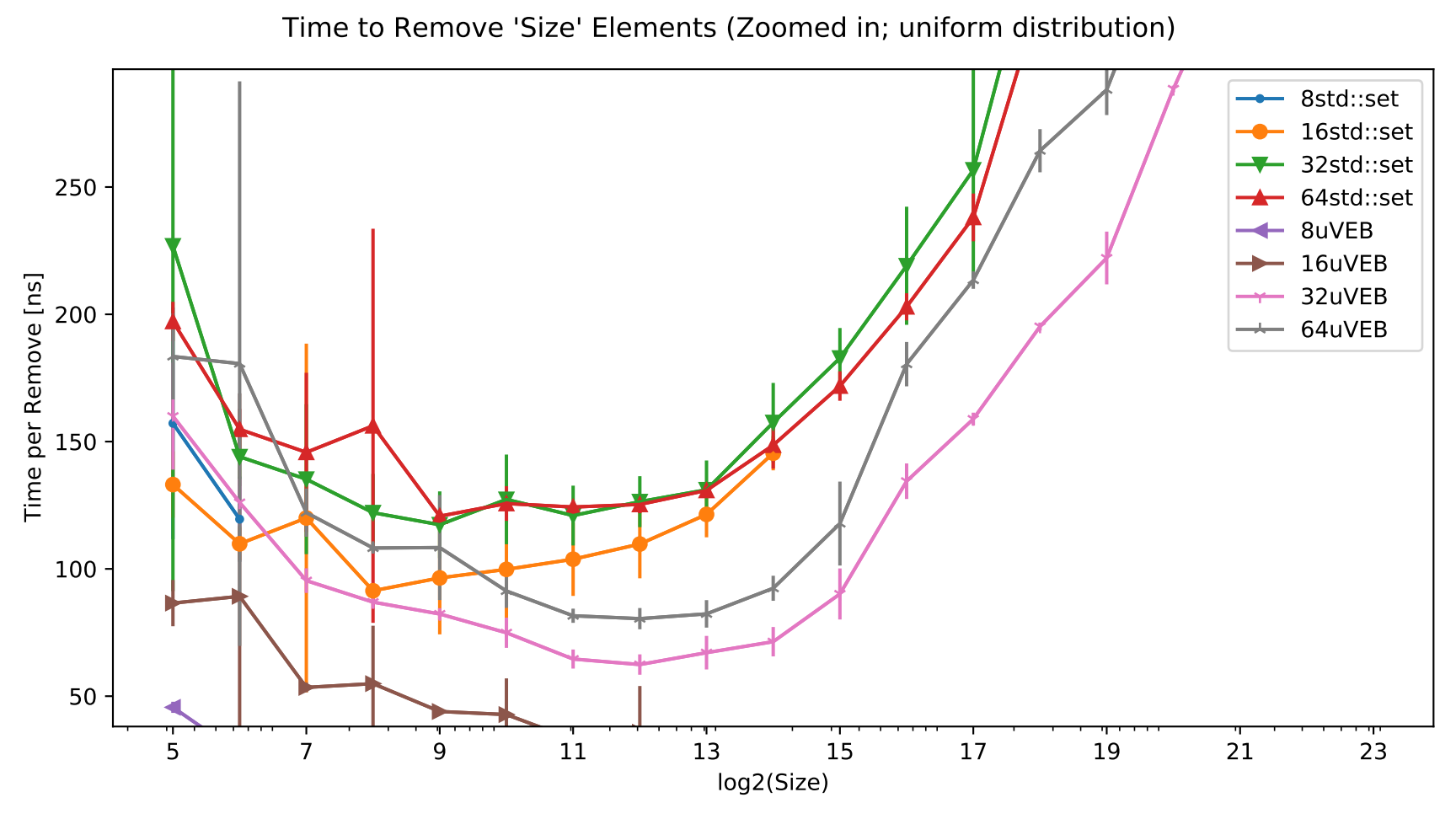
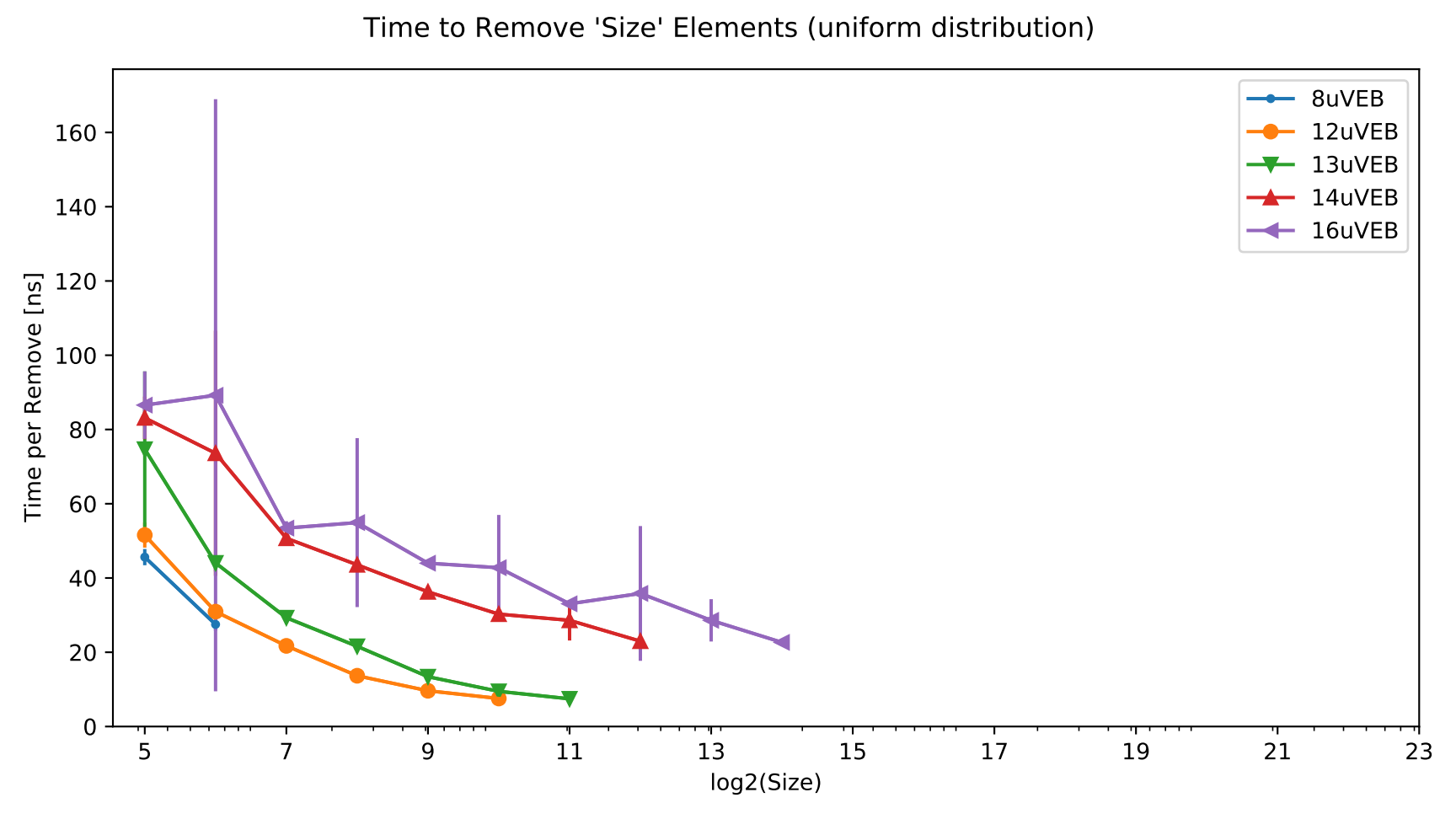
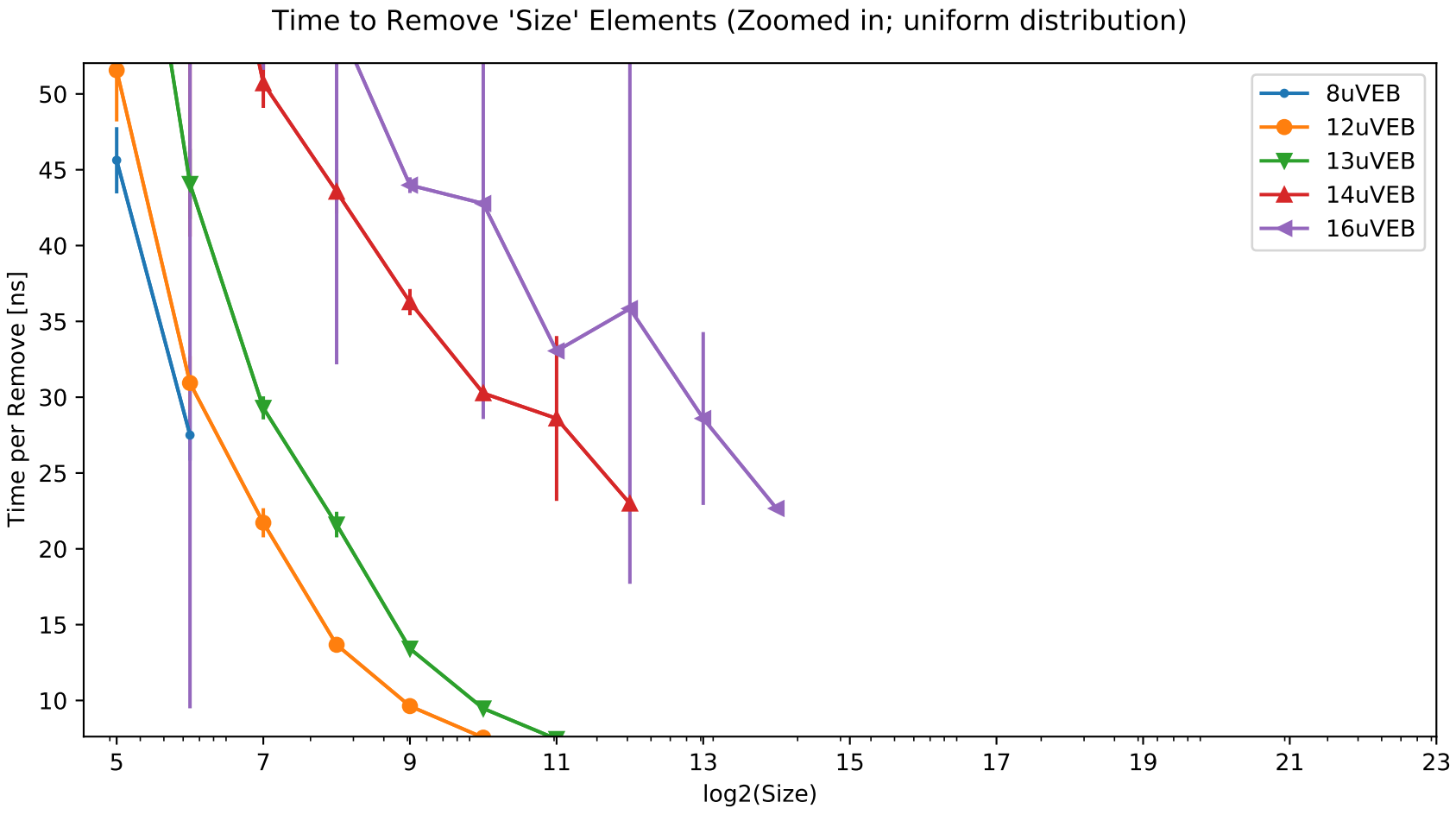
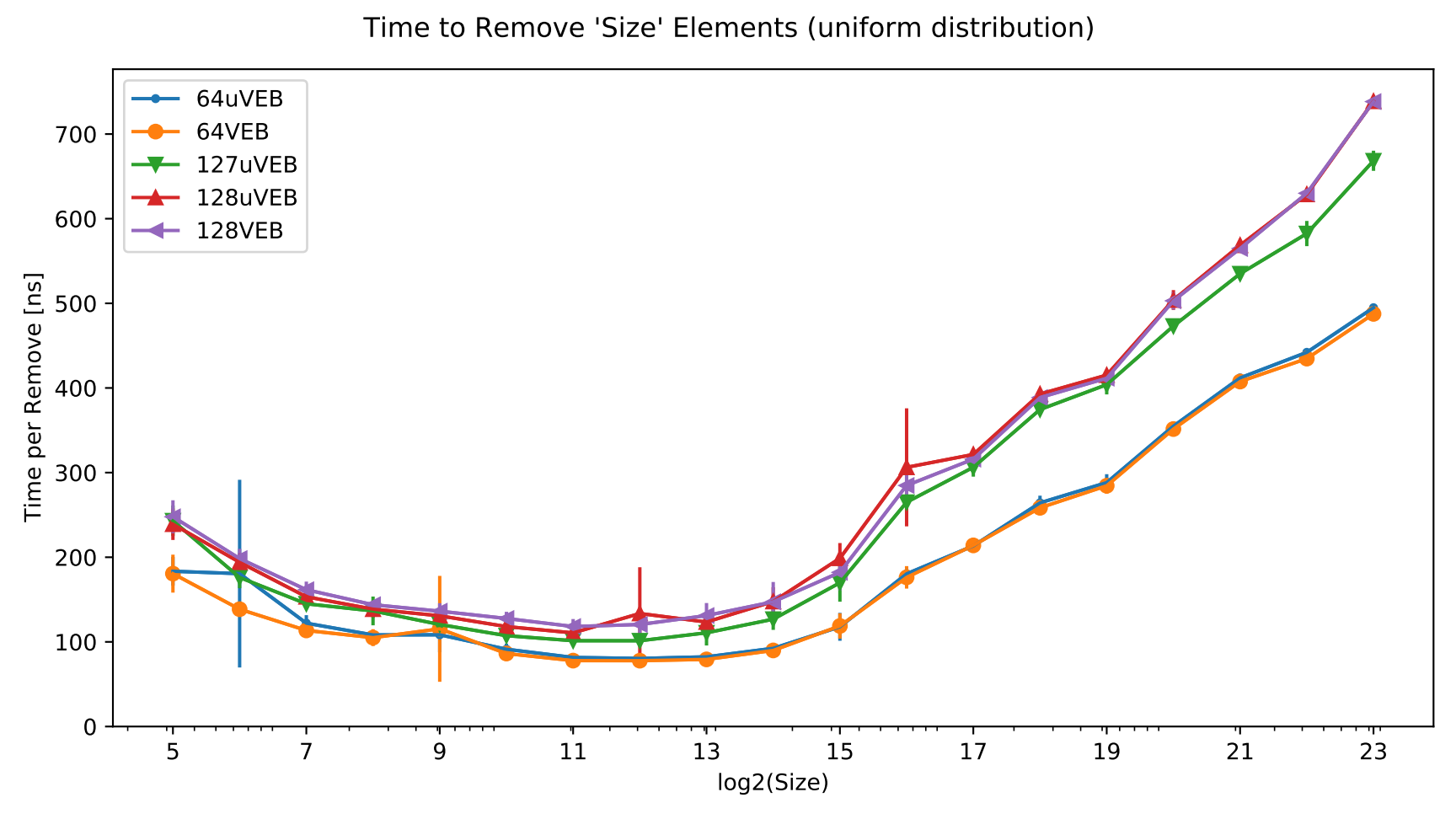
{K}std::set = std::set<uint{K}_t>, {K}uVEB = VanEmdeBoas<{K}>, {K}VEB = VanEmdeBoas<{K}, int{K}_t>, uVEB32 = VanEmdeBoas32<>, 32uVEBL = VanEmdeBoasLocked<32>, uVEB32L = VanEmdeBoas32Locked<>, uVEB32LT = VanEmdeBoas32LockedTop<>, uVEB32LFG = VanEmdeBoas32LockedFineGrained<>, uVEB32LL = VanEmdeBoas32Lockless.
No #defines => sf::contention_free_shared_mutex is used often; also bytell_hash_map by Malte Skarupke is used for VanEmdeBoas and VanEmdeBoasLocked (not VanEmdeBoas32 and its parallel variants)
Random distributions: uniform, cluster = random placed clusters with 1000 succeeding elements, normal = normal distribution with mean ~0/2^31 for signed/unsigned and std (2^31)/10, incProb = linear increasing probability where the smallest value has probability 0, decProb = linear decreasing probability where the largest value has probability 0
There are ten iterations for each data point.
Hardware: i7-7700HQ, 16GB DDR4 Windows Laptop

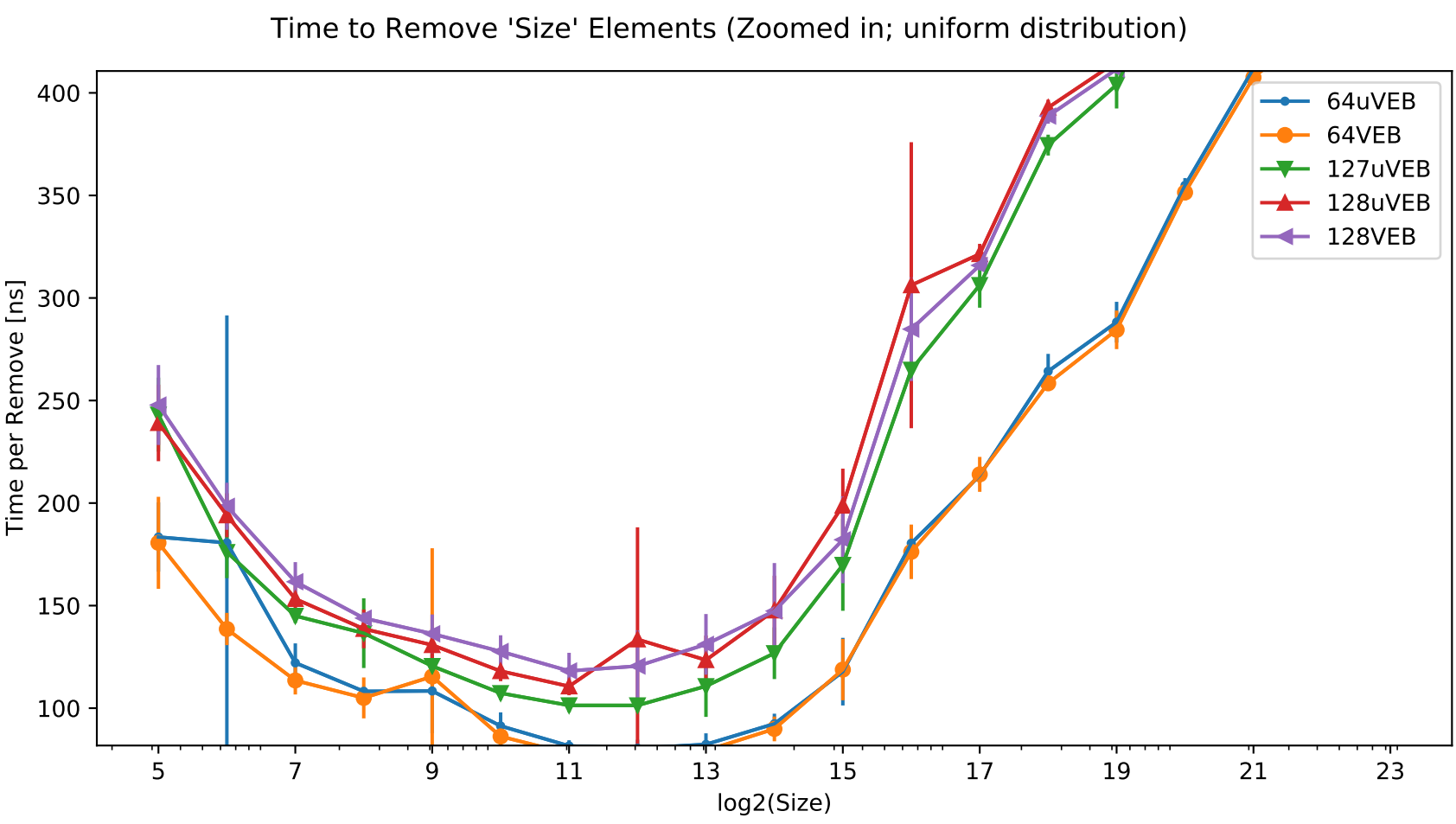

Time to Remove 'Size' Elements (uniform distribution)
Time per Remove [ns]
log2(Size)
8std::set
16std::set
32std::set
64std::set
8uVEB
16uVEB
32uVEB
64uVEB
0
200
400
600
800
1000
1200
5
7
9
11
13
15
17
19
21
23

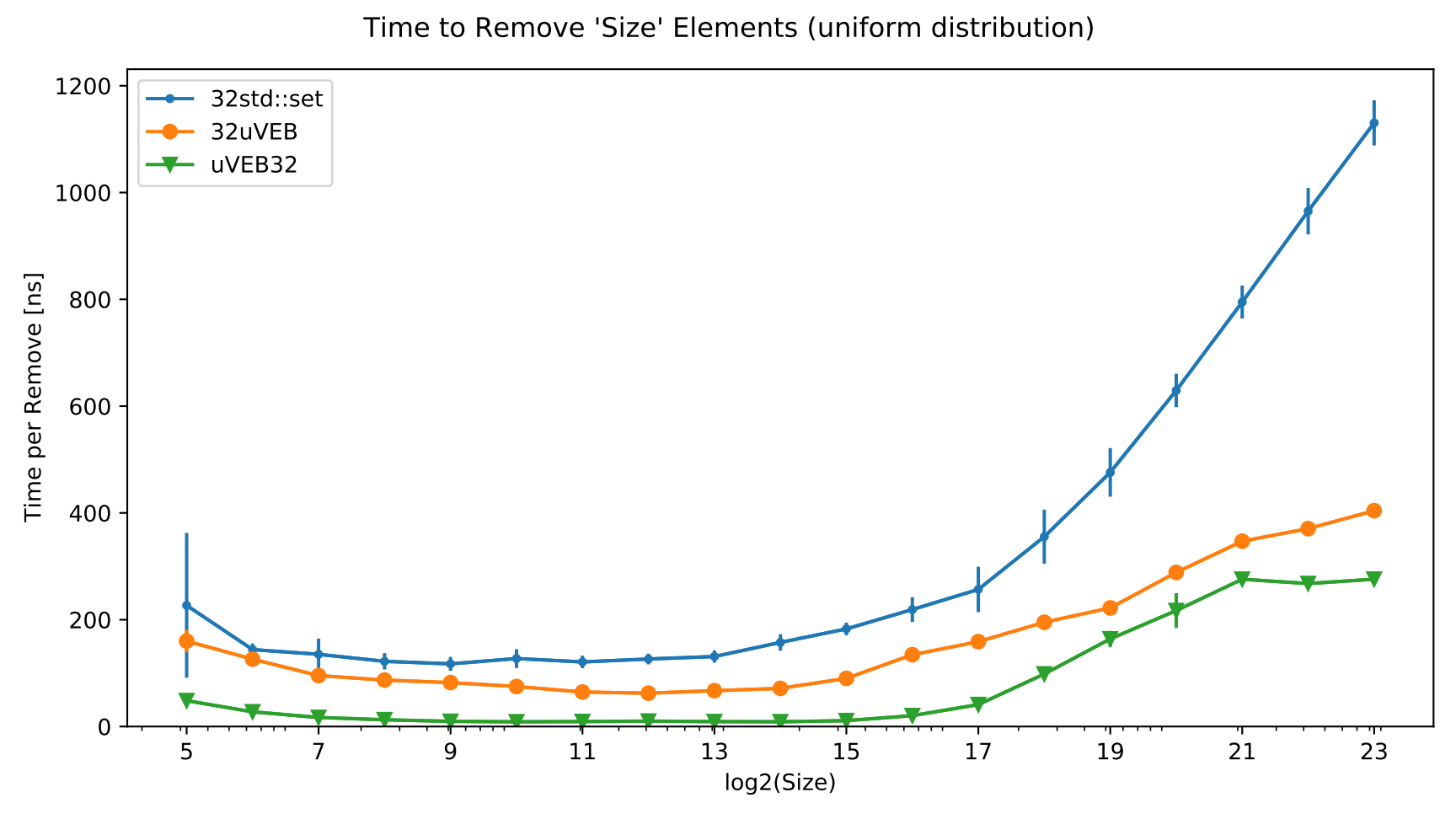

Time to Remove 'Size' Elements (Zoomed in; uniform distribution)
Time per Remove [ns]
log2(Size)
50
100
150
200
250
5
7
9
11
13
15
17
19
21
23
8std::set
16std::set
32std::set
64std::set
8uVEB
16uVEB
32uVEB
64uVEB

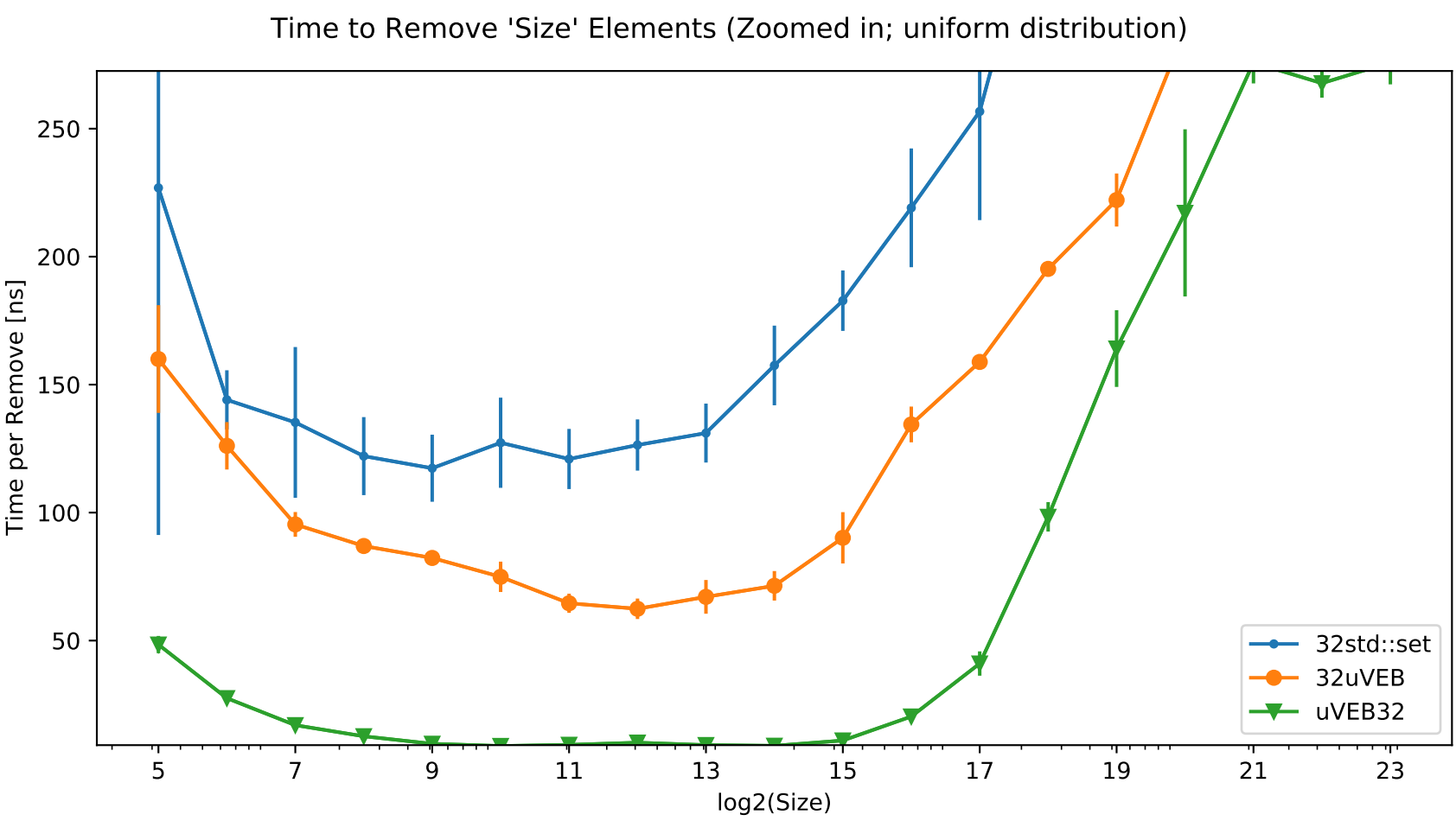

Time to Remove 'Size' Elements (uniform distribution)
Time per Remove [ns]
log2(Size)
0
20
40
60
80
100
120
140
160
5
7
9
11
13
15
17
19
21
23
8uVEB
12uVEB
13uVEB
14uVEB
16uVEB

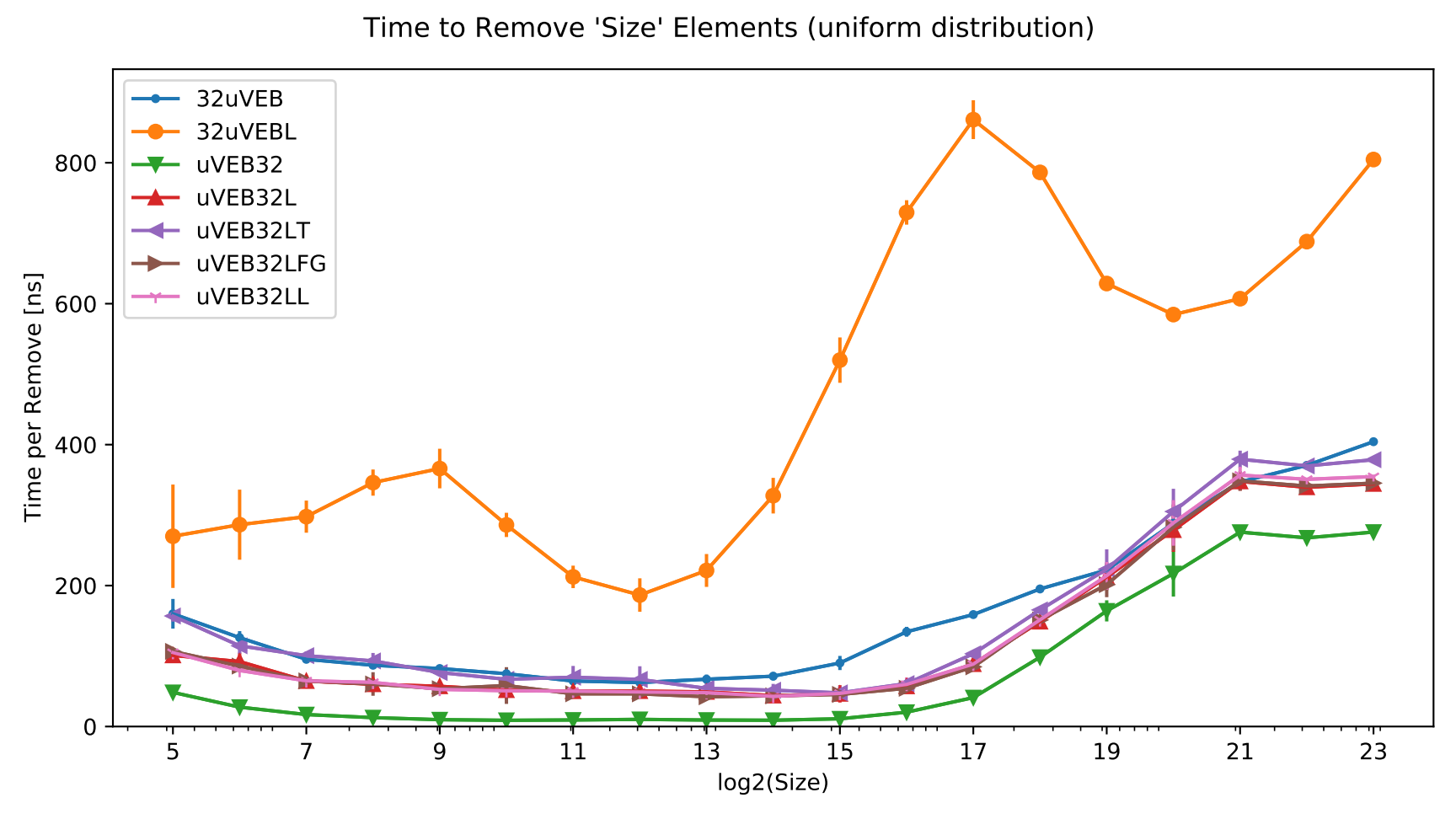

Time to Remove 'Size' Elements (Zoomed in; uniform distribution)
Time per Remove [ns]
log2(Size)
8uVEB
12uVEB
13uVEB
14uVEB
16uVEB
50
45
40
35
30
25
20
15
10
5
7
9
11
13
15
17
19
21
23

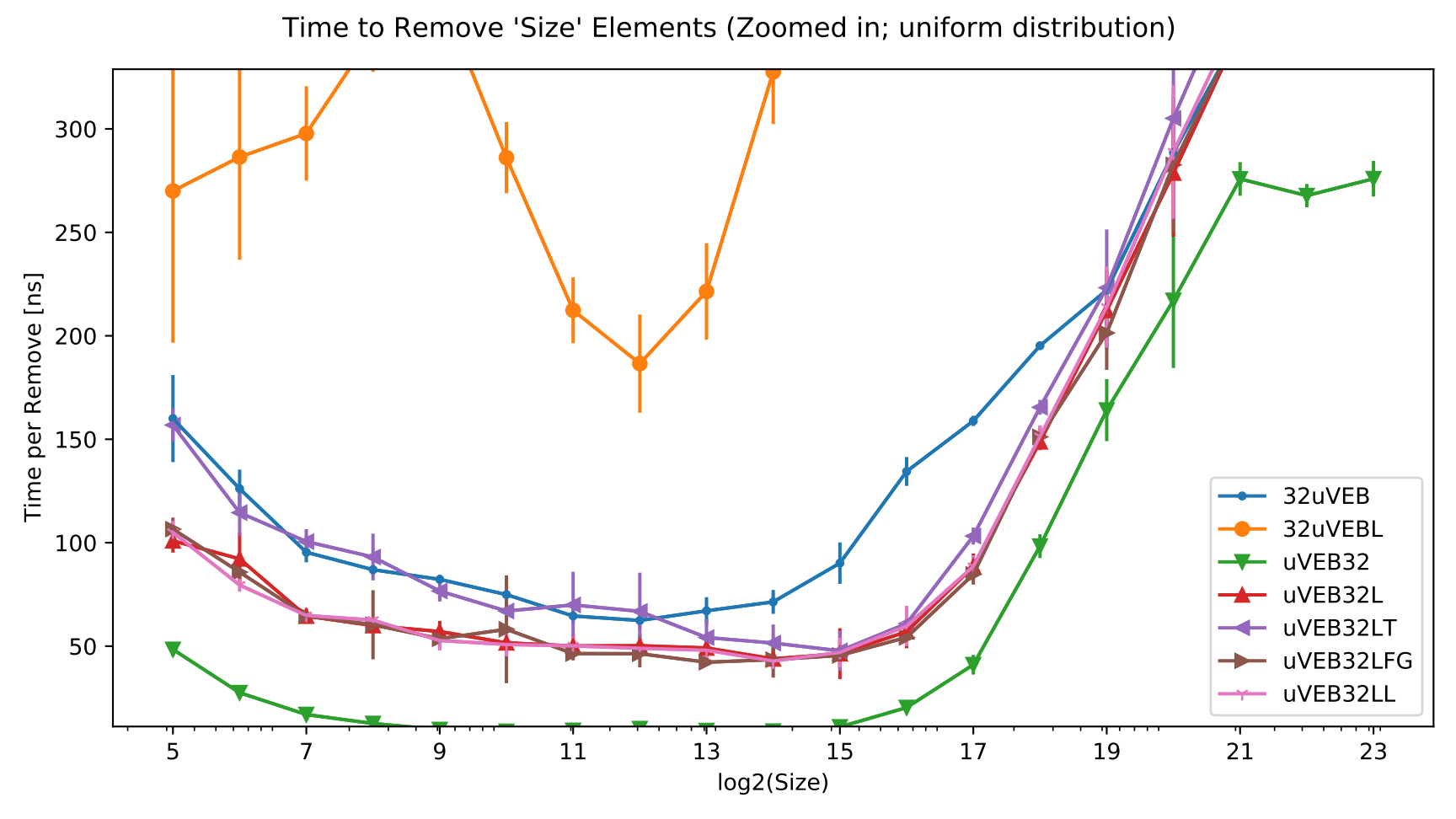

Time to Remove 'Size' Elements (uniform distribution)
64uVEB
64VEB
127uVEB
128uVEB
128VEB
Time per Remove [ns]
0
100
200
300
400
500
600
700
5
7
9
11
13
15
17
19
21
23
log2(Size)

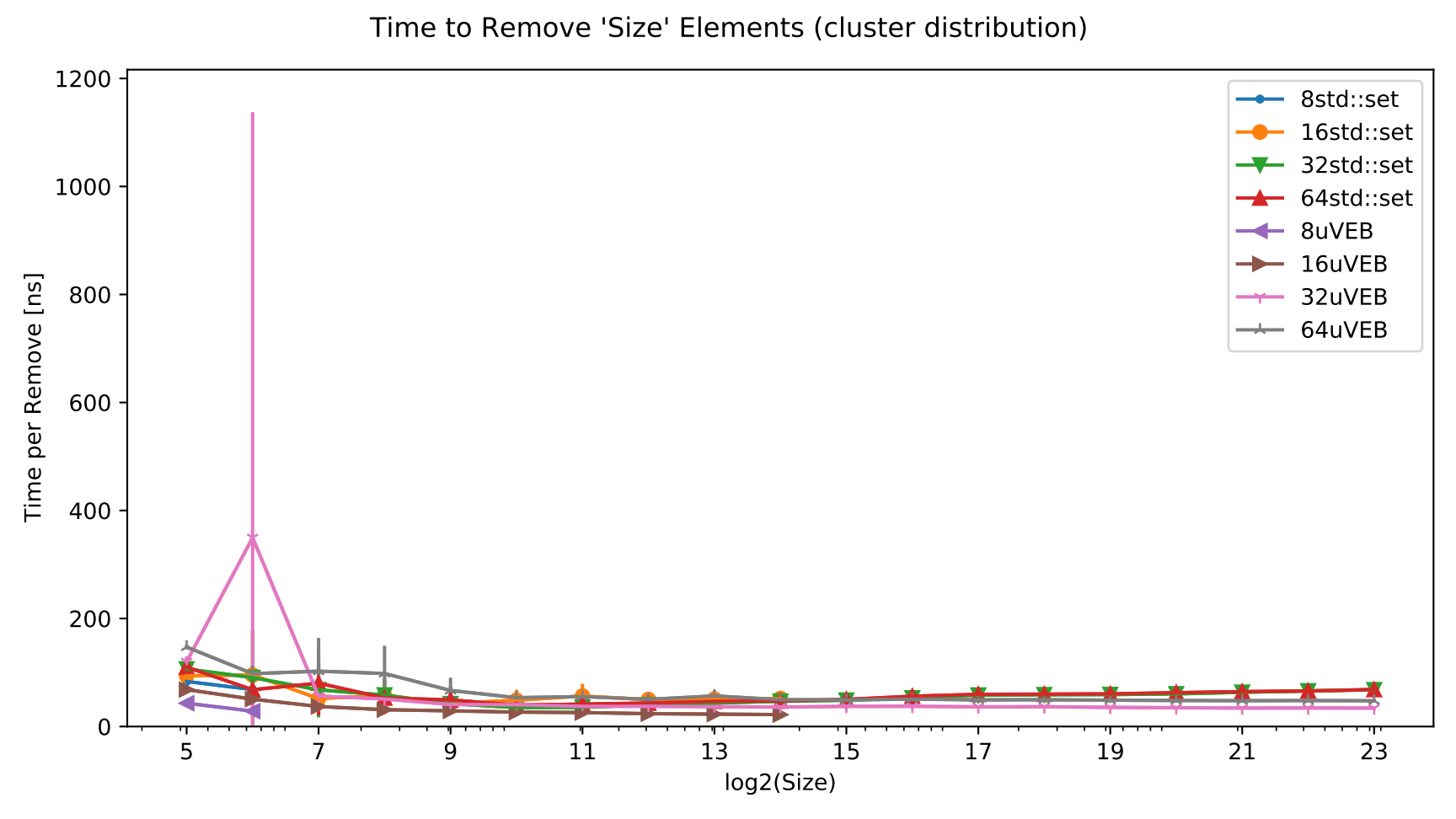

Time to Remove 'Size' Elements (Zoomed in; uniform distribution)
Time per Remove [ns]
log2(Size)
64uVEB
64VEB
127uVEB
128uVEB
128VEB
100
150
200
250
300
350
400
5
7
9
11
13
15
17
19
21
23

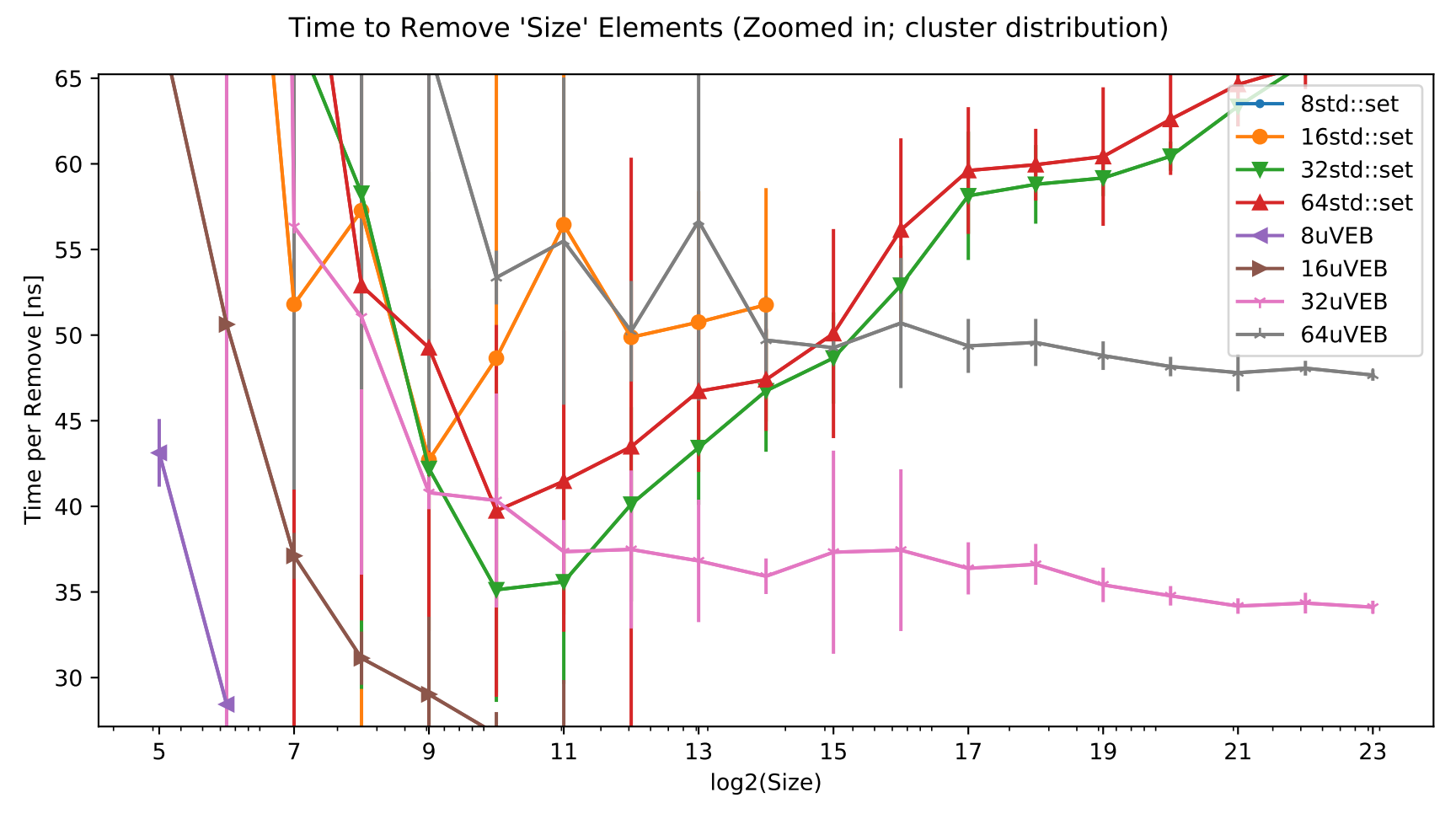

Time to Remove 'Size' Elements (uniform distribution)
32std::set
32uVEB
uVEB32
Time per Remove [ns]
log2(Size)
0
200
400
600
800
1000
1200
5
7
9
11
13
15
17
19
21
23

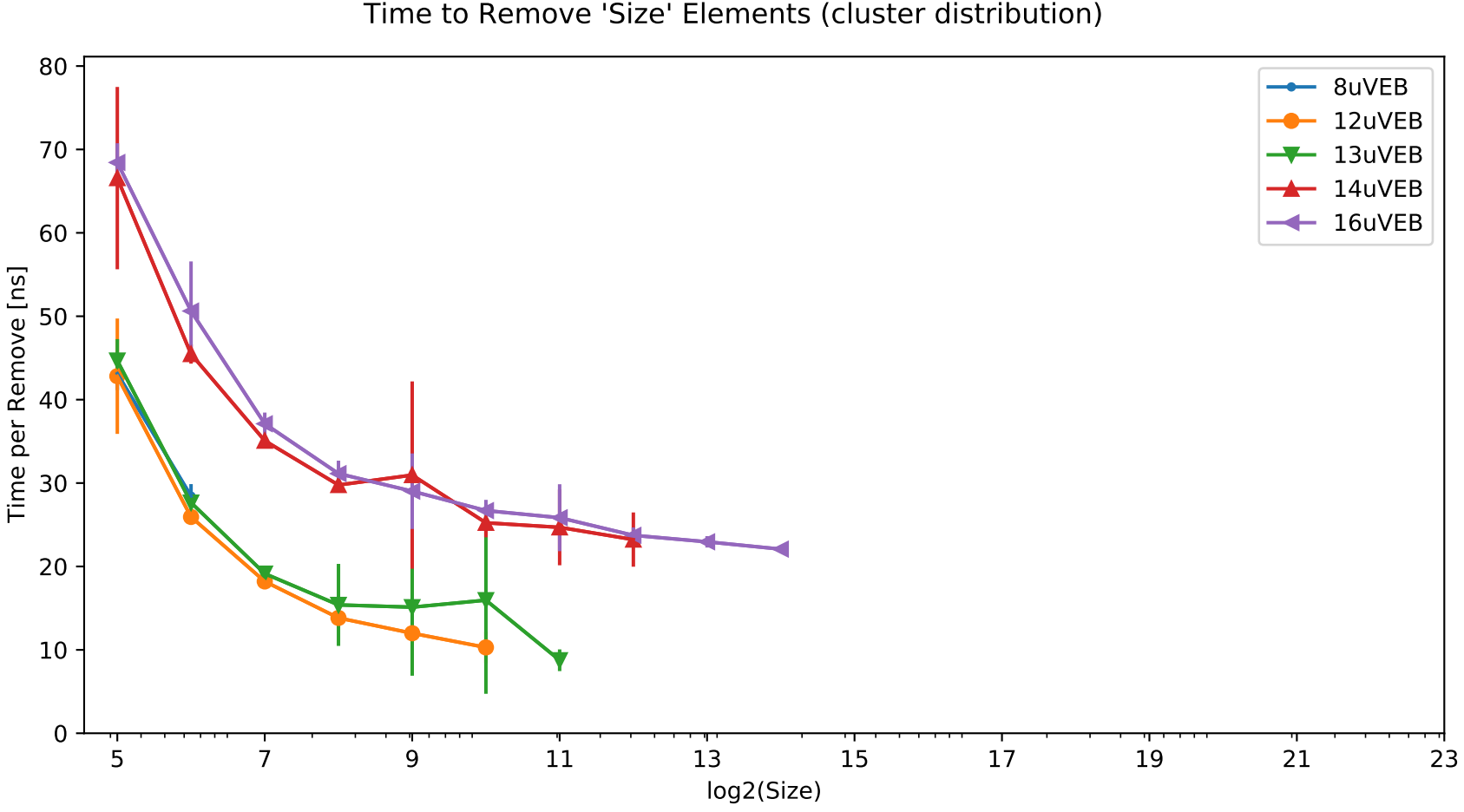

Time to Remove 'Size' Elements (Zoomed in; uniform distribution)
Time per Remove [ns]
250
200
150
100
50
5
7
9
11
13
15
17
19
21
23
log2(Size)
32std::set
32uVEB
uVEB32

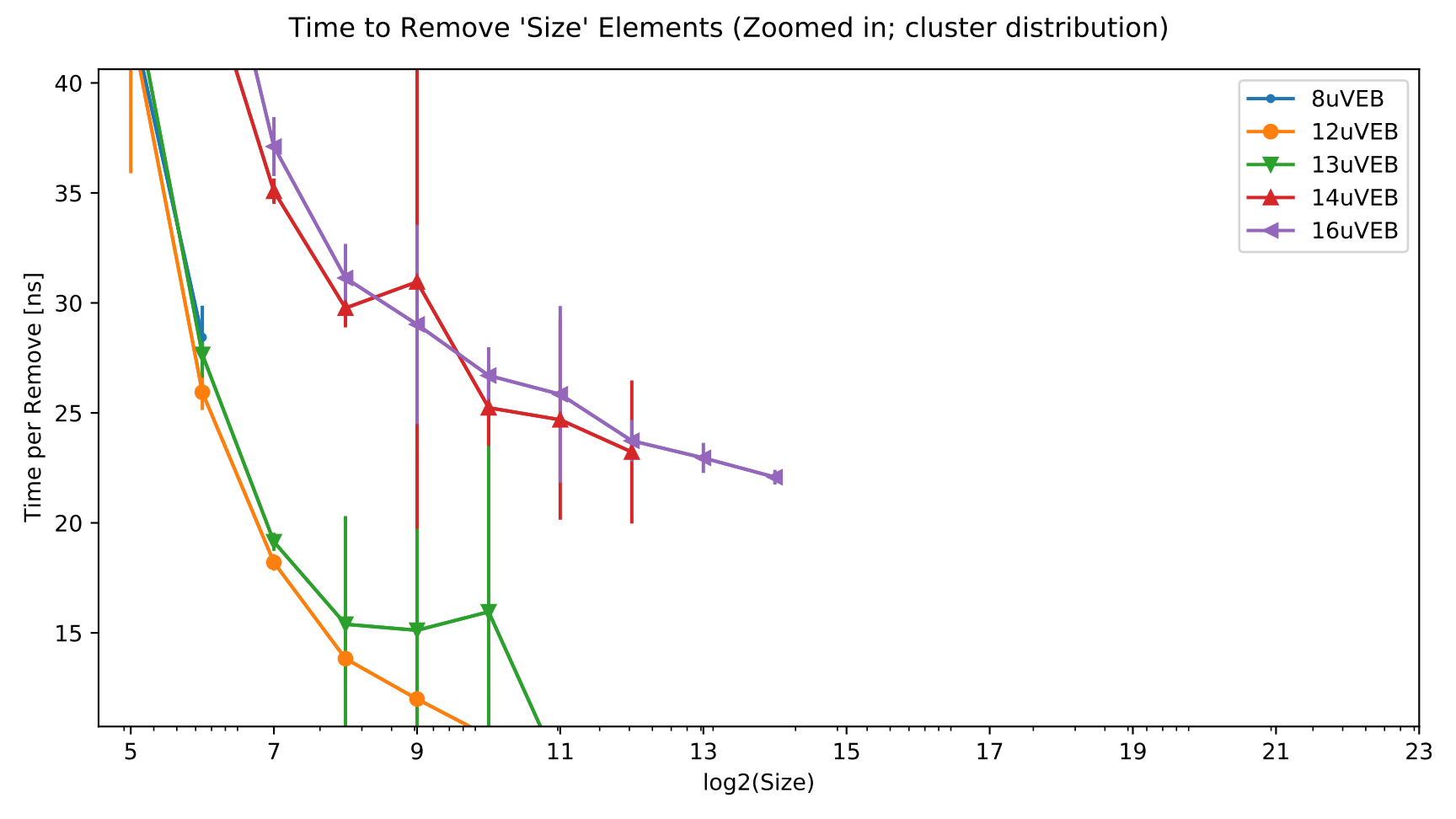

Time to Remove 'Size' Elements (uniform distribution)
32uVEB
32uVEBL
uVEB32
uVEB32L
uVEB32LT
uVEB32LFG
uVEB32LL
Time per Remove [ns]
0
200
400
600
800
5
7
9
11
13
15
17
19
21
23
log2(Size)

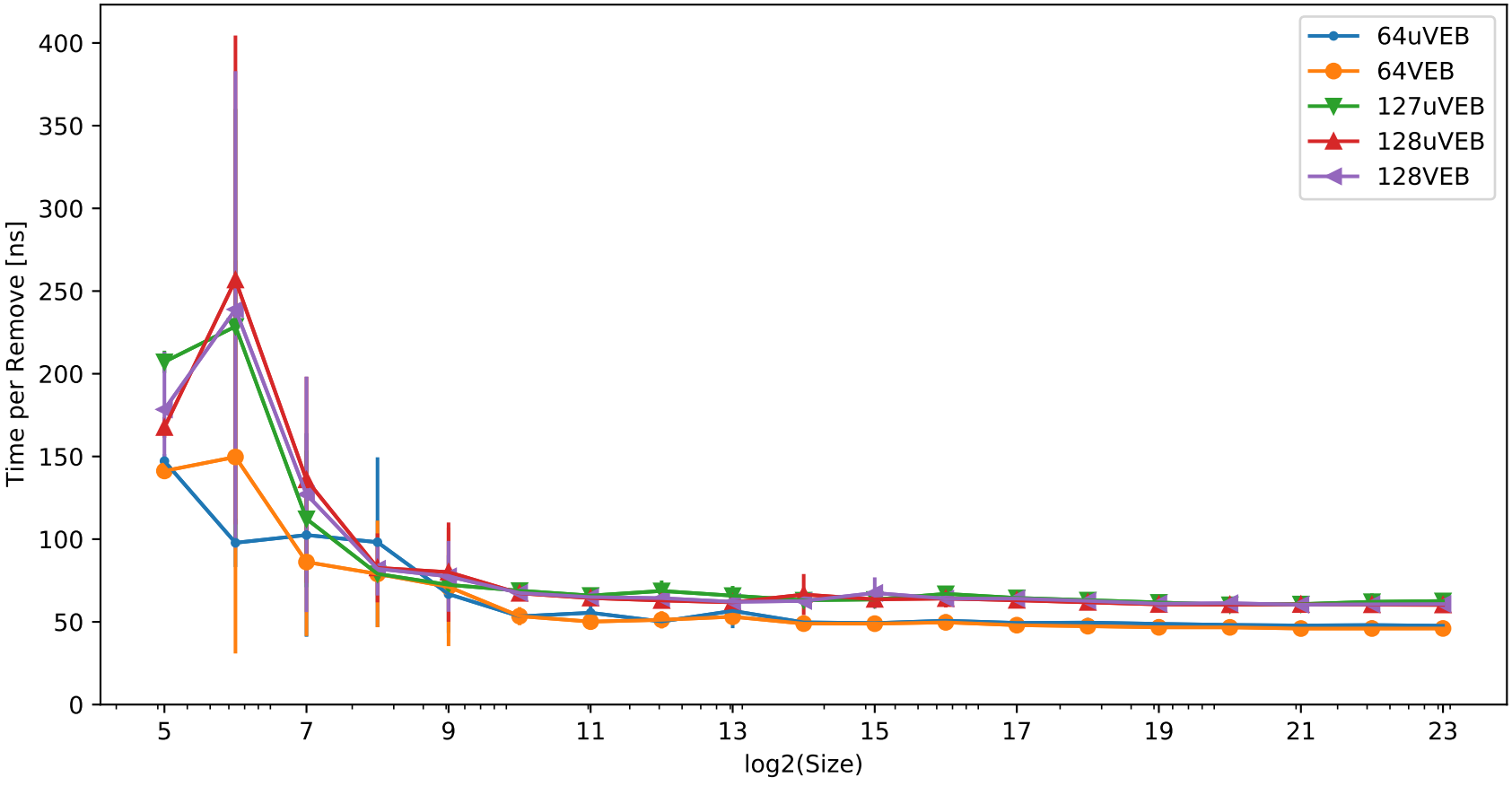

Time to Remove 'Size' Elements (Zoomed in; uniform distribution)
Time per Remove [ns]
300
250
200
150
100
50
5
7
9
11
13
15
17
19
21
23
log2(Size)
32uVEB
32uVEBL
uVEB32
uVEB32L
uVEB32LT
uVEB32LFG
uVEB32LL

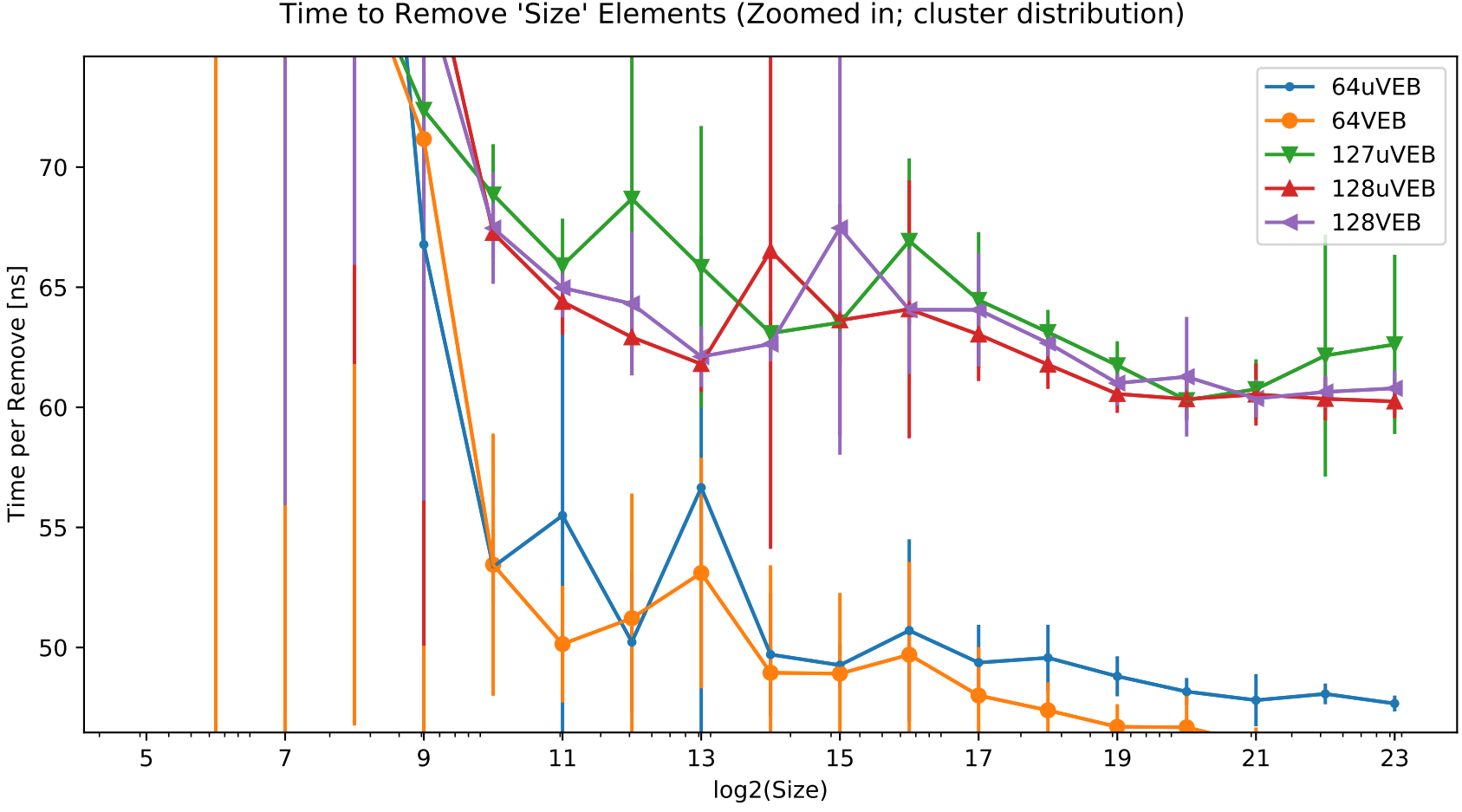

Time to Remove 'Size' Elements (cluster distribution)
Time per Remove [ns]
log2(Size)
0
200
400
600
800
1000
1200
5
7
9
11
13
15
17
19
21
23
8std::set
16std::set
32std::set
64std::set
8uVEB
16uVEB
32uVEB
64uVEB

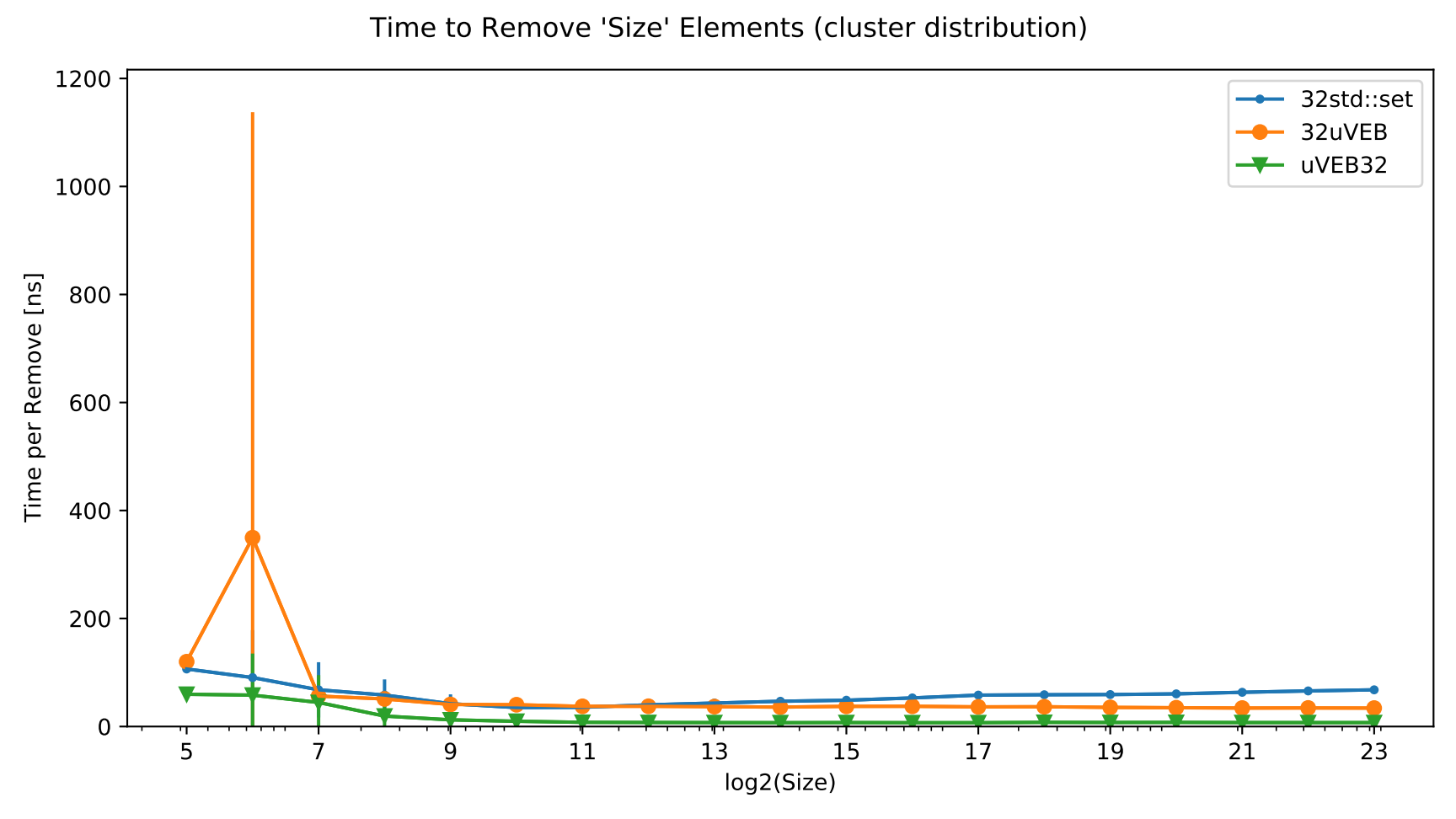

Time to Remove 'Size' Elements (Zoomed in; cluster distribution)
Time per Remove [ns]
log2(Size)
65
60
55
50
45
40
35
30
5
7
9
11
13
15
17
19
21
23
8std::set
16std::set
32std::set
64std::set
8uVEB
16uVEB
32uVEB
64uVEB

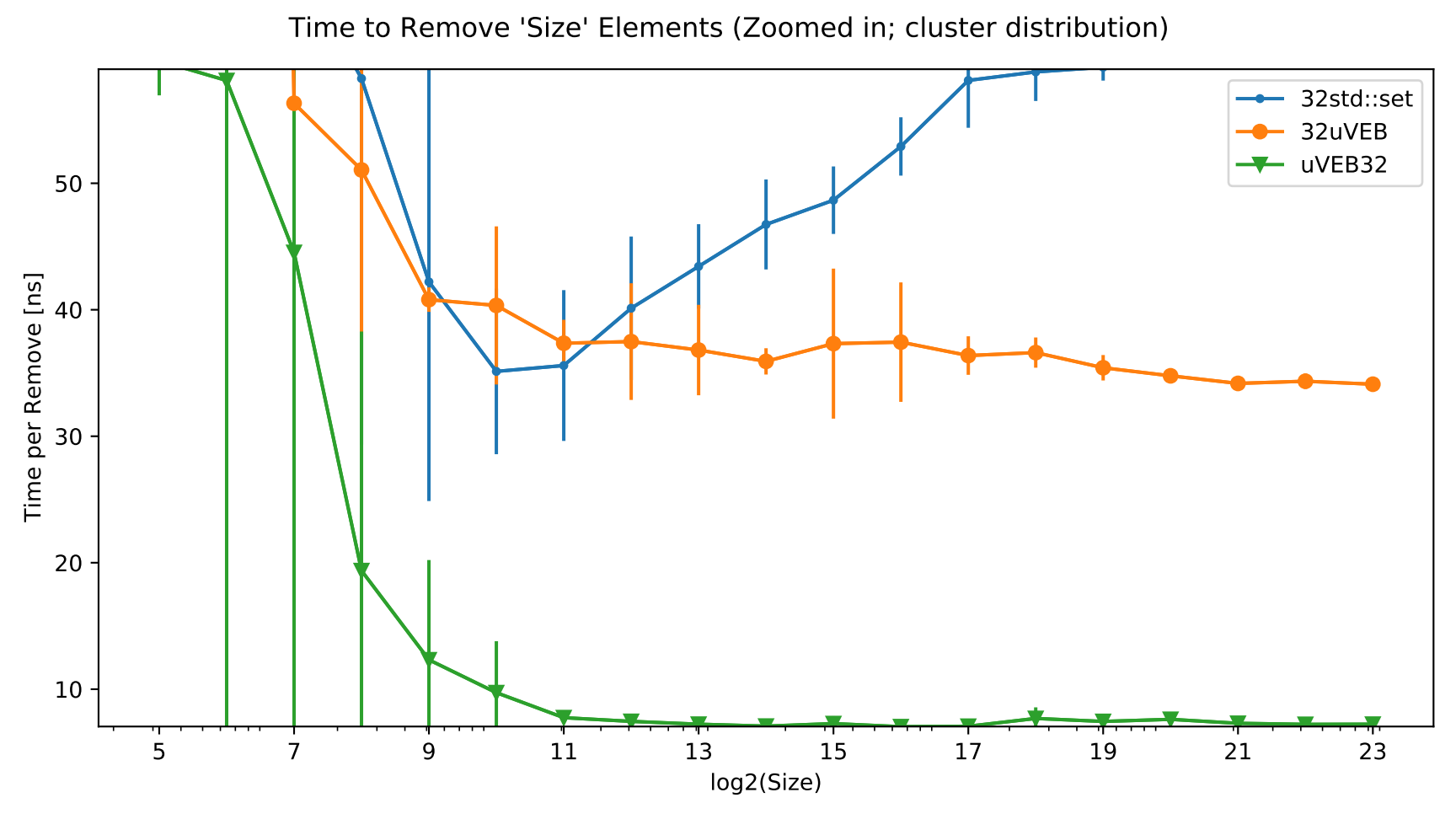

Time to Remove 'Size' Elements (cluster distribution)
Time per Remove [ns]
log2(Size)
8uVEB
12uVEB
13uVEB
14uVEB
16uVEB
0
10
20
30
40
50
60
70
80
5
7
9
11
13
15
17
19
21
23

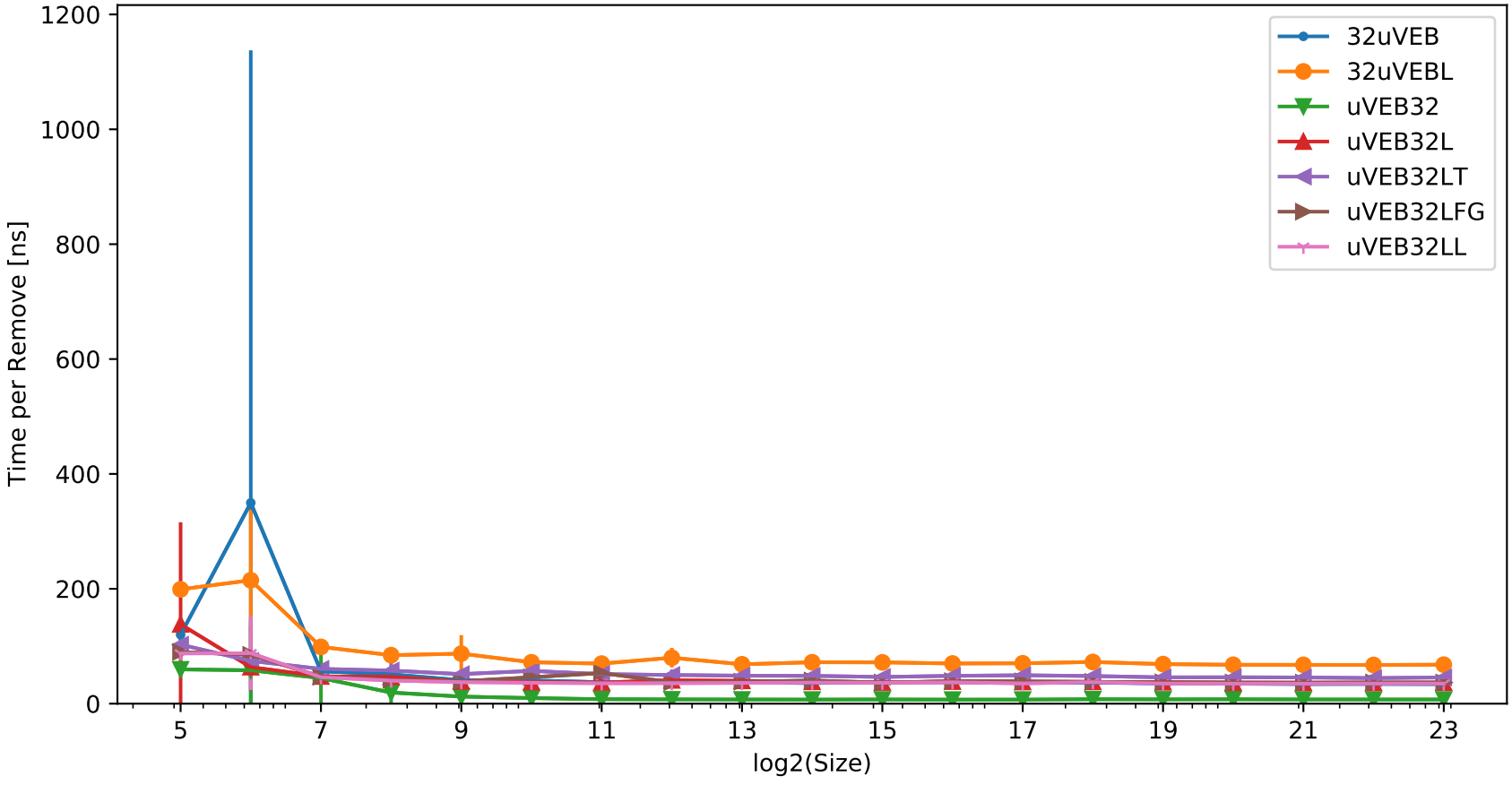

Time to Remove 'Size' Elements (Zoomed in; cluster distribution)
Time per Remove [ns]
log2(Size)
8uVEB
12uVEB
13uVEB
14uVEB
16uVEB
40
35
30
25
20
15
5
7
9
11
13
15
17
19
21
23

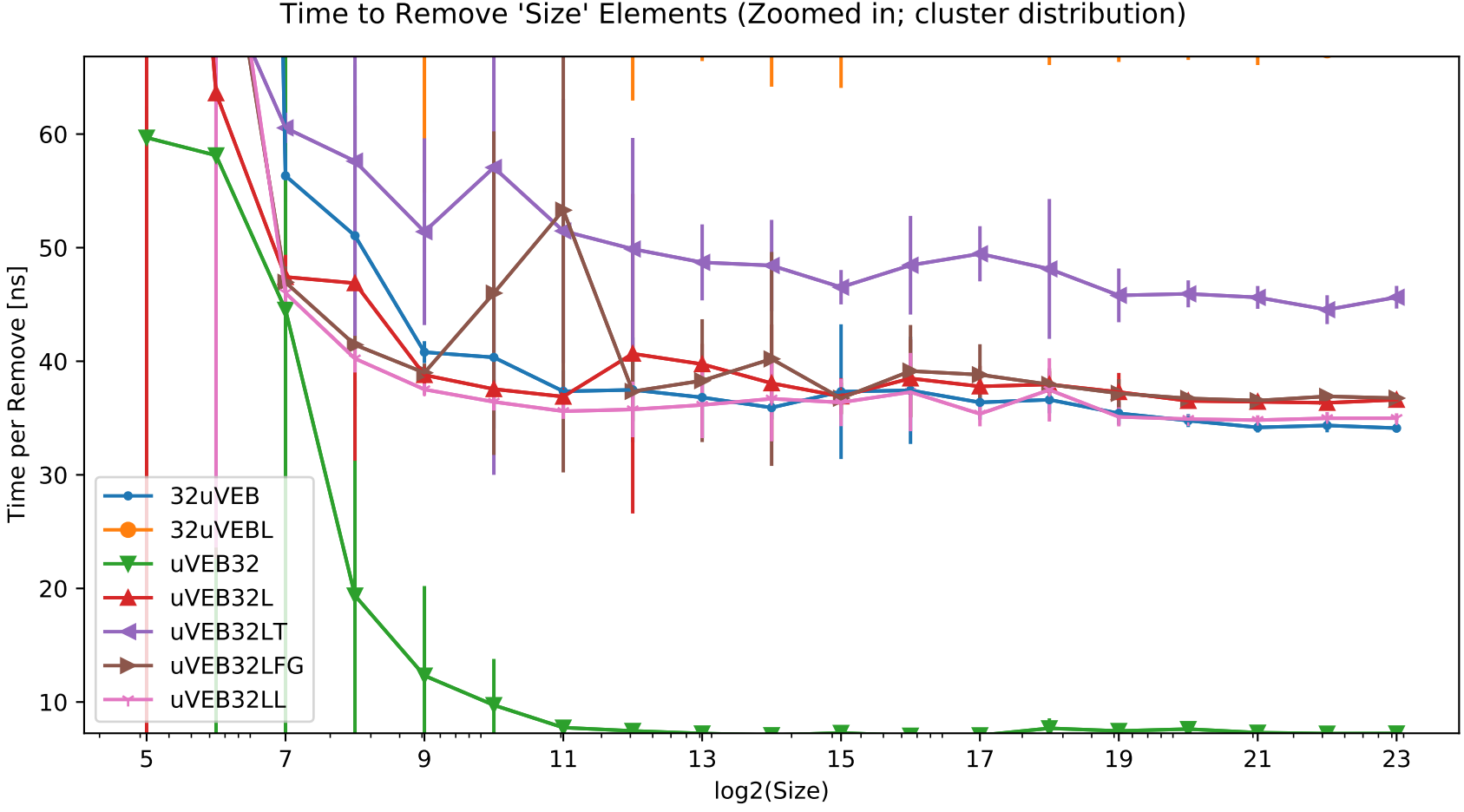

Time to Remove 'Size' Elements (cluster distribution)
Time per Remove [ns]
log2(Size)
0
50
100
150
200
250
300
350
400
5
7
9
11
13
15
17
19
21
23
64uVEB
64VEB
127uVEB
128uVEB
128VEB

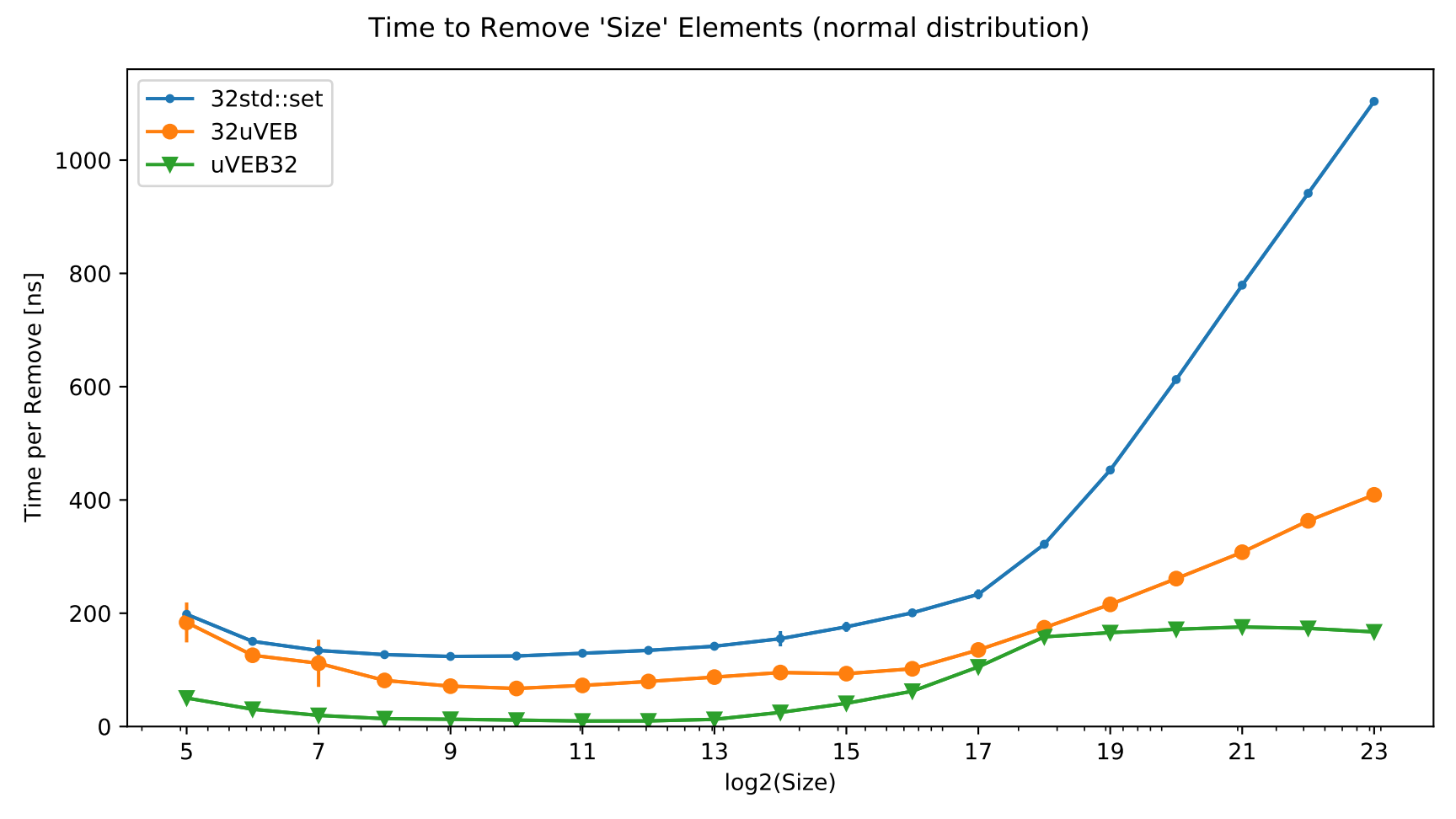

Time to Remove 'Size' Elements (Zoomed in; cluster distribution)
Time per Remove [ns]
70
65
60
55
50
5
7
9
11
13
15
17
19
21
23
log2(Size)
64uVEB
64VEB
127uVEB
128uVEB
128VEB

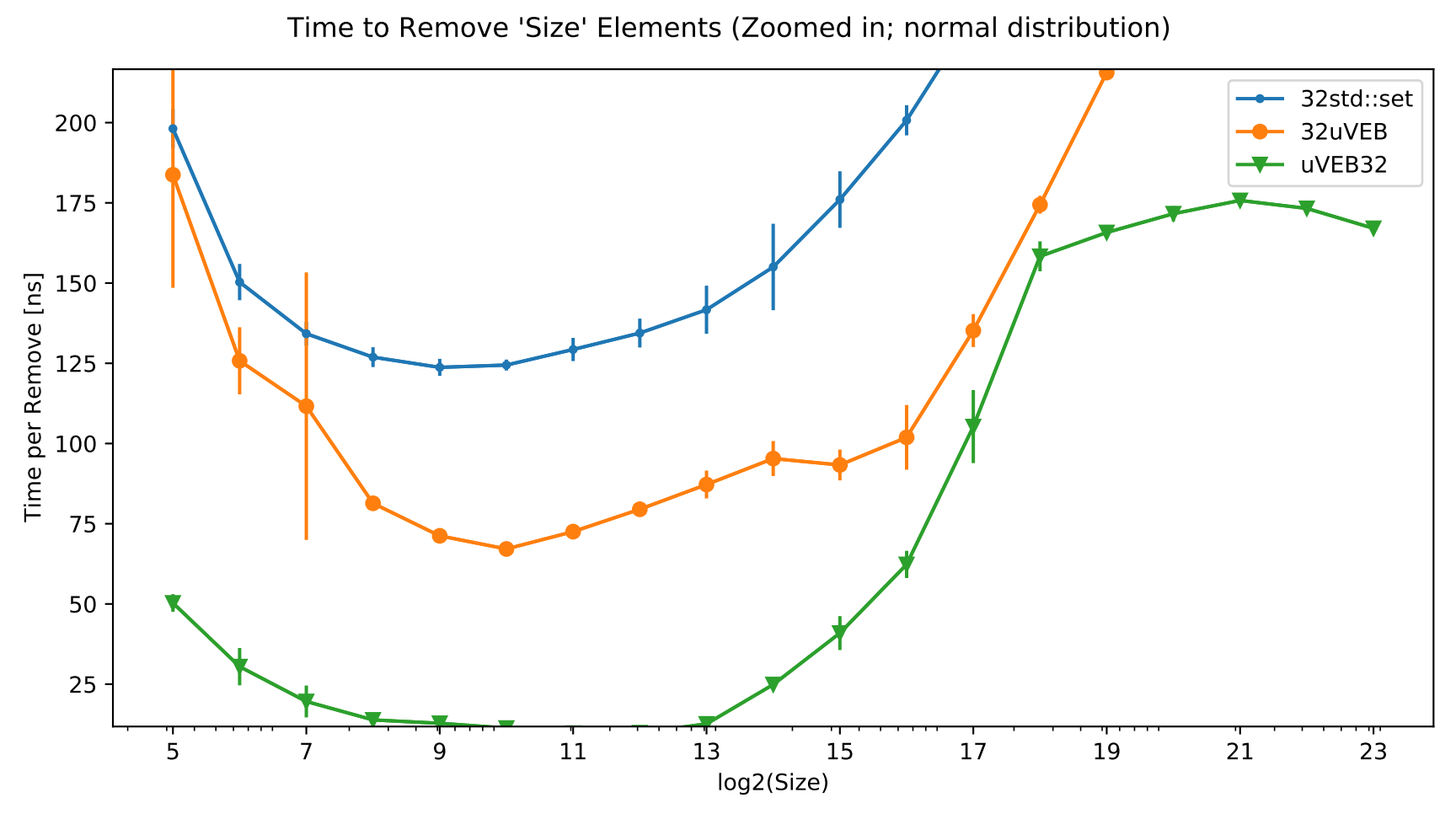

Time to Remove 'Size' Elements (cluster distribution)
Time per Remove [ns]
log2(Size)
32std::set
32uVEB
uVEB32
0
200
400
600
800
1000
1200
5
7
9
11
13
15
17
19
21
23

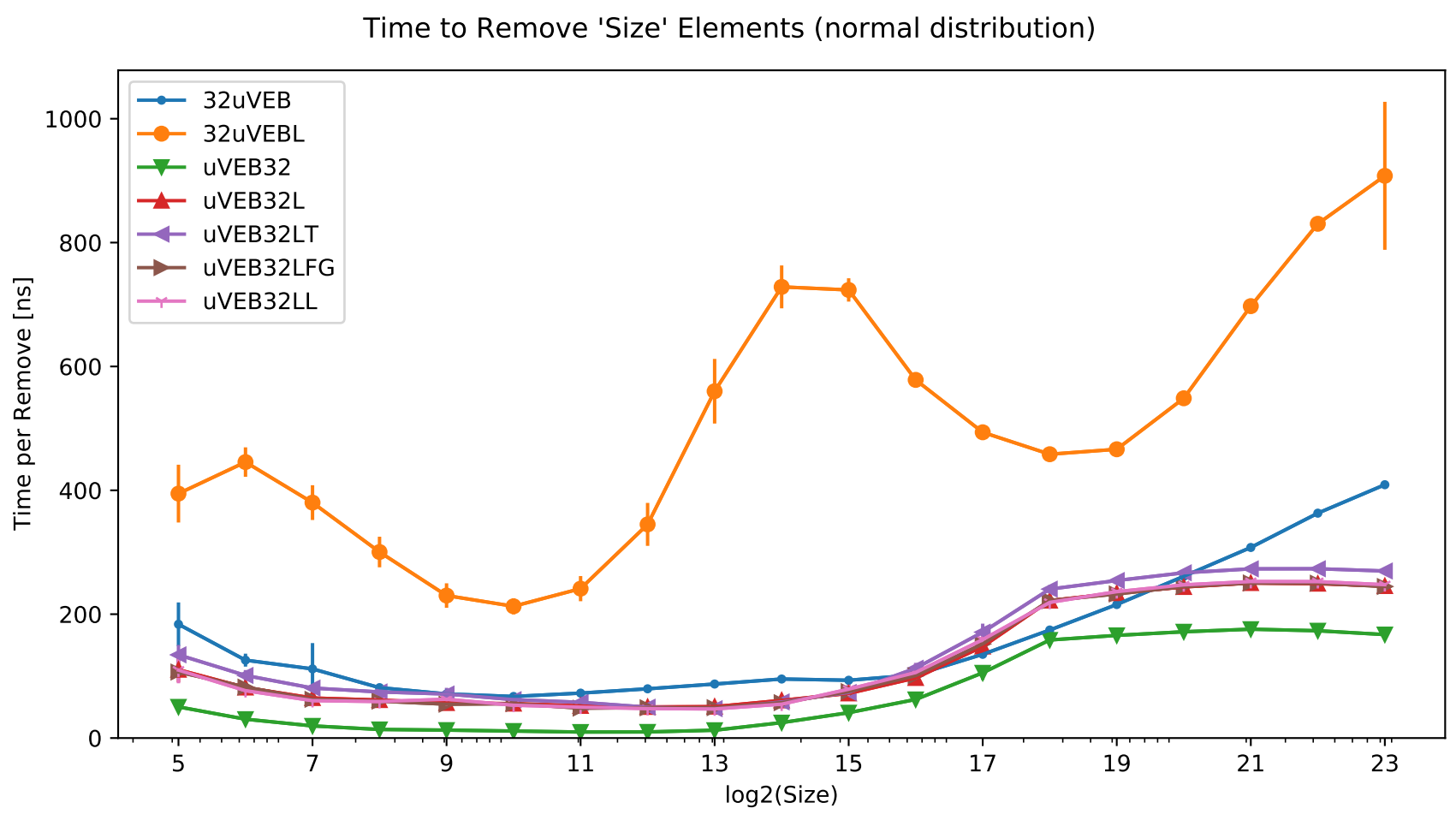

Time to Remove 'Size' Elements (Zoomed in; cluster distribution)
32std::set
32uVEB
uVEB32
Time per Remove [ns]
10
20
30
40
50
5
7
9
11
13
15
17
19
21
23
log2(Size)

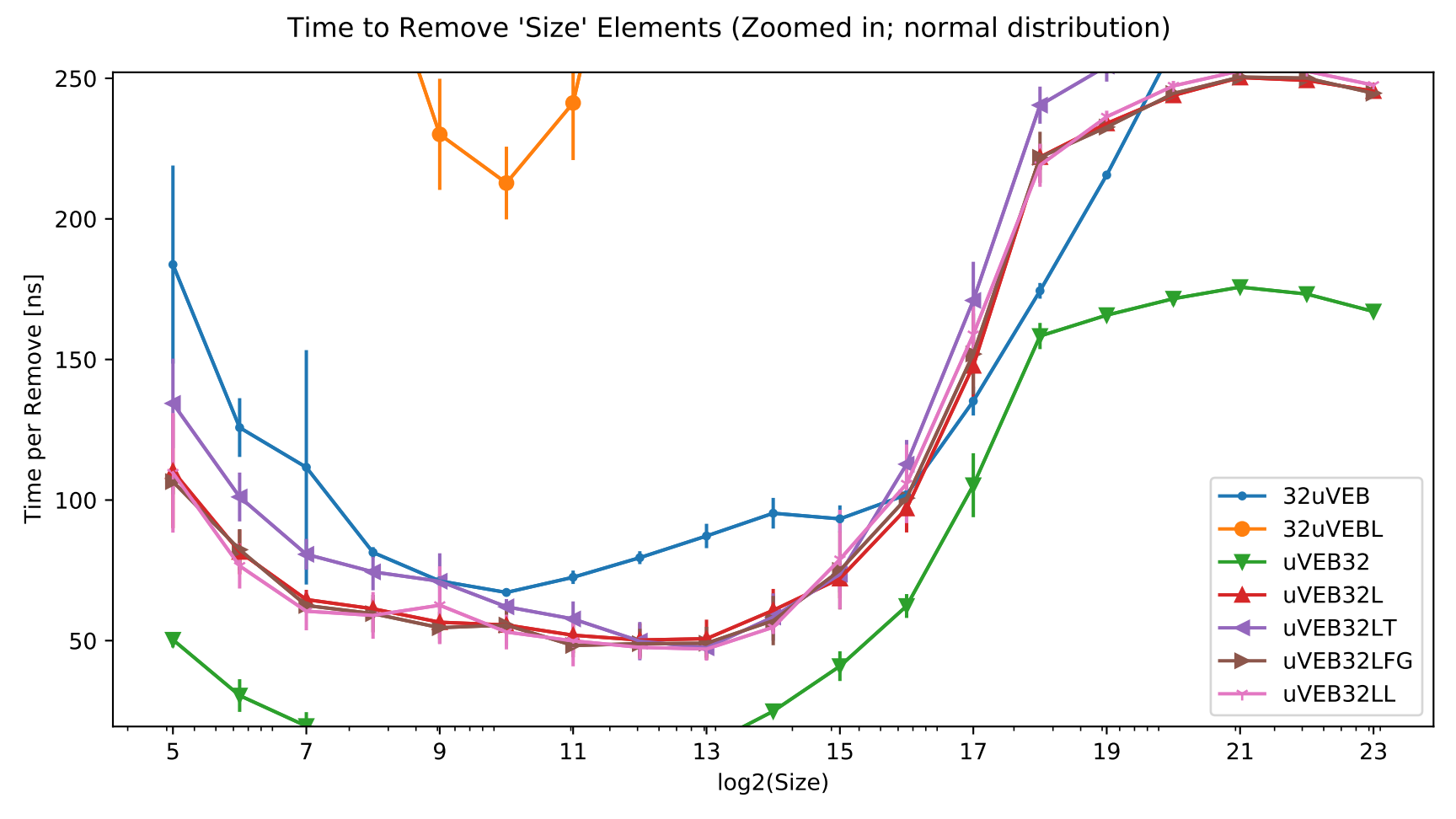

Time to Remove 'Size' Elements (cluster distribution)
Time per Remove [ns]
log2(Size)
0
200
400
600
800
1000
1200
5
7
9
11
13
15
17
19
21
23
32uVEB
32uVEBL
uVEB32
uVEB32L
uVEB32LT
uVEB32LFG
uVEB32LL

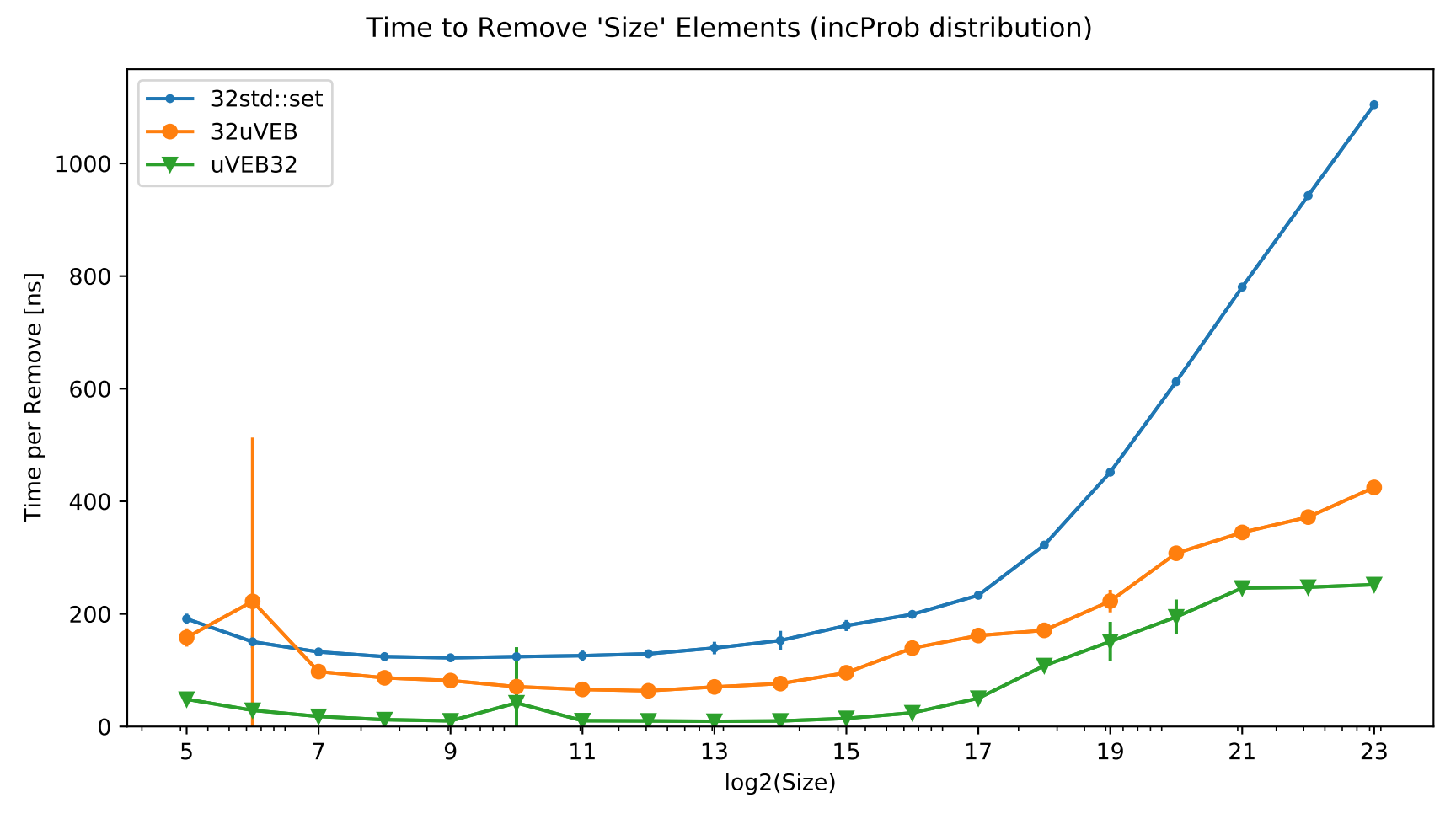

Time to Remove 'Size' Elements (Zoomed in; cluster distribution)
Time per Remove [ns]
log2(Size)
10
20
30
40
50
60
5
7
9
11
13
15
17
19
21
23
32uVEB
32uVEBL
uVEB32
uVEB32L
uVEB32LT
uVEB32LFG
uVEB32LL

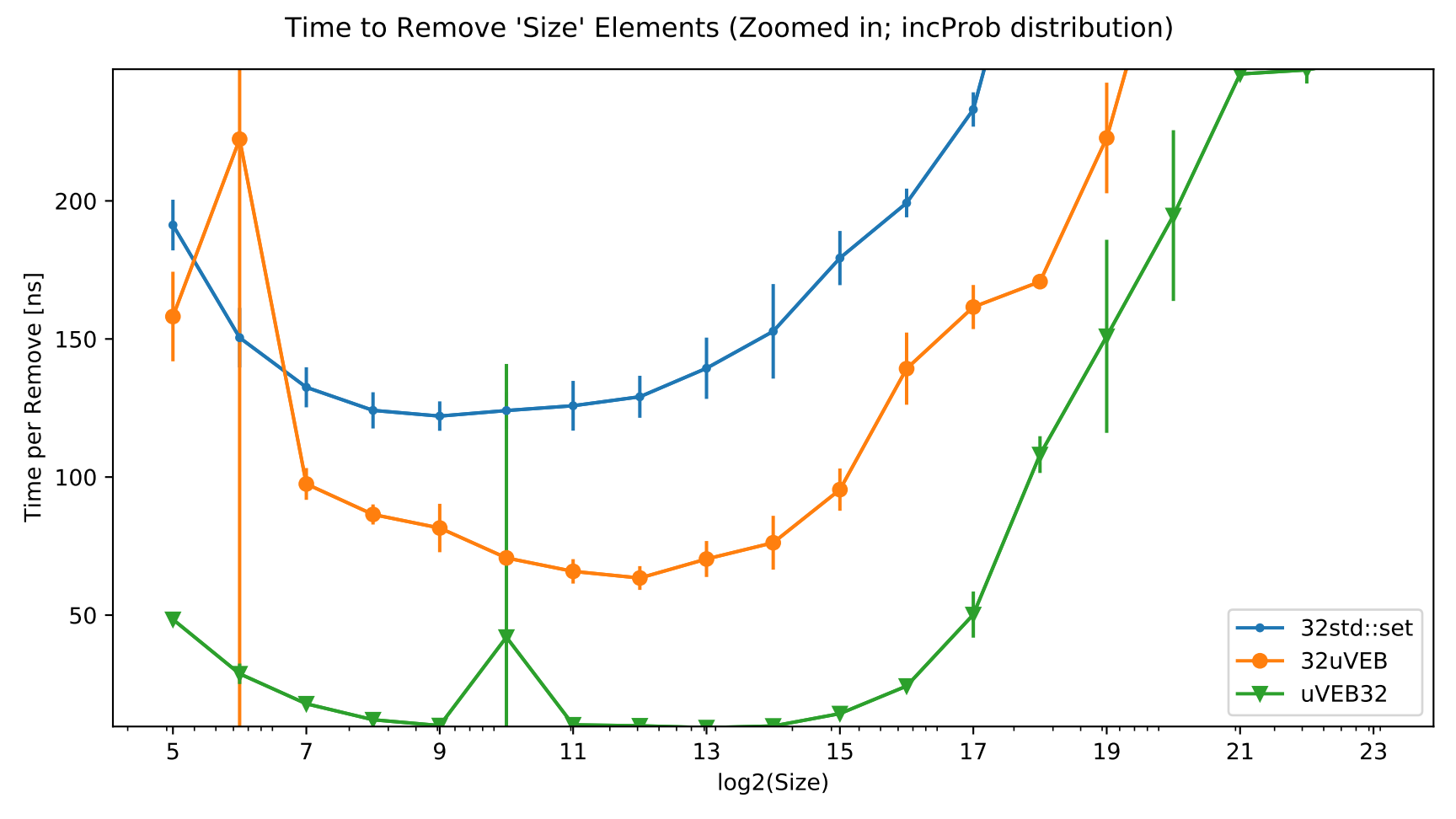

Time to Remove 'Size' Elements (normal distribution)
32std::set
32uVEB
uVEB32
Time per Remove [ns]
0
200
400
600
800
1000
5
7
9
11
13
15
17
19
21
23
log2(Size)

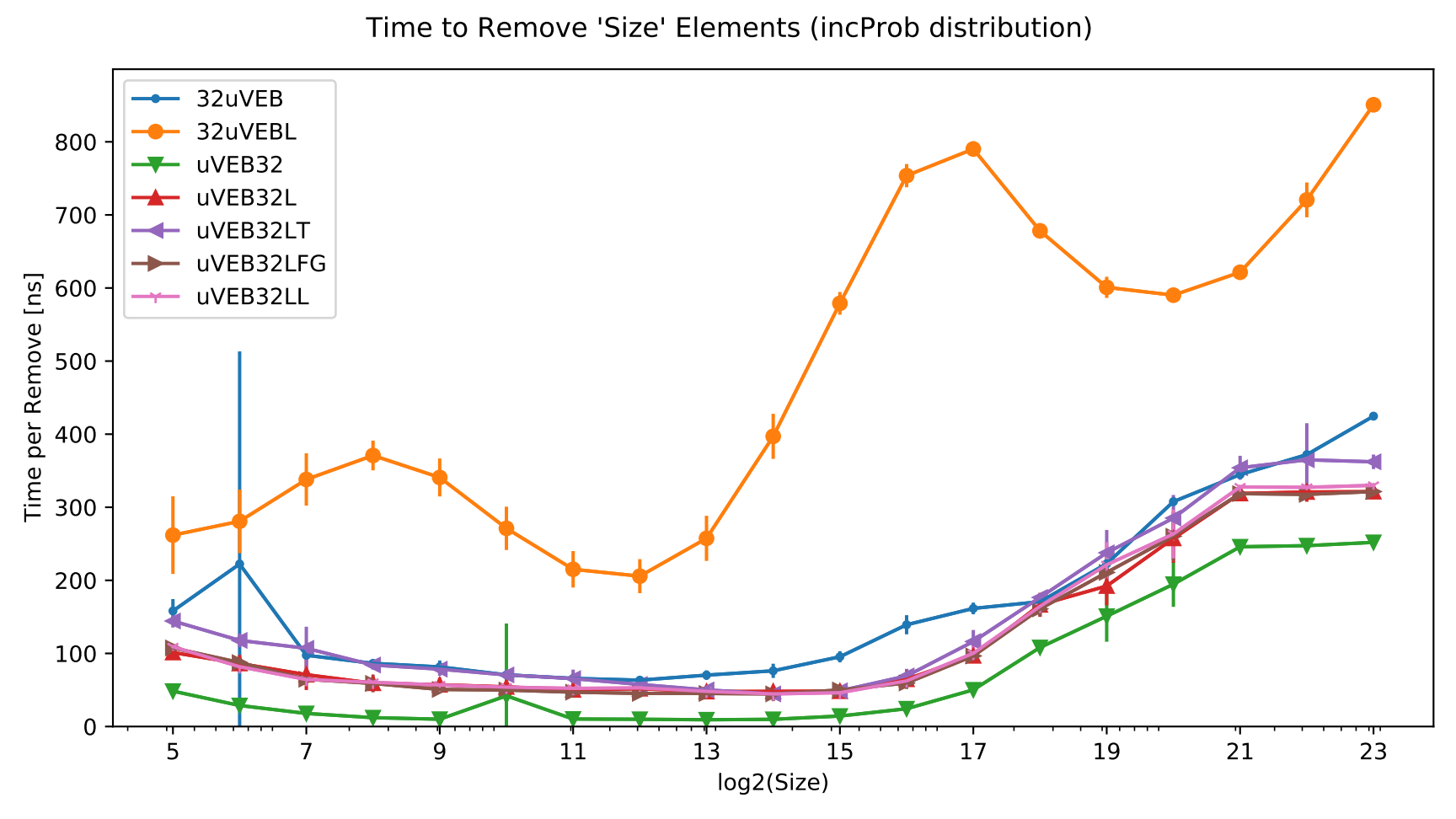

Time to Remove 'Size' Elements (Zoomed in; normal distribution)
Time per Remove [ns]
log2(Size)
32std::set
32uVEB
uVEB32
200
175
150
125
100
75
50
25
5
7
9
11
13
15
17
19
21
23

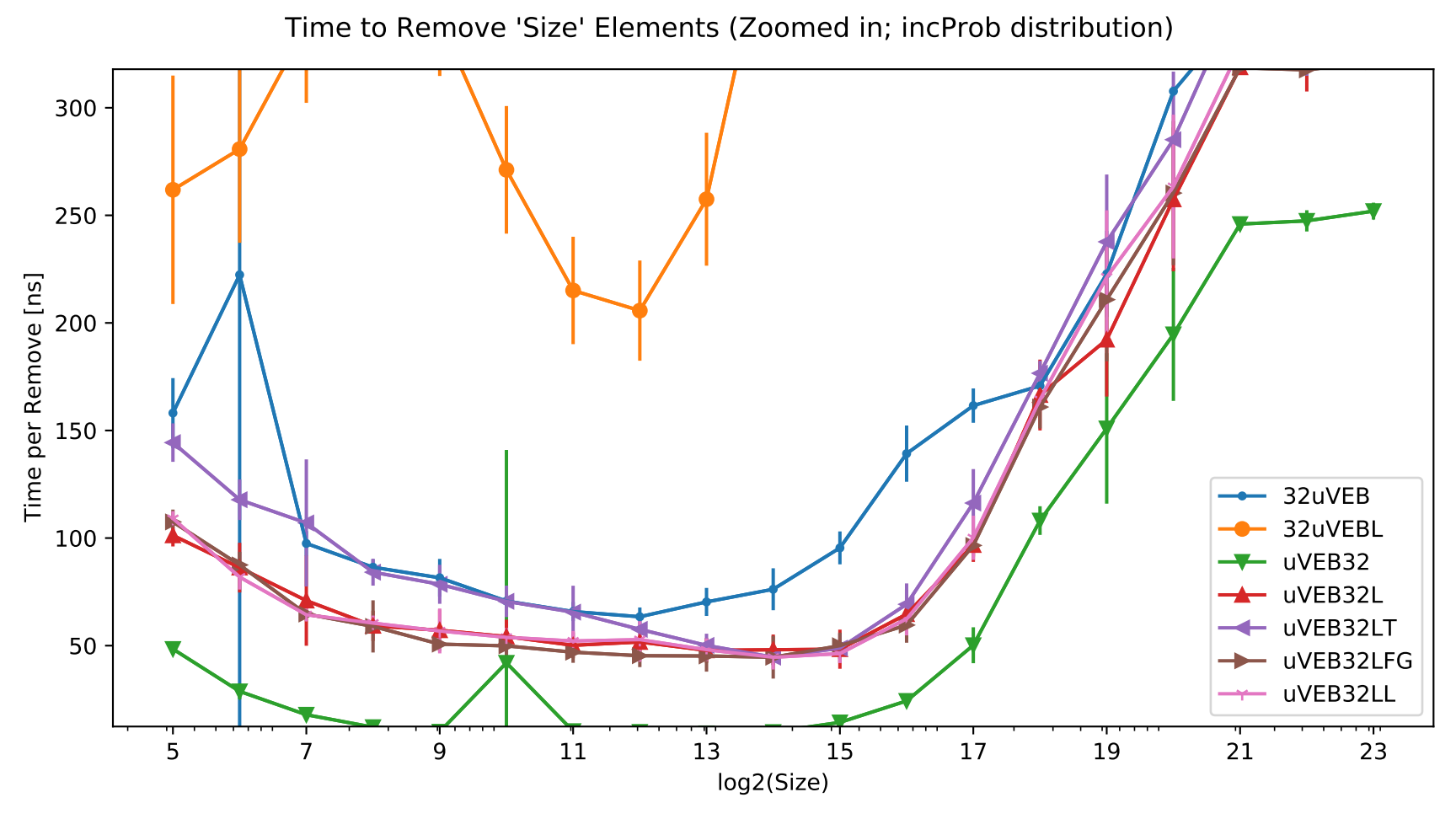

Time to Remove 'Size' Elements (normal distribution)
32uVEB
32uVEBL
uVEB32
uVEB32L
uVEB32LT
uVEB32LFG
uVEB32LL
Time per Remove [ns]
0
200
400
600
800
1000
5
7
9
11
13
15
17
19
21
23
log2(Size)

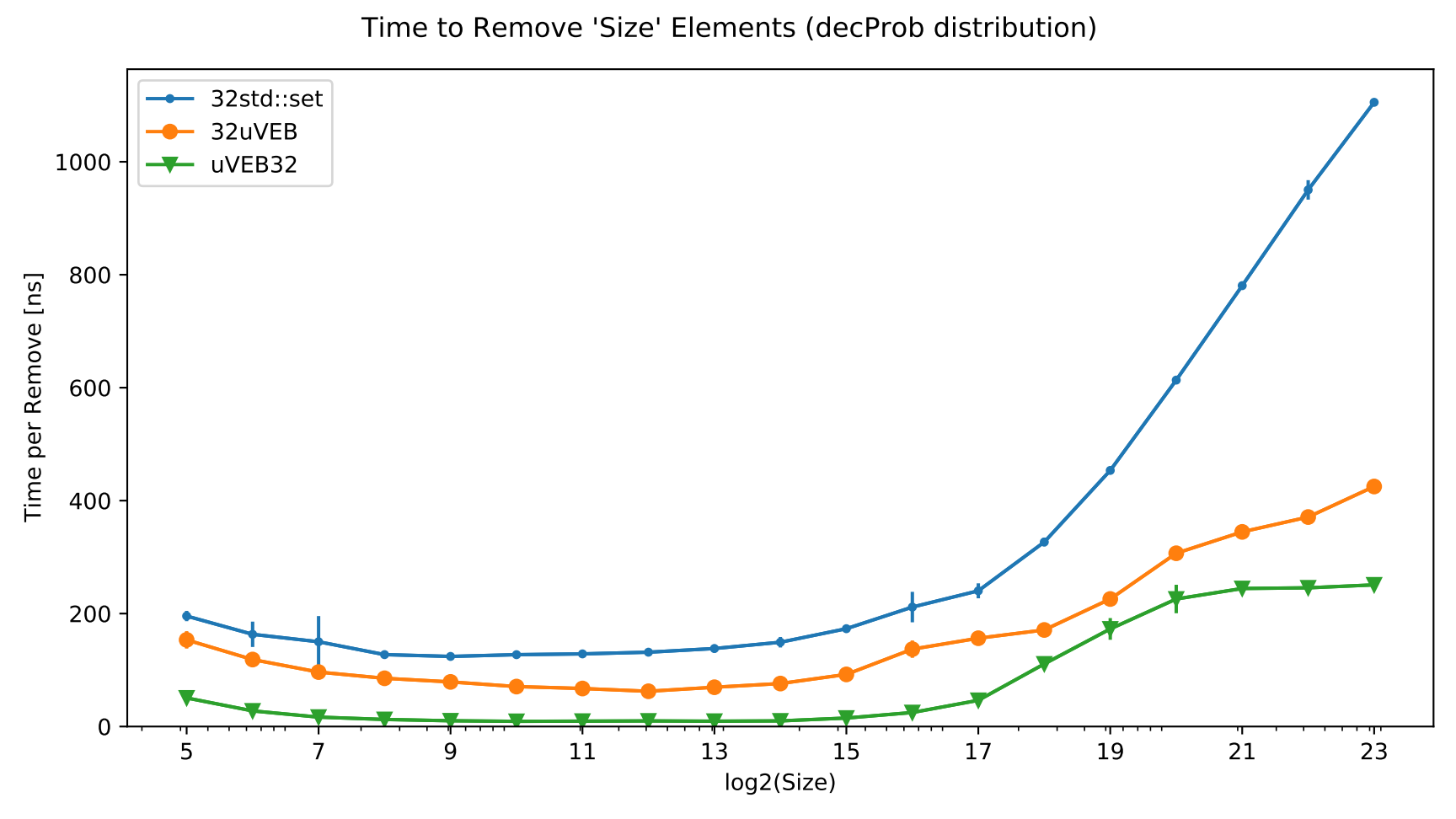

Time to Remove 'Size' Elements (Zoomed in; normal distribution)
Time per Remove [ns]
250
200
150
100
50
5
7
9
11
13
15
17
19
21
23
log2(Size)
32uVEB
32uVEBL
uVEB32
uVEB32L
uVEB32LT
uVEB32LFG
uVEB32LL

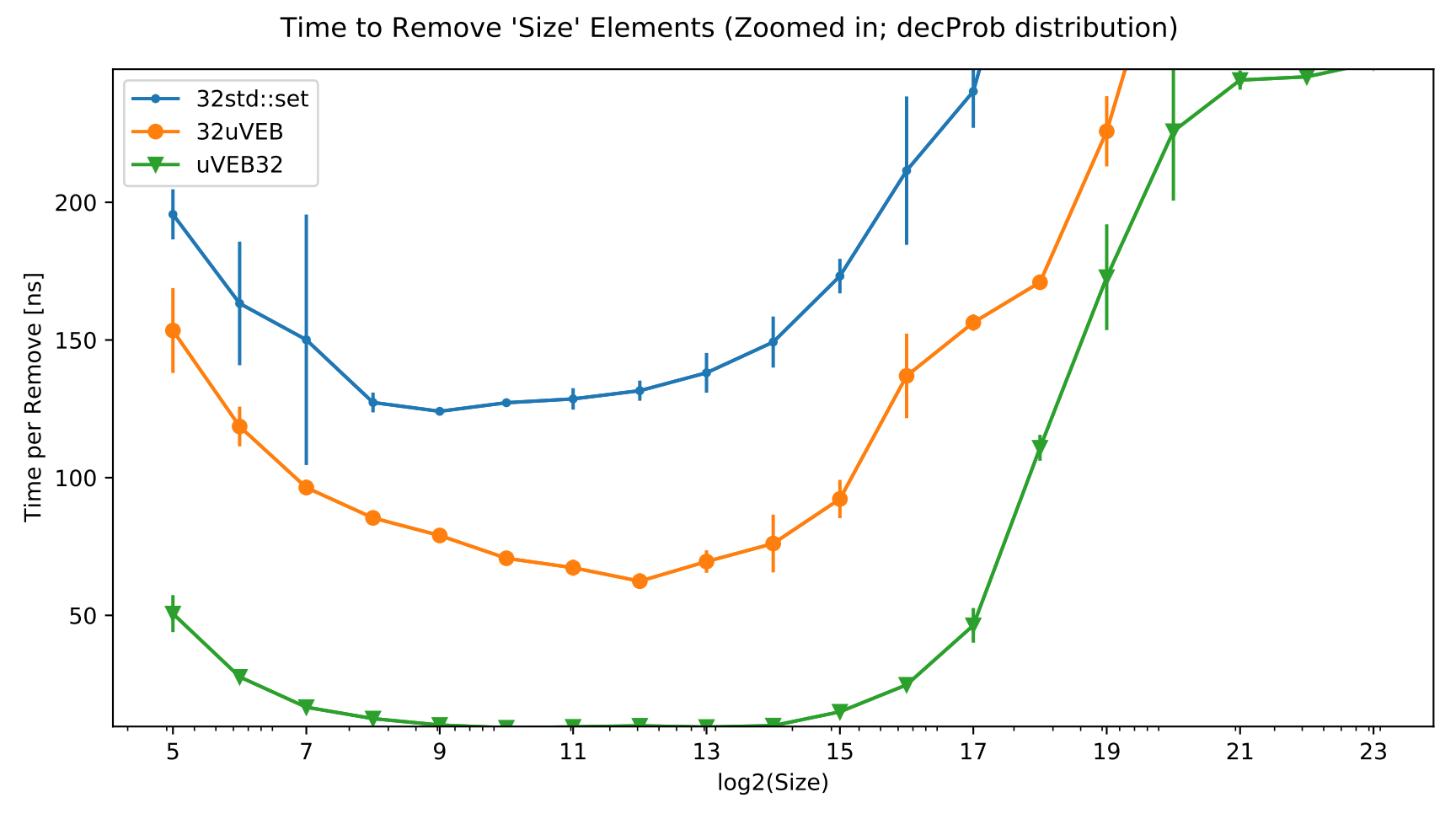

Time to Remove 'Size' Elements (incProb distribution)
32std::set
32uVEB
uVEB32
Time per Remove [ns]
0
200
400
600
800
1000
5
7
9
11
13
15
17
19
21
23
log2(Size)

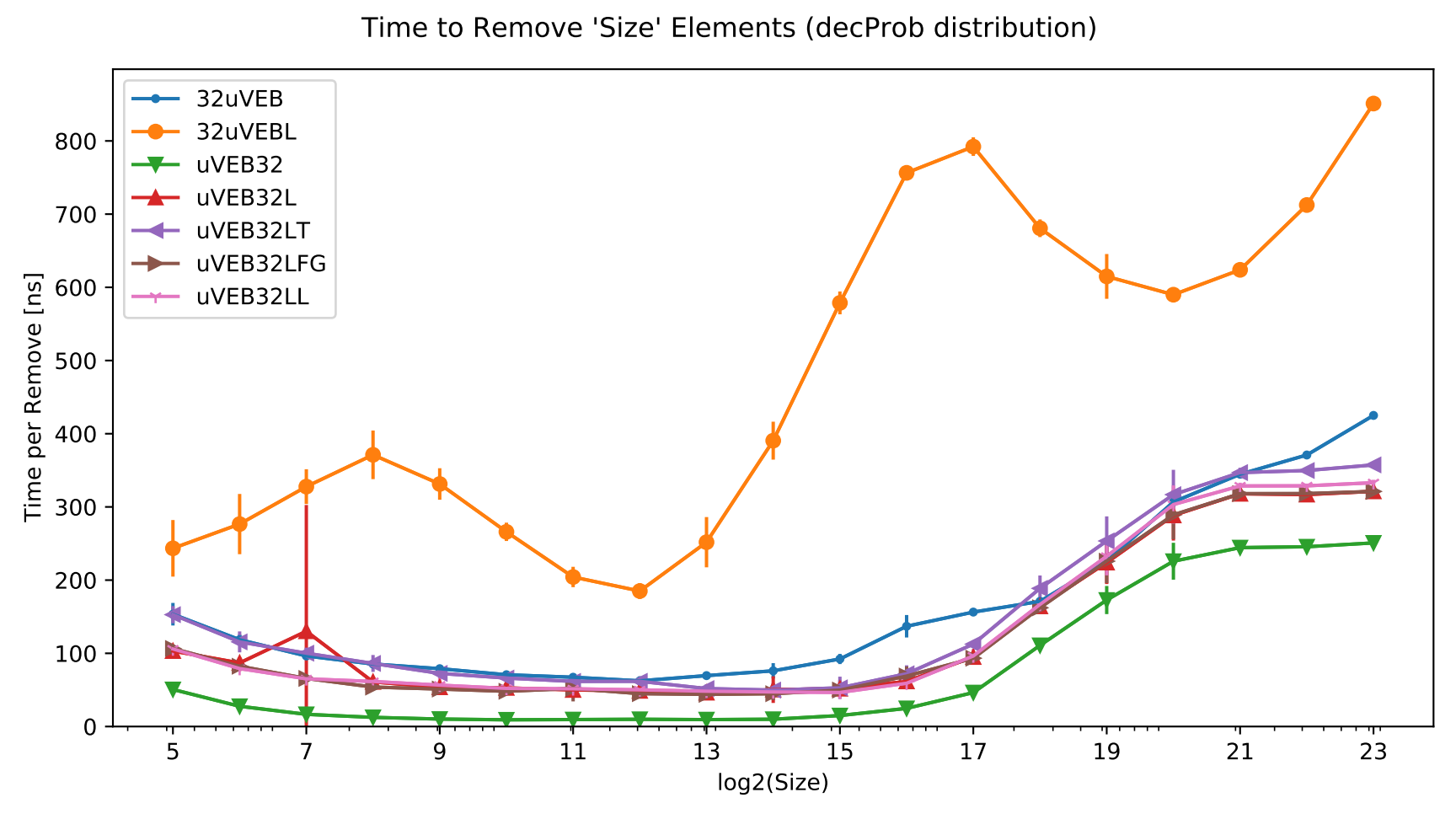

Time to Remove 'Size' Elements (Zoomed in; incProb distribution)
Time per Remove [ns]
200
150
100
50
5
7
9
11
13
15
17
19
21
23
log2(Size)
32std::set
32uVEB
uVEB32

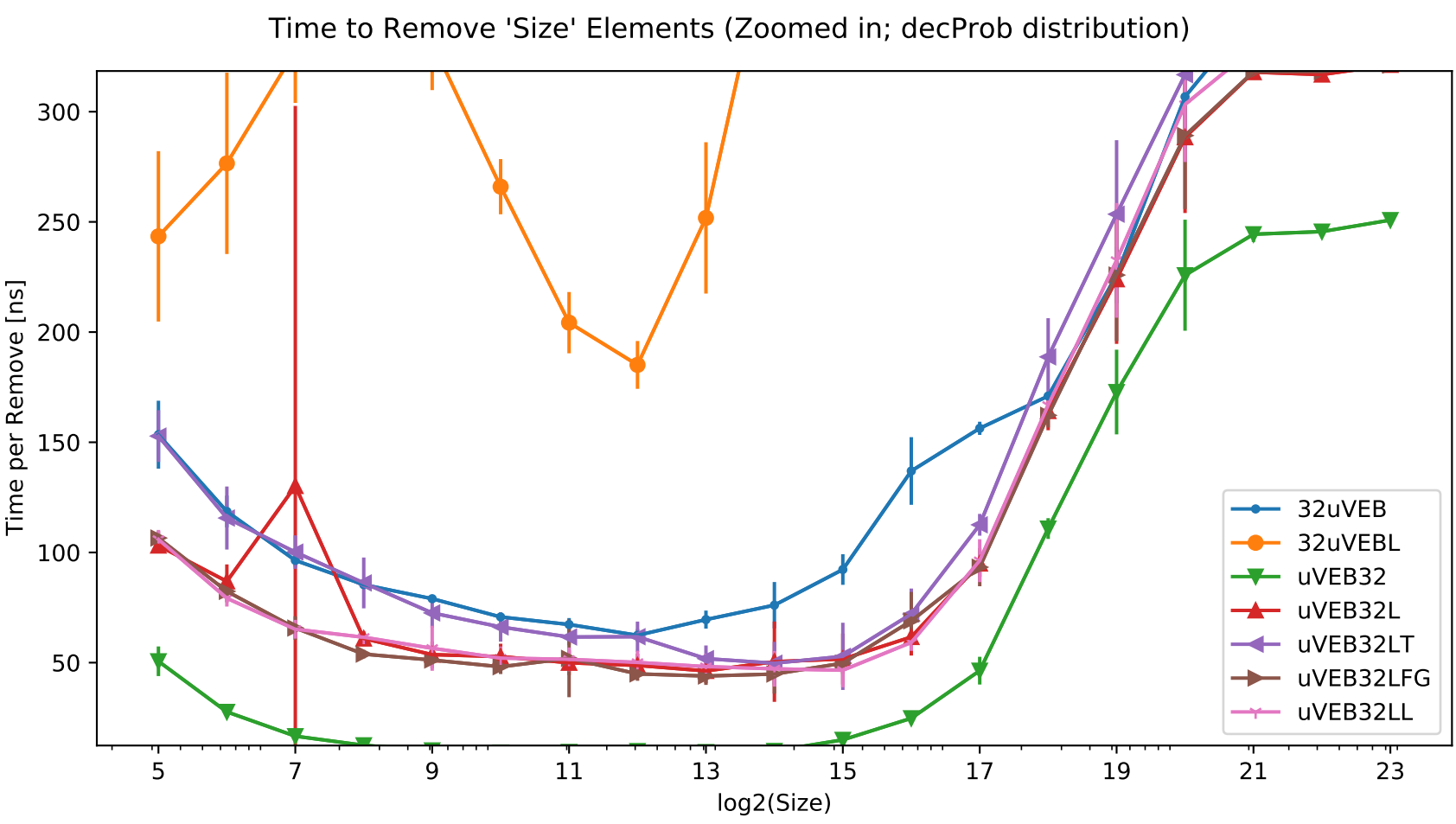

Time to Remove 'Size' Elements (incProb distribution)
32uVEB
32uVEBL
uVEB32
uVEB32L
uVEB32LT
uVEB32LFG
uVEB32LL
Time per Remove [ns]
0
100
200
300
400
500
600
700
800
5
7
9
11
13
15
17
19
21
23
log2(Size)


Time to Remove 'Size' Elements (Zoomed in; incProb distribution)
Time per Remove [ns]
300
250
200
150
100
50
5
7
9
11
13
15
17
19
21
23
log2(Size)
32uVEB
32uVEBL
uVEB32
uVEB32L
uVEB32LT
uVEB32LFG
uVEB32LL


Time to Remove 'Size' Elements (decProb distribution)
32std::set
32uVEB
uVEB32
Time per Remove [ns]
0
200
400
600
800
1000
5
7
9
11
13
15
17
19
21
23
log2(Size)


Time to Remove 'Size' Elements (Zoomed in; decProb distribution)
32std::set
32uVEB
uVEB32
Time per Remove [ns]
200
150
100
50
5
7
9
11
13
15
17
19
21
23
log2(Size)


Time to Remove 'Size' Elements (decProb distribution)
32uVEB
32uVEBL
uVEB32
uVEB32L
uVEB32LT
uVEB32LFG
uVEB32LL
Time per Remove [ns]
0
100
200
300
400
500
600
700
800
5
7
9
11
13
15
17
19
21
23
log2(Size)


Time to Remove 'Size' Elements (Zoomed in; decProb distribution)
Time per Remove [ns]
300
250
200
150
100
50
5
7
9
11
13
15
17
19
21
23
log2(Size)
32uVEB
32uVEBL
uVEB32
uVEB32L
uVEB32LT
uVEB32LFG
uVEB32LL