**Distributed Mutual Exclusion using Proposed Boost.AFIO** (asynchronous filesystem and file io)

Niall Douglas

#### **Contents:**

1. Quick overview of proposed Boost.AFIO and its current status: v1 and v2 2. Overview of API design of Abstract Base Class afio::algorithm:: shared fs mutex 3. Recap from CppCon tutorial: The four base techniques of concurrency control on the file system

#### **Contents:**

- 4. High-level overview of our atomic append lock algorithm
- 5. Detail of the atomic append lock algorithm implementation
- 6. Benchmarks comparing our atomic append lock algorithm implementation to lock files and byte range locks

# History and status of proposed Boost.AFIO

# Proposed Boost.AFIO v1 (2012-2015)

#### Proposed Boost.AFIO v1

- Provides a single universal file system programming model across all OSs Fully featured on Windows and Linux 0 • Reduced featured on FreeBSD and OS X • Where a platform is deficient in host OS support, where possible a feature is emulated, even if quite inefficiently
  - Raw performance is secondary to correctness and cross-platform consistency of behaviours

#### Proposed Boost.AFIO - current status

- Entered Boost peer review queue in October 2013
- Was peer reviewed by Boost community August 2015
   Oniversal rejection by all reviewers bar one
- Biggest problem areas noted by peer reviewers were:
  - Too heavyweight e.g. mandatory use of reference counting for lifetime management, use of exceptions for error transport, mandatory use of thread pool
  - Lack of breakout of internal routines into a public API people can mash up on their own
  - Didn't solve any problem people think they have/Documentation was confusing
  - Performance was lower than using the host OS APIs directly

# Proposed Boost.AFIO v2 (2015-)

#### Proposed Boost.AFIO v2

#### • "Bare metal" design

- Exposes all the quirks of the host OS to user unfiltered
- No threads, no resource nor memory management, no exceptions (we return lightweight monadic *Outcomes* instead)
- Performance never measurably worse than using host OS APIs directly - overhead often just *hundreds* of assembler opcodes
- Tight mapping between C++ type system and filing system object primitives
  - Made possible by dropping WinXP support
- Publicly exposes core file system algorithms library into afio::algorithm::\*

#### Proposed Boost.AFIO v2 - status

- Very early alpha code use v1 for now!
- No test suite yet at all!
- Currently only works on Microsoft Windows

   Getting POSIX to do reliable delete-on-last-close semantics was much harder than expected (sorry!)
- v2 dependencies are >= VS2015 C++ 14, Core C++ GSL (Martin's gsl-lite), Filesystem TS
  - Designed around coming C++ 1z features (borrowing spans, auto free functions, contiguity guarantees, custom attributes, STL v2)

Top level AFIO v2 shared\_fs\_mutex API overview

#### afio::algorithm::shared\_fs\_mutex

There are these implementations of shared\_fs\_mutex in AFIO v2:

- 1. shared\_fs\_mutex::lock\_files
- 2. shared\_fs\_mutex::byte\_ranges

3. shared\_fs\_mutex::atomic\_append

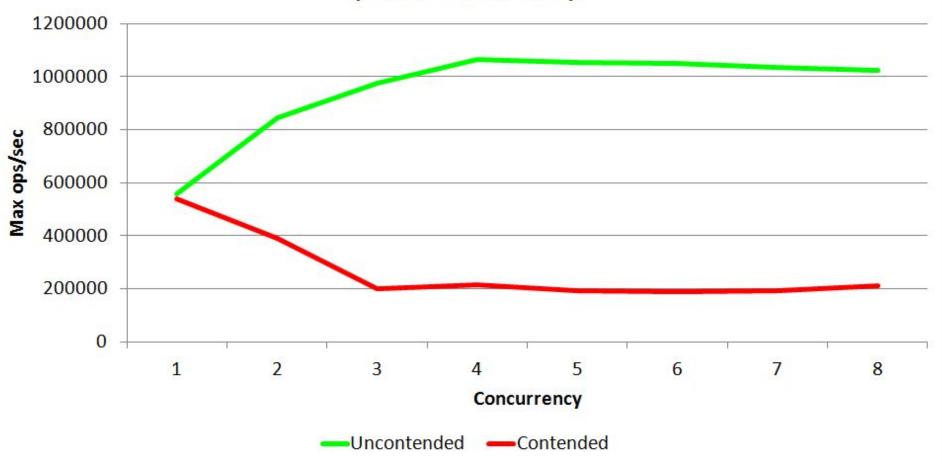
(the one we are about to workshop now)

All implement the abstract base class shared\_fs\_mutex::shared\_fs\_mutex

## shared\_fs\_mutex abstract base class

- Its API design is due to:
- Modern filing systems tend to parallelise quite well
  - For uncontended locks on the same object, typically aggregate performance improves up to CPU count, after which plateaus before beginning a linear slow decline
  - For contended locks, constant time on the OS process context switch time

#### Scaling of byte range locks to concurrency on NTFS (2 core 4 thread CPU)

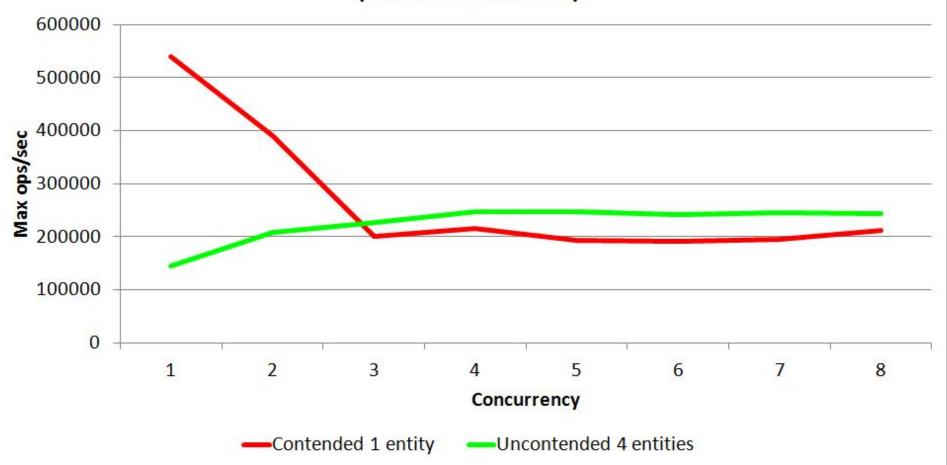


#### shared\_fs\_mutex abstract base class

 It therefore usually improves overall performance to push granularity of locking onto the file system

 So, instead of giant single locks which contend more frequently, use many fine grained locks which contend <u>rarely</u>

#### Scaling of byte range locks to concurrency on NTFS (2 core 4 thread CPU)



# shared\_fs\_mutex abstract base class

- virtual shared\_fs\_mutex::lock() therefore takes a span<> of multiple entities to lock
  - An entity is simply a 63 bit number
  - Top bit set means <u>exclusive</u>, unset means <u>shared</u>
     (note top bit is useless for byte range locks on POSIX, and we internally use the top bit on Windows to emulate advisory locks)
- To entity conversion functions are provided:
  - Crypto random, from string, from span<T> etc

#### afio::algorithm::shared\_fs\_mutex

- How entities are mapped onto the file system depends on the implementation, so:
  - shared\_fs\_mutex::lock\_file maps entities into 16 character hexadecimal files opened with O\_EXCL
- shared\_fs\_mutex::byte\_ranges maps entities into single byte offsets into the shared lock file
   Contention is handled by backing off all preceding locks and randomising the list before trying again, starting with the entity which was contended last try

#### So why do we need shared\_fs\_mutex::atomic\_append? A problem with lock files/byte range locks. is the inverse log scaling to entity count It gets much worse with high waiters and high entities on a contended lock • Hyperbolic drop off in performance after a certain

Nyperbolic drop on in performance after a certain system dependent point - a "write hole"
 What we need is an algorithm with an <u>excellent worst case</u>: hello atomic\_append!

#### atomic\_append

 Before we can design a correct atomic append algorithm, we need to understand Concurrency Control primitives on the file system in order to glue together an efficient and correct implementation

(for an expansion to the following theory overview, see CppCon 2015 tutorial "Racing the filesystem" <u>https://www.youtube.com/watch?v=uhRWMGBjlO8</u>) Further reading:

AFIO v2 API reference: https://ned14.github.io/boost.afio

Abstract base class algorithm::shared\_fs\_mutex API reference: https://goo.gl/NG9ttv

# Concurrency control on the file system

A very rapid theory primer

#### File system concurrency control:

- Needed anywhere where more than one process may modify storage [potentially] concurrent to other processes
- POSIX specifies strong read/write reordering visibility guarantees (atomic, acquire/release) but implementations vary <u>extensively</u> in conformance

#### File system concurrency primitives:

There are four types of concurrency control possible on the file system (in order of increasing performance):

- 1. Exclusive lock files (easiest, most portable)
- 2. Byte range locks (easy on Windows and recent Linux, dragons live on non-Linux POSIX, tricky on SMB, NFS)
- Atomic append + extent deallocation (extent based i.e. recent filing systems only)
- 4. POSIX change visibility ordering guarantees (file system geeks only, dragons abound here especially on Windows)



#### 1. Exclusive lock files

## **Exclusive lock files**

#### Pros:

Works as expected between operating systems on the same networked drive

#### Cons:

- Exclusive only i.e. cannot permit multiple readers
- Not sudden power loss friendly
- On POSIX, race free breaking stale lock files from unexpected process exit is a problem
  - Windows has very useful delete-on-last-close facility
- No way of efficiently sleeping until a lock file is freed
  - Expensive on CPU and battery, bad for mobile devices

#### 2. Byte Range Locks

# Byte range locks

#### Pros:

- Allows non-modifying operations to parallelise
- Automatically unlocks on sudden process exit
- No problems with unexpected power off
- Thread can be slept waiting for lock (blocking)

#### Cons:

- Limited viable use cases (inode based!) on POSIX except Linux >= 3.15
  - On POSIX any single close() unlocks all locks for that inode for all fds in the process <sup>©</sup>
- Problematic on shared networked drives
  - Advisory on POSIX, mandatory on Windows, plus on POSIX offset and length is signed unfortunately

(we'll be making use of this for our algorithm)

 On everything including SMB except NFS, writes to append-only files are atomic • i.e. concurrent writes are never interleaved in append offset chosen Extent-based filing systems allow arbitrary deallocation of ranges of a [sparse] file • i.e. they no longer consume physical storage

- Combining these facilities allows safe concurrent file updates through appending whatever the change is and deallocating any obsoleted data
  - File grows "forever" but actually doesn't
  - If deallocation done frequently, kernel page cache will usually skip writing any actual data to disk, so in practice this is a pure memory IPC technique highly dependent on memory bandwidth

Pros:

- Very fast EXCEPT on ZFS
   (I need to submit a bug report actually ...)
- Works without quirks on all configurations except NFS
- Only portable way of achieving <u>late durability</u>
- With a bit of mind warping, technique is surprisingly algorithmically flexible e.g. a distributed mutual exclusion algorithm (Suzuki & Kasami; Maekawa & Ricart; Agrawala)

#### Cons:

- Requires an extents-based filing system (anything created in the past 30 years is usually extents-based) otherwise file grows in physical storage forever
  - One can use segmented files (slow, i/o intensive!) to work around this on old filing systems
- Performs best if appended records are "chunky"
  - Extent granularity is anywhere between 4Kb and 128Kb depending on filing system

# 4. POSIX concurrent change visibility ordering guarantees

(brutally incomplete summary of just enough detail for this workshop)

### Atomicity of writes w.r.t. reads

Empirical test with kernel page cache enabled i.e. O\_DIRECT=off/FILE\_FLAG\_NO\_BUFFERING=off

Microsoft Windows 10	NTFS	1 byte
Linux 4.2.10	ext4	1 byte
FreeBSD 10.2	ZFS	>= 1Mb

#### Atomicity of writes w.r.t. reads

#### Kernel page cache disabled i.e. O\_DIRECT=on/FILE\_FLAG\_NO\_BUFFERING=on

Microsoft Windows 10		>= cache line (64 bytes) <= PCIe burst (4096)
Linux 4.2.10	ext4	>= 1Mb
FreeBSD 10.2	ZFS	>= 1Mb

# The atomic append lock algorithm - Overview

Questions before we begin this section?

Atomic append lock algorithm overview

 To be honest I started with a modified Suzuki-Kasami algorithm • Hence this talk's description during Call for Papers But as I kept optimising the implementation I arrived at something quite different Only last weekend did I Google to see if someone had invented my algorithm already - the answer is "sorta" ...

### Eisenburg & McGuire algorithm

Algorithm from their 1972 paper:

https://en.wikipedia.org/wiki/Eisenberg\_%26\_McGuire\_algorithm

Key characteristics for N processes:

- Array[N] of IDLE, WAITING, ACTIVE states
- On begin to lock:
  - Set my state to WAITING
  - Busy spin from me to the lock holder until all intervening states are IDLE
  - Set my state to ACTIVE
  - First ACTIVE state gets the lock

#### Lamport's Bakery algorithm

Algorithm from his 1974 paper:

https://en.wikipedia.org/wiki/Lamport%27s\_bakery\_algorithm

Key characteristics for N processes:

- Each new entrant receives a unique number from a "Lamport clock"
- We loop scanning the shared list of other waiters until our number is the lowest
- Can be easily made FIFO and therefore bounded wait and starvation free

### Peterson's N-process algorithm

Algorithm from his 1981 paper:

https://en.wikipedia.org/wiki/Peterson%27s\_algorithm

Key characteristics for N processes:

- List of (N-1) "waiting rooms" shared by all users
- Processes advance from Room[0] to Room[N-1], being reduced by one with each advance
- Room[N-1] is the critical section
- Starvation free
- But no bounded waiting!

### The atomic\_append algorithm

#### Ours is a mix of all the above:

- The atomically appended file is the shared FIFO queue of waiters
- The act of atomic append is the "Lamport clock" via an always incrementing file length where lower offsets are relatively closer to gaining the lock
- Therefore there is a total sequentially consistent ordering from the end of the file towards the beginning

### The atomic\_append algorithm

#### To lock:

- 1. Atomic append our lock request for up to M entities
- 2. Scan from our lock request backwards looking for other requests locking same thing as us. If found, spin reading them until they become all bits zero
- 3. When we reach the front of the list, we have the lock! To unlock:
- 1. Fill our lock request with all bits zero

### The atomic\_append algorithm

Characteristics:

- Strict FIFO fairness
- Guaranteed progress
- Ideal execution complexity

I believe this is actually an *ideal* mutual exclusion algorithm!

# The atomic append lock algorithm - Detail

Questions before we begin this section?

```
#pragma pack(1)
     struct alignas(16) header
     {
                                    // Hash of remaining 112 bytes
       uint128 hash;
       uint64 generation;
                                 // Iterated per write
       uint64 time_offset; // time_t in seconds at time of creation. Used to offset us_coun
       uint64 first known good; // offset to first known good lock request
       uint64 first after hole punch; // offset to first byte after last hole punch
       // First 48 bytes are the header, remainder is zeros for future expansion
       uint64 padding[10];
       // Last byte is used to detect first user of the file
     };
     static assert(sizeof(header) == 128, "header structure is not 128 bytes long!");
     struct alignas(16) lock_request
     {
       uint128 hash;
                                                 // Hash of remaining 112 bytes
       uint64 unique id;
                                                  // A unique id identifying this locking instance
                                                 // Microseconds since the lock file created
       uint64 us count : 56;
       uint64 items : 8;
                                                 // The number of entities below which are valid
       shared_fs_mutex::entity_type entities[12]; // Entities to exclusive or share lock
     };
     static_assert(sizeof(lock_request) == 128, "lock_request structure is not 128 bytes long!");
#pragma pack(pop)
```

## Questions?

#### atomic\_append::init()

- 1. Open the shared lock file with read/write access and delete-on-last-close semantics
- 2. Try to lock for exclusive access the final byte in the header
  - a. If successful, truncate file and write new header. Atomic downgrade exclusive lock to shared
  - b. If unsuccessful, lock for shared access the final byte in the header

### atomic\_append::init()

3. Invent a random 64 bit unique id so our lock requests can be disambiguated from other actors locking the same thing • We use the crypto strong randomness source 4. Precache the current header • On filing systems which present torn writes to readers, need to iterate reading header until 128 bit hash matches contents

## Questions?

### atomic\_append::lock()

- 1. Flip the handle to the shared lock file into atomic-append-only mode
- 2. Record the current length of the file
- 3. (If NFS compatibility is needed, byte range lock file from current length to max during append)
- 4. Atomic append our lock\_request
- 5. Flip the handle back to read/write mode
- 6. Read all bytes from previously recorded length of file to end of file in 4Kb chunks

### atomic\_append::lock()

- 7. Find the offset of the lock\_request we previously atomic appended
- Take an exclusive advisory byte range lock on our lock\_request
- Scan backwards from that offset examining each preceding lock\_request until header.
   first\_known\_good reached, reloading header after if we ever contend
   a. (If hash doesn't match contents, reload)

### atomic\_append::lock()

- b. If it is all bits zero (released), skip
- c. If the entities it will lock are none of ours, skip
- d. If the entities it will lock match some of ours but both are for shared access, skip
- e. If the entities it will lock match some of ours but either is for exclusive access, then take a shared byte range lock on this lock\_request
  This blocks until the lock\_request changes
  Loop checking this lock\_request

  10. We have the lock, so return

## Questions?

#### atomic\_append::unlock()

- Write an all bits zero lock\_request to my lock\_request offset
  - (some filing systems eliminate physical storage for contiguous chunks of all bits zero)
- 2. Release the exclusive byte range lock on my lock\_request
- 3. If my offset was on a 4Kb boundary (i.e. every 4096/128 = 32 records) ...

### atomic\_append::unlock()

- 4. Load 6Kb of data from header. first\_known\_good onwards
- 5. Iterate until finding first non-zero record
- 6. If header.first\_known\_good header. first\_after\_hole\_punch >= 1Mb
  o Punch hole in physical storage
- Write new header with updated first\_known\_good etc

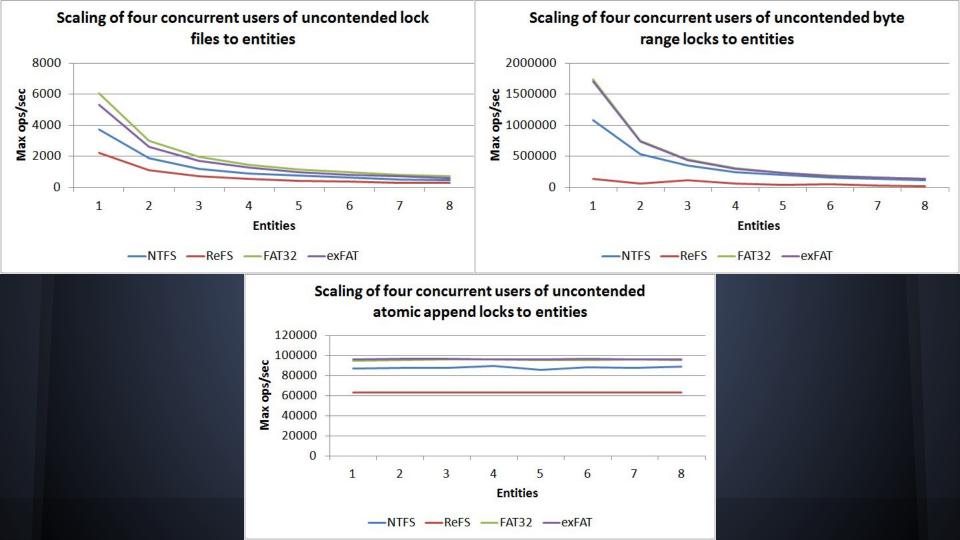
## Questions?

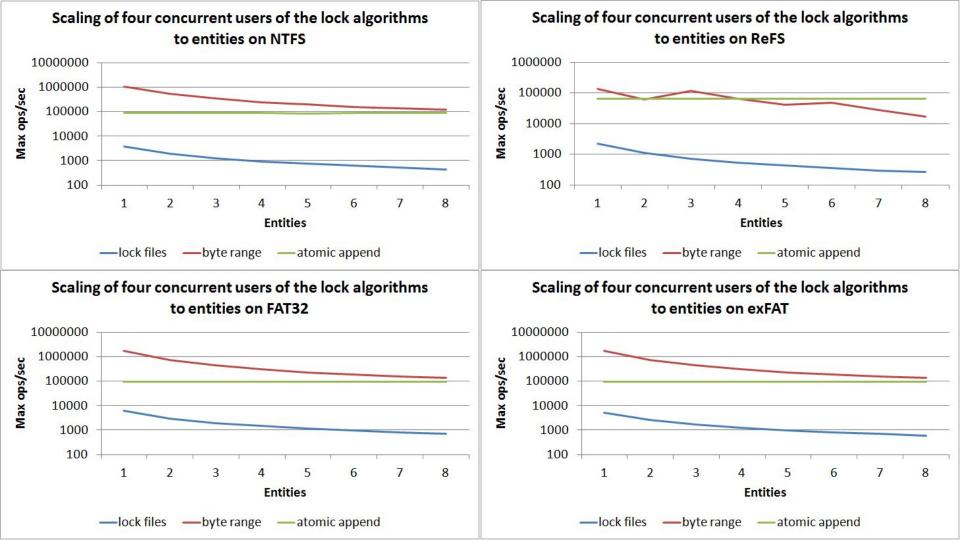
### **Benchmarks!**

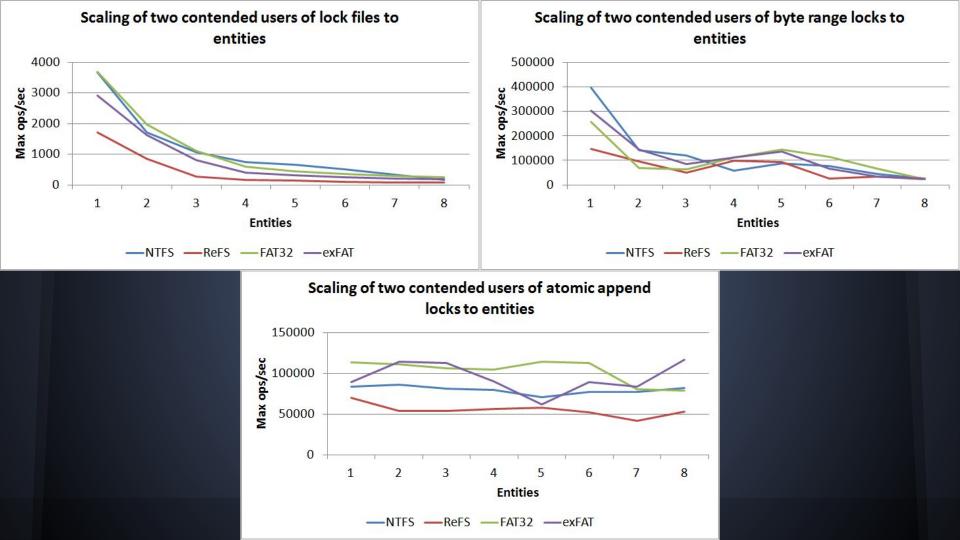
#### The following benchmarks are for:

2 core 4 thread 4.125Gb/sec main memory bandwidth GenuineIntel Intel(R) Core(TM) i5 CPU M 540 @ 2.53 GHz (2008 era laptop) Microsoft Windows 10.0.10240.16683 Known deficiencies in this atomic\_append implementation:

- Unnecessary read() between scan forward and backward for lock\_request
- 2. Hash check failures reload too much data
- 3. If OS has unified page cache and SMB/NFS compatibility not important, using memory maps would be a big gain
  - Fallback to non-mapped i/o if a SMB/NFS user tries to claim lock is straightforward to add







				NTES									BeFS									FAT32									FAT				
lock_files	5			NTES					lock_file:				RefS					lock_files				FAT32					lock_files				exFAT				
in an Chinas		2 entities	3 entities	4 entities	5 entities (	6 entities	7 entities 8	3 entities	i v ingrinit		2 entities	3 entities	4 entities 5	entities 6	6 entities 1	rentities 8	entities		entities	2 entities 3	entities .	4 entities !	5 entities	6 entities 7	entities 8	entities			2 entities	3 entities 4	4 entities	5 entities	6 entities	7 entities	8 entities
1 waiters		1548	979	773	622	522	448	404	1 waiters		885	575	433	337	289	239	193	1 waiters	4126	2050	1337	1007	797	663	566	495	1 waiters	3726	1630	1098	819	651	543	463	410
2 waiters		1717	1058	749	660	499	333	173	2 waiters			274	172	137	96	82	75	2 waiters	3702	1972	1118	590	443	359	296	251	2 waiters	2912	1625	810	397	315	252	213	185
3 waiters 4 waiters	3676 3507	1559 1456	869 468	556 265	233	177	119 83	88	3 waiters 4 waiters		817 746	230 185	128	95	64 53	53 32	39	3 waiters 4 waiters	3258 2967	1559 991	619 390	370 235	256 153	202	168 86	126	3 waiters 4 waiters	2558 2190	1207	367 194	231 142	178 105	136 78	113	98
5 waiters	3170	1298	326	203	115	82	57	43	5 waiters		702	167	77	47	36	25	15	5 waiters	2756	708	255	151	101	66	46	35	5 waiters	1996	551	141	93	59	46	35	32
6 waiters		958	282	161	89	62	45	31	6 waiters			135	66	38	22	15	14	6 waiters	2613	479	208	111	63	41	35	23	6 waiters	1851	452	103	65	39	33	20	16
7 waiters		896	264	123	78	48	31	25	7 waiters			116	56	39	16	19	14	7 waiters	2476	411	150	78	46	34	24	17	7 waiters	16:35	215	81	45	27	19	12	12
8 waiters	2771	524	221	123	62	44	25	13	8 waiters	1077	263	108	54	26	15	15	10	8 waiters	2330	364	124	60	34	25	16	12	8 waiters	1575	327	62	34	17	14	11	5
hubs me			-		_				byte_ran									byte_range		-							byte_rand							_	
byte_rang		2 entities	3 entities	4 entities	5 entities (	6 entities	7 entities 8	8 entities	byte_ran		2 entities	3 entities	4 entities 5	entities 6	6 entities 1	entities 8	entities			2 entities 3	entities	4 entities	5 entities	6 entities 7	entities 8	entities			2 entities	3 entities 4	4 entities	5 entities	6 entities	7 entities	8 entities
1 waiters		296029	197740			100535	85732	75138	1 waiters					199491		131250 1		1 waiters									1 waiters		638981					187836	
2 waiters				58698				25083	2 waiters					94209	25537		22051	2 waiters a			a construction of the second					23677	2 waiters					136074		33090	25279
3 waiters				111594	95092			28078	3 waiters		48373						72383	3 waiters						119058		09026	3 waiters		181299			107825		31487	104735
4 waiters 5 waiters		113706 110786	83977 108678	81919 97624	29144 71422	32086	10601 3508	4480 2844	4 waiters 5 waiters			58536 128873		32224			60953 46703	4 waiters 5 waiters 2		65317		49707			38234	31888	4 waiters 5 waiters		62657 188574				37125	37315	29180 83509
5 waiters 6 waiters			84291	30080	24534	4261	2642	2195	6 waiters				43073			50262	19321	6 waiters a		103261	86641	46551	45428		83868	13660	6 waiters		89597					34573	7475
			100005	68568	12964	3057	2311	2136			161033					22758	4109	7 waiters 2							47306	6149	7 waiters							38449	4589
			58576	23138	4123	2670	2249	2143		84749		55076	39044	79235	40358	5568	1739	8 waiter:	151525	58934	51814	52859	50787	61537	6977	3293	8 waiter:	81512	54944	50445	48631	51229	31016	4036	2663
										201													-				1			( )					
atomic_a	P.P	Q and this	2 antibir	4	E antibia - 4	6 anhibi	7 entities 8	Q	atomic_a	P.P	2 entities	2 antibir	d antibia F	antibian 4				atomic_ap		2 entities 3		A ambibic - I	C antibia - 1	6	antibian 9		atomic_ap		9	2 antibia -	4 antibir -	E antibi -	6 entities	7 anhibir -	Q and it's a
1 waiters			61542				62603	62119	1 waiters	and second provide	2 entities -	73507	the second s	73902	73950	74353	73480	1 waiters		87324			87932			entities 87693	1 waiters				86634	86151		86466	87020
2 waiters		85748	81203	79872		76958	77422	81651	2 waiters		53963	53596	55971	57507	52513	41748	52999	2 waiters				104316	114361		80450	78941	2 waiters	89396	114035		89724	61888	89214	83526	116452
3 waiters	74157	74859	74343	74380	74604	75360	74574	75318	3 waiters	55658	52130	55622	52074	54549	55827	52924	56233	3 waiters	79563	79156	79160	78737	79699	79638	79329	79760	3 waiters	79858	80587	80396	80665	80088	80326	79865	79538
4 waiters		59977				58904	60003	59328	4 waiters					40163	41035		41052		64640	64628		64893	65592			64766	4 waiters	65129	64532	60795	63315		64594	64710	65255
5 waiters 6 waiters	57662 56053	57868 55935	58221 56111	58120 55512	57901 55806	57932 55998		57948 56229	5 waiters 6 waiters					37250 36148	37177 36657	~.~	37435		63913 61629	63808 61672		63654	63184 61484	63520 61505	00046	63646 61493	5 waiters 6 waiters	63975	61311		63464 61226		63731 61838	62666	63681 61717
6 waiters 7 waiters		55422		55385	55472	55213		55325	7 waiters								36351							60646		61030	7 waiters	60873	60813	a second				60754	60112
8 waiters		55129				55720	55477	55741	8 waiters			35440					35755			60196					1000	59380	8 waiters			60264				60156	59861
1										-								1 A A																	
!lock_file:						-			!lock_file									!lock_files									!lock_files					_		-	-
1 waiters		2 entities 1438	3 entities 367	4 entities : 745	5 entities ( 585	6 entities 1 455	7 entities 8 407	3 entities	1 waiters		2 entities	3 entities 4 592	4 entities 5 418	entities t 34.9	5 entities 1 282	entities 8 247	entities	1 waiters	entities 3845	2 entities 3 1982	entities + 1294	4 entities ! 972	5 entities   774	6 entities 7 641	entities 8 550	entities	1 waiters	1 entities 3254	2 entities 1624	3 entities 4 1065	4 entities 802	5 entities 643	6 entities 534	7 entities 458	8 entities 399
2 waiters		1701	1202	872	705	588	475	430	2 waiters		1003	707	514	419	336	297	258	2 waiters	5219	2563	1693	1262	998	834	713	621	2 waiters	4510	2152	1446	1073	855	710	606	528
3 waiters		1804	1206	910	705	589	528	441	3 waiters		1103	632	534	424	338	293	265	3 waiters	5826	2865	1880	1393	1114	928	794	672	3 waiters	5007	2404	1592	1178		788	655	569
4 waiters		1884	1204	906	746	608	510	440	4 waiters		1112	698	523	430	357	290	266	4 waiters	6044	2978	1963	1456	1166	962	815	713	4 waiters	5299	2595	1688	1258	988	817	696	602
5 waiters		1901	1267	941	753	631	539	466	5 waiters	2220	1119	735	523	435	341	305	267							992	840	735	5 waiters		2678	1773	1314	1037	847 870	716 731	623
6 waiters 7 waiters		1958 2029	1373 1357	972 1017	777	631												5 waiters	6298	3075	2027	1503	1191					5536							632
8 waiters		2023			040		545	495	6 waiters	2353	1078	736	531	439	360	302	271	6 waiters	6373	3141	2066	1526	1213	999	861	740	6 waiters	5741	2749	1816	1342				
			1402	1020	813 777	640 677	545 549 543	495 470 517	6 waiters 7 waiters 8 waiters	2353 2372	1078 1068															740 747 746					1342 1358 1385		885	744	
!byte_ran			1402			640	543	470	7 waiters	2353 2372	1078 1068	736 748	531 541	439 444	360 358	302 310	271 275	6 waiters 7 waiters	6373 6467	3141 3151	2066 2085	1526 1553	1213 1232	999 1025	861 864	747	6 waiters 7 waiters	5741 5832	2749 2786	1816 1792	1358	1076	885	744	641
				1020	777	640 677	543 543	470 517	7 waiters	2353 2372 2348	1078 1068 1128	736 748 754	531 541 560	439 444 421	360 358 370	302 310 314	271 275 259	6 waiters 7 waiters 8 waiters !byte_rang	6373 6467 6432	3141 3151 3187	2066 2085 2105	1526 1553 1561	1213 1232 1240	999 1025 1018	861 864 862	747 746	6 waiters 7 waiters 8 waiters !byte_ran	5741 5832 5863 ges	2743 2786 2843	1816 1792 1872	1358 1385	1076 1085	885 882	744 741	641 643
1999 - C	1 entities		3 entities	1020 4 entities	777 5 entities (	640 677 6 entities i	543 543 7 entities 8	470 517	7 waiters 8 waiters !byte_rar	2353 2372 2348 iges 1 entities	1078 1068 1128 2 entities	736 748 754 3 entities 4	531 541 560 4 entities 5	439 444 421 entities 6	360 358 370 6 entities 1	302 310 314 7 entities 8	271 275 259 entities	6 waiters 7 waiters 8 waiters !byte_rang 1	6373 6467 6432 es entities	3141 3151 3187 2 entities 3	2066 2085 2105	1526 1553 1561 4 entities !	1213 1232 1240 5 entities (	999 1025 1018 6 entities 7	861 864 862 I entities 8	747 746	6 waiters 7 waiters 8 waiters !byte_ran	5741 5832 5869 ges 1 entities	2743 2786 2843 2 entities	1816 1792 1872 3 entities 4	1358 1385 4 entities	1076 1085 5 entities	885 882 6 entities	744 741	641 643
1 waiters 2 waiters	1 entities 591620	297724	3 entities 201182	1020 4 entities 151854	777 5 entities ( 105881	640 677 6 entities 1 101030	543 543 7 entities 8 84476	470 517 8 entities 76541	7 waiters 8 waiters !byte_rar 1 waiters	2353 2372 2348 Iges 1 entities 1E+06	1078 1068 1128 2 entities 520411	736 748 754 3 entities 4 355979 3	531 541 560 4 entitie: 5 266540	439 444 421 entities 6 211000	360 358 370 6 entities 1 148776	302 310 314 7 entities 8 151066	271 275 253 entities 131804	6 waiters 7 waiters 8 waiters !byte_rang 1 waiters	6373 6467 6432 es entities 1E+06	3141 3151 3187 2 entities 3 651134	2066 2085 2105 entities 445110	1526 1553 1561 4 entities ! 335650	1213 1232 1240 5 entities 235706	999 1025 1018 6 entities 7 221729	861 864 862 entities 8 190568	747 746 entities 141714	6 waiters 7 waiters 8 waiters Ibyte_ran 1 waiters	5741 5832 5869 ges 1 entities 1E+06	2743 2786 2843 2 entities 656683	1816 1792 1872 3 entities 437435	1358 1385 4 entities 323985	1076 1085 5 entities 251656	885 882 6 entities <sup>-</sup> 199019	744 741 7 entities 167644	641 643 8 entities 163807
1 waiters 2 waiters 3 waiters	1 entities 591620 873678	297724 443791	3 entities 201182	1020 4 entities 151854 213171	777 5 entities ( 105881 163548	640 677 6 entities 1 101030 138431	543 543 7 entities 8 84476 120790	470 517	7 waiters 8 waiters !byte_rar	2353 2372 2348 ges 1 entities 1E+06 1E+06	1078 1068 1128 2 entities 520411 528860	736 748 754 3 entities 4 355979 3 135038	531 541 560 4 entitie: 5 266540	439 444 421 entities 6 211000 235155	360 358 370 6 entities 1 148776 154452	302 310 314 7 entities 8 151066 1 90226	271 275 259 entities	6 waiters 7 waiters 8 waiters 1 byte_rang 1 waiters 2 waiters	6373 6467 6432 es entities	3141 3151 3187 2 entities 3 651134 792593 5	2066 2085 2105 3 entities 445110 506283	1526 1553 1561 4 entities 335650 370064	1213 1232 1240 5 entities 235706 284546	999 1025 1018 6 entities 7 221729	861 864 862 (entities 8 190568 159069	747 746	6 waiters 7 waiters 8 waiters !byte_ran	5741 5832 5869 ges 1 entities 1E+06 2E+06	2743 2786 2843 2 entities 656683 780903	1816 1792 1872 3 entities 4	1358 1385 4 entities 323985 362693	1076 1085 5 entities 251656 287461	885 882 6 entities 193013 214017	744 741	641 643 8 entities 163807 155709
2 waiters	1 entities 591620 873678 1E+06	297724 443791 493416	3 entities 201182 287517	1020 4 entities 151854 213171 227890	777 5 entities ( 105881 163548 183447	640 677 6 entities 1 101030 138431 151368	543 543 7 entities 8 84476 120790	470 517 8 entities 76541 105803	7 waiters 8 waiters !byte_ran 1 waiters 2 waiters	2353 2372 2348 I entities 1E+06 1E+06 194610	1078 1068 1128 2 entities 520411 528860	736 748 754 3 entities 4 355979 3 135038 35954	531 541 560 4 entitie: 5 266540 145839 38425	439 444 421 entities 6 211000 235155 25111	360 358 370 6 entities 1 148776 154452 50603	302 310 314 (entities 8 151066 1 90226	271 275 253 entities 131804 35331	6 waiters 7 waiters 8 waiters 1 1 waiters 2 waiters 3 waiters	6373 6467 6432 es entities 1E+06 2E+06	3141 3151 3187 2 entities 3 651134	2066 2085 2105 3 entities 445110 506289 485385	1526 1553 1561 4 entities 335650 370064 338797	1213 1232 1240 5 entities 235706 284546 276625	999 1025 1018 6 entities 7 221729 225984 221715	861 864 862 (entities 8 190568 159069 182034	747 746 entities 141714 153741	6 waiters 7 waiters 8 waiters !byte_ran 1 waiters 2 waiters	5741 5832 5869 ges 1 entities 1E+06 2E+06	2743 2786 2843 2 entities 656683 780303 795368	1816 1732 1872 3 entities 4 437435 486963	1358 1385 4 entities 323985 362693 356799	1076 1085 5 entities 251656 287461 256000	885 882 6 entities 199019 214017 216859	744 741 7 entities 167644 198650 185515	641 643 8 entities 163807 155709
2 waiters 3 waiters 4 waiters 5 waiters	1 entities 591620 873678 1E+06 1E+06 1E+06	297724 443791 493416 535494 528127	3 entities 201182 287517 316390 348619 341497	1020 4 entities 151854 213171 227830 245531 250788	777 5 entities ( 105881 163548 183447 197498 192878	640 677 6 entities 1 101030 138431 151368 155370 158116	543 543 7 entities 8 84476 120730 129916 138553 137599	470 517 8 entities 76541 105803 114330 118115 115318	7 waiters 8 waiters 1 byte_ran 2 waiters 3 waiters 4 waiters 5 waiters	2353 2372 2348 1 entities 1E+06 1E+06 194610 132911 350358	1078 1068 1128 2 entities 520411 528860 77004 61955 197264	736 748 754 3 entities 4 355979 135038 35954 119189 92625	531 541 560 4 entitie: 5 266540 145839 38425 64402 95750	439 444 421 entities 6 211000 235155 25111 40300 66667	360 358 370 6 entities 1 148776 154452 50603 47368 38116	302 310 314 7 entities 8 151066 1 30226 43203 27307 43134	271 275 259 131804 35991 15568 16595 36594	6 waiters 7 waiters 8 waiters 11 waiters 2 waiters 3 waiters 4 waiters 5 waiters	6373 6467 6432 es entities 1E+06 2E+06 2E+06 2E+06 2E+06	3141 3151 3187 2 entities 3 651134 792593 5 807595 748291 699749	2066 2085 2105 445110 506289 485385 445838 426576	1526 1553 1561 4 entities 335650 370064 338797 306652 297692	1213 1232 1240 5 entities 235706 284546 276625 230967 228880	999 1025 1018 6 entities 7 221729 225984 221715 189784 179782	861 864 862 190568 159069 182034 157505 153433	747 746 141714 153741 58496 36059 35206	6 waiters 7 waiters 8 waiters 1 byte_ran 1 waiters 2 waiters 3 waiters 4 waiters 5 waiters	5741 5832 5863 1 entities 1E+06 2E+06 2E+06 2E+06 2E+06 2E+06	2749 2786 2849 2 entities 656689 780909 795368 740913 701754	1816 1792 1872 3 entities 437435 486963 495761 441650 425566	1358 1385 4 entities 323985 362693 356799 299441 288508	1076 1085 251656 287461 256000 229149 213805	885 882 6 entities 199019 214017 216859 182145 179101	744 741 7 entities 167644 198650 185515 153369 154379	641 643 8 entities 163807 155709 160322 134874 131910
2 waiters 3 waiters 4 waiters 5 waiters 6 waiters	1 entities 591620 873678 1E+06 1E+06 1E+06 1E+06	297724 443791 493416 535494 528127 504259	3 entities 201182 287517 316390 348619 341497 337299	1020 4 entities 151854 213171 227830 245531 250788 250581	777 5 entities ( 105881 163548 183447 197498 192878 191613	640 677 6 entities 1 101030 138431 151368 155370 158116 160244	543 543 7 entities 8 84476 120730 129316 138553 137539 130326	470 517 8 entities 76541 105803 114330 118115 118115 118340	7 waiters 8 waiters 1 byte_ran 2 waiters 3 waiters 4 waiters 5 waiters 6 waiters	2353 2372 2348 1 entities 1E+06 1E+06 194610 132911 350358 332401	1078 1068 1128 2 entities 520411 528860 77004 61955 197264 195857	736 748 754 3 entities 4 355979 135038 35954 119189 92625 87038	531 541 560 4 entitie: 5 266540 145839 38425 64402 95750 64157	439 444 421 entities 6 211000 235155 25111 40900 66667 54242	360 358 370 6 entitie: 1 148776 154452 50603 47368 38116 58424	302 310 314 7 entities 8 151066 1 30226 43209 27307 43134 38474	271 275 259 131804 35991 15568 16595 36594 37733	6 waiters 7 waiters 8 waiters 1 1 1 waiters 2 waiters 3 waiters 4 waiters 5 waiters 6 waiters	6373 6467 6432 entities 1E+06 2E+06 2E+06 2E+06 2E+06 2E+06 2E+06	3141 3151 3187 2 entities 3 651134 792593 5 807595 748291 699749 690379	2066 2085 2105 445110 506283 445385 445838 426576 414241	1526 1553 1561 4 entities 335650 370064 338797 306652 297692 291863	1213 1232 1240 5 entities 235706 284546 276625 230367 228880 215476	999 1025 1018 6 entities 7 221729 225984 221715 189784 179782 178984	861 864 862 190568 159069 182034 157505 153433 153737	747 746 141714 153741 55436 36053 35206 131952	6 waiters 7 waiters 8 waiters 1byte_rand 1 waiters 2 waiters 3 waiters 4 waiters 5 waiters 6 waiters	5741 5832 5869 ges 1 entities 1E+06 2E+06 2E+06 2E+06 2E+06 2E+06	2749 2786 2849 2 entities 656689 780909 795368 740913 701754 691817	1816 1792 1872 3 entities 437435 486963 495761 441650 425566 417782	1358 1385 4 entities 323985 362693 356799 299441 288508 288313	1076 1085 251656 287461 256000 229149 213805 222022	885 882 6 entities 199019 214017 216859 182145 179101 176361	744 741 7 entities 167644 198650 185515 153369 154379 150580	641 643 8 entities 163807 155709 160322 134874 131910 132539
2 waiters 3 waiters 4 waiters 5 waiters 6 waiters 7 waiters	1 entities 591620 873678 1E+06 1E+06 1E+06 1E+06 1E+06	297724 443791 493416 535494 528127 504259 508833	3 entities 201182 287517 316390 348619 341497 337299 336061	1020 4 entities 151854 213171 227890 245531 250788 250581 246945	777 5 entities ( 105881 169548 183447 197498 192878 191613 186329	640 677 6 entities 1 101030 138431 151368 155370 158116 150244 157043	543 543 7 entities 8 84476 120790 129916 138553 137599 130926 136279	470 517 8 entities 76541 105803 114330 118115 115318	7 waiters 8 waiters 1 byte_ran 2 waiters 3 waiters 4 waiters 5 waiters 6 waiters 7 waiters	2353 2372 2348 1 entities 1E+06 194610 132911 350358 332401 333198	1078 1068 1128 2 entitics 520411 528860 77004 61955 197264 195857 200036	736 748 754 3 entities 4 355979 3 135038 35954 119189 92625 87038 129953	531 541 560 4 entitie: 5 266540 145839 38425 64402 95750 64157 95895	439 444 421 211000 235155 25111 40300 66667 54242 58470	360 358 370 5 entities 1 148776 154452 50603 47368 38116 58424 48473	302 310 314 (entities 8 151066 43203 27307 43134 38474 51701	271 275 259 131804 35991 15568 16595 36594	6 waiters 7 waiters 8 waiters 1 1 waiters 2 waiters 3 waiters 4 waiters 5 waiters 6 waiters 7 waiters	6373 6467 6432 es entities 2E+06 2E+06 2E+06 2E+06 2E+06 2E+06 2E+06	3141 3151 3187 2 entities 3 651134 792593 5 807593 639749 639749 639749 63979 675096	2066 2085 2105 3 entities 445110 506283 4455385 445838 426576 414241 414863	1526 1553 1561 4 entities 335650 370064 338797 306652 297692 291869 290919	1213 1232 1240 5 entities 235706 284546 276625 230367 228880 215476 223037	999 1025 1018 6 entitie: 7 221729 225984 221715 189784 179782 178984 177217	861 864 862 190568 159063 182034 157505 153433 153737 151001	747 746 141714 153741 58496 36059 35206	6 waiters 7 waiters 8 waiters 1 byte_rand 1 waiters 2 waiters 3 waiters 4 waiters 5 waiters 6 waiters 7 waiters	5741 5832 5863 1 entities 12+06 22+06 22+06 22+06 22+06 22+06 22+06	2749 2786 2849 2 entities 656689 780909 795368 740913 701754 691817 665967	1816 1732 1872 3 entities 4 437435 43563 435761 441650 425566 417782 407830	1358 1385 4 entities 323985 362693 356799 299441 288508 288313 287003	1076 1085 251656 287461 256000 229149 213805 222022 212915	885 882 6 entities 199019 214017 216859 182145 179101 176361 175691	744 741 7 entities 167644 198650 185515 153369 154379 150580 151625	641 643 163807 155709 160322 134874 131910 132539 129728
2 waiters 3 waiters 4 waiters 5 waiters 6 waiters	1 entities 591620 873678 1E+06 1E+06 1E+06 1E+06 1E+06	297724 443791 493416 535494 528127 504259 508833	3 entities 201182 287517 316390 348619 341497 337299	1020 4 entities 151854 213171 227890 245531 250788 250581 246945	777 5 entities ( 105881 169548 183447 197498 192878 191613 186329	640 677 6 entities 1 101030 138431 151368 155370 158116 150244 157043	543 543 7 entities 8 84476 120790 129916 138553 137599 130926 136279	470 517 8 entities 76541 105803 114330 118115 118115 118340	7 waiters 8 waiters 1 byte_ran 2 waiters 3 waiters 4 waiters 5 waiters 6 waiters 7 waiters	2353 2372 2348 1 entities 1E+06 194610 132911 350358 332401 333198	1078 1068 1128 2 entities 520411 528860 77004 61955 197264 195857	736 748 754 3 entities 4 355979 3 135038 35954 119189 92625 87038 129953	531 541 560 4 entitie: 5 266540 145839 38425 64402 95750 64157 95895	439 444 421 211000 235155 25111 40300 66667 54242 58470	360 358 370 6 entitie: 1 148776 154452 50603 47368 38116 58424	302 310 314 7 entities 8 151066 1 30226 43209 27307 43134 38474	271 275 259 131804 35991 15568 16595 36594 37733	6 waiters 7 waiters 8 waiters 1 1 1 waiters 2 waiters 3 waiters 4 waiters 5 waiters 6 waiters	6373 6467 6432 es entities 2E+06 2E+06 2E+06 2E+06 2E+06 2E+06 2E+06	3141 3151 3187 2 entities 3 651134 792593 5 807595 748291 699749 690379	2066 2085 2105 3 entities 445110 506283 4455385 445838 426576 414241 414863	1526 1553 1561 4 entities 335650 370064 338797 306652 297692 291869 290919	1213 1232 1240 5 entities 235706 284546 276625 230367 228880 215476 223037	999 1025 1018 6 entitie: 7 221729 225984 221715 189784 179782 178984 177217	861 864 862 190568 159069 182034 157505 153433 153737	747 746 141714 153741 55436 36053 35206 131952	6 waiters 7 waiters 8 waiters 1 byte_rand 1 waiters 2 waiters 3 waiters 4 waiters 5 waiters 6 waiters 7 waiters	5741 5832 5863 1 entities 12+06 22+06 22+06 22+06 22+06 22+06 22+06	2749 2786 2849 2 entities 656689 780909 795368 740913 701754 691817 665967	1816 1792 1872 3 entities 437435 486963 495761 441650 425566 417782	1358 1385 4 entities 323985 362693 356799 299441 288508 288313 287003	1076 1085 251656 287461 256000 229149 213805 222022 212915	885 882 6 entities 199019 214017 216859 182145 179101 176361 175691	744 741 7 entities 167644 198650 185515 153369 154379 150580 151625	641 643 8 entities 163807 155709 160322 134874 131910 132539
2 waiters 3 waiters 4 waiters 5 waiters 6 waiters 7 waiters	1 entities 591620 873678 1E+06 1E+06 1E+06 1E+06 1E+06 1E+06	297724 443791 493416 535494 528127 504259 508833	3 entities 201182 287517 316390 348619 341497 337299 336061	1020 4 entities 151854 213171 227890 245531 250788 250581 246945	777 5 entities ( 105881 169548 183447 197498 192878 191613 186329	640 677 6 entities 1 101030 138431 151368 155370 158116 150244 157043	543 543 7 entities 8 84476 120790 129916 138553 137599 130926 136279	470 517 8 entities 76541 105803 114330 118115 118115 118340	7 waiters 8 waiters 1 byte_ran 2 waiters 3 waiters 4 waiters 5 waiters 6 waiters 7 waiters	2353 2372 2348 1 entities 1E+06 1E+06 154610 132311 350358 332401 333186 233186	1078 1068 1128 2 entitics 520411 528860 77004 61955 197264 195857 200036	736 748 754 3 entities 4 355979 3 135038 35954 119189 92625 87038 129953	531 541 560 4 entitie: 5 266540 145839 38425 64402 95750 64157 95895	439 444 421 211000 235155 25111 40300 66667 54242 58470	360 358 370 5 entities 1 148776 154452 50603 47368 38116 58424 48473	302 310 314 r entities 8 151066 43203 27307 43134 38474 51701	271 275 259 131804 35991 15568 16595 36594 37733	6 waiters 7 waiters 8 waiters 1 1 waiters 2 waiters 3 waiters 4 waiters 5 waiters 6 waiters 7 waiters	6373 6467 6432 entities 1E+06 2E+06 2E+06 2E+06 2E+06 2E+06 2E+06 2E+06	3141 3151 3187 2 entities 3 651134 792593 5 807593 639749 639749 639749 63979 675096	2066 2085 2105 3 entities 445110 506283 4455385 445838 426576 414241 414863	1526 1553 1561 4 entities 335650 370064 338797 306652 297692 291869 290919	1213 1232 1240 5 entities 235706 284546 276625 230367 228880 215476 223037	999 1025 1018 6 entitie: 7 221729 225984 221715 189784 179782 178984 177217	861 864 862 190568 159063 182034 157505 153433 153737 151001	747 746 141714 153741 55436 36053 35206 131952	6 waiters 7 waiters 8 waiters 1 byte_rand 1 waiters 2 waiters 3 waiters 4 waiters 5 waiters 6 waiters 7 waiters	5741 5832 5863 1 entities 1E+06 2E+06 2E+06 2E+06 2E+06 2E+06 2E+06 2E+06 2E+06	2749 2786 2849 2 entities 656689 780909 795368 740913 701754 691817 665967	1816 1732 1872 3 entities 4 437435 43563 435761 441650 425566 417782 407830	1358 1385 4 entities 323985 362693 356799 299441 288508 288313 287003	1076 1085 251656 287461 256000 229149 213805 222022 212915	885 882 6 entities 199019 214017 216859 182145 179101 176361 175691	744 741 7 entities 167644 198650 185515 153369 154379 150580 151625	641 643 163807 155709 160322 134874 131910 132539 129728
2 waiters 3 waiters 4 waiters 5 waiters 6 waiters 7 waiters 8 waiters	1 entities 591620 873678 1E+06 1E+06 1E+06 1E+06 1E+06 1E+06	297724 443791 493416 535494 528127 504259 508833 511027	3 entities 201182 287517 316390 348619 341497 337299 336061 335178	1020 4 entities 151854 213171 227890 245531 250788 250588 246345 246345 247347	777 5 entities ( 105881 163548 183447 193748 192878 192878 193632 184047	640 677 6 entities 1 101090 138431 151368 155370 158116 160244 157043 153060	543 543 7 entities 8 84476 120790 129916 138553 137599 130926 136279	470 517 8 entities 76541 105803 114330 118115 115318 118840 114355 118271	7 waiters 8 waiter 1 waiters 2 waiter 3 waiters 4 waiters 5 waiters 6 waiters 7 waiters 8 waiters 8 waiters	2353 2372 2348 1 entities 1E+06 154610 132611 350358 332401 333186 427728 append 1 entities	1078 1068 1128 2 entitics 520411 528860 77004 61955 197264 195857 200036	736 748 754 3 entities 4 355979 135038 35954 119189 92625 87038 129953 127801	531 541 560 4 entities 5 266540 145833 38425 64402 95750 64457 95895 34760 4 entities 5	433 444 421 211000 235155 25111 40300 66667 54242 58470 74075 entities f	360 358 370 6 entities 1 148776 154452 50603 47368 38116 58424 48473 60352 6 entities 1	302 310 314 (entities 8 151066 130226 43203 27307 43134 38474 51701 42841 (entities 8	271 275 259 35304 35391 15568 16595 36594 36595 36594 36595 36594 36661	6 waiters 7 waiters 8 waiters 1 byte_rang 1 waiters 2 waiters 3 waiters 4 waiters 5 waiters 6 waiters 8 waiters 8 waiters 8 waiters 1 latomic_ap	6373 6467 6432 es entities 1E+06 2E+	3141 3151 3187 2 entities 3 651134 732533 807535 633743 633743 633743 633743 633743 633743 633743 633743 633743 633743 633743 633743 633743 633743 633743 633743 633743 63375 63375 63376 63376 63376 63376 63376 63376 63376 63376 63376 63376 633777 633777 633777 633777 633777 6337777 63377777777	2066 2085 2105 445110 506283 4455385 445838 426576 414241 414863 406077	1526 1553 1561 4 entities 335650 330664 338797 306652 297692 297692 297692 297692 297893 290919 285991 4 entities	1213 1232 1240 5 entities 235706 284546 276625 230367 226880 215476 223037 215080 5 entities	999 1025 1018 6 entities 7 221729 225984 221715 189784 179782 175984 177217 177074 6 entities 7	861 864 862 190568 159069 182034 157005 153433 153737 151001 153112	747 746 entities 141714 153741 55436 36053 35206 31952 22833 30403 entities	6 waiters 7 waiters 8 waiters 1 byte_ran 1 waiters 2 waiters 3 waiters 4 waiters 6 waiters 6 waiters 7 waiters 8 waiters 8 waiters	5741 5832 5863 1 entities 2E+06 2E+06 2E+06 2E+06 2E+06 2E+06 2E+06 2E+06 2E+06 2E+06 2E+06 2E+06 1 entities	2743 2786 2843 2 entitie: 656683 780303 780303 740913 701754 631817 665967 647714 2 entitie:	1816 1732 1872 3 entities 4 437435 486363 435761 441650 441650 441650 441782 407890 401734 3 entities 4	1358 1385 4 entities 323985 3562693 356799 299441 288508 288313 287003 279177 4 entities	1076 1085 251656 287461 256000 229143 213805 222022 212915 215734 5 entities	885 882 193013 214017 216853 182145 173101 176361 175631 175631 172387 6 entitics	744 741 167644 198650 165515 153369 154379 150580 151625 146291 7 entities	641 643 8 entities 163807 155709 160322 134874 131910 132539 129728 129728 129103 8 entities
2 waiters 3 waiters 4 waiters 5 waiters 6 waiters 7 waiters 8 waiters 1 waiters	1 entities 531620 873678 1E+06 1E	297724 443791 493416 535494 528127 504259 508833 511027 2 entities 63195	3 entities 201182 287517 316390 348619 341497 337299 336061 335178 3 entities 63276	1020 4 entities 213171 227830 245531 250788 250581 246345 247347 4 entities 62353	777 5 entities ( 105881 163548 183447 197498 192878 191613 186329 189047 5 entities ( 63238	640 677 6 entitica 101030 138431 151368 155370 158116 160244 157043 153060 6 entitica 6 entitica	543 543 7 entities 8 84476 120790 129916 138553 130926 136279 132999 7 entities 8 63535	470 517 76541 105803 11830 118315 118840 114355 118271 118271 8 entities 63185	7 waiters 8 waiters 1 waiters 2 waiters 3 waiters 5 waiters 6 waiters 8 waiters 8 waiters 1 waiters	2353 2372 2348 dges 1 entities 1E+06 1E+06 1E+06 1E+06 1E+06 332401 332311 350358 332401 333186 427728 append 1 entities 73684	1078 1068 1128 2 entities 528860 77004 61955 137264 137264 133048 193048 2 entities 73841	736 748 754 3 entitics 4 355979 35954 119189 92625 87038 129953 129953 127801 3 entitics 4 73987	531 541 560 4 entitics 5 266540 145833 36425 64402 35750 64402 35750 64402 35750 64453 35835 34760 4 entitics 5 73157	433 444 421 211000 235155 25111 40300 54242 58470 74075 entities 6 74473	360 358 370 6 entities 1 148776 154452 50603 47368 38116 58424 48473 60952 6 entities 1 74293	302 310 314 7 entities 8 151066 43203 27307 43134 38474 43841 42841 7 entities 8 73735	271 275 253 (31804 35334) 35334 15566 16535 36534 37733 36208 36861 36861	6 waiters 7 waiters 8 waiters 1 hyte_rang 2 waiters 3 waiters 4 waiters 5 waiters 7 waiters 8 waiters 8 waiters 1 aviters 1 waiters 1 waiters	6373 6467 6432 ees entities 1E+06 2E	3141 3151 3187 2 entitice 3 651134 702593 807595 748291 663316 663316 661316 2 entitice 3 87425	2066 2085 2105 445110 006289 4453835 445838 445838 445838 445838 445838 445838 445838 445838 445838 445838 445838 406077 414241 414863 406077 414241 414863 405077 405777 40777 407777 407777 407777 4077777777	1526 1553 1561 4 entities 335650 370064 338797 306652 297692 207672 207720	1213 1232 1240 5 entities 235706 284546 230367 228880 215476 223037 215080 5 entities 87317	999 1025 1018 6 entitie: 7 221729 225984 221715 183784 173782 178384 177217 177074 5 entitie: 7 87427	861 864 862 190568 159069 182034 157005 153433 153737 151001 153112	747 746 141714 153741 58496 36059 35206 31952 32833 30403	6 waiter: T waiters 8 waiters 1 waiters 2 waiters 2 waiters 3 waiters 4 waiters 6 waiters 8 waiters 8 waiters 1 stomic_a 1 waiters	5741 5832 5863 (es) 1 entities 1E+06 2E+06 2E+06 2E+06 2E+06 2E+06 2E+06 2E+06 2E+06 2E+06 2E+06 2E+06 2E+06 3E+06 2E+06 3E+06 2E+06 3E+05	2743 2786 2849 2 entitie: 656689 780909 795368 740913 701754 691817 665967 641714 2 entitie: 87509	1816 1792 1872 3 entitics 4 437435 4463633 445566 445566 417782 407830 40734 3 entitics 4 87204	1358 1385 4 entities 323985 356799 299441 288508 288313 287003 279177 4 entities 86897	1076 1085 251656 287461 287461 287461 287461 22912 213805 22022 212915 215734 5 entities 87233	885 882 199019 214017 216859 182145 175631 175631 175631 172387 6 entities 86852	744 741 7 entities 167644 198650 185515 153363 154373 150580 151625 146231 7 entities 87433	641 643 8 entities 163807 155709 160822 134874 131910 132539 129728 129728 129103 8 entities 87161
2 waiters 3 waiters 4 waiters 5 waiters 6 waiters 8 waiters !atomic_a 1 waiters 2 waiters	1 entities 531620 873678 1E+06 1E	297724 443791 493416 535494 526127 504259 508833 511027 2 entities 63195 80924	3 entities 201182 287517 316330 348619 341437 337239 336061 335178 3 entities 63276 77032	1020 4 entities 151854 213171 227890 245531 250581 250581 246345 247347 4 entities 62353 82316	777 5 entities ( 105881 163548 183447 1917498 191613 196329 189047 5 entities ( 62238 82866	640 677 6 entitics 1 101030 138431 151368 155370 158116 160244 157043 153060 6 entitics 1 62377 82033	543 543 7 entities 8 84476 120916 129916 138553 138553 130926 136279 130926 136279 132999 7 entities 8 63595 84138	470 517 76541 105803 114330 118115 118115 118271 114355 118271 8 entities 63185 75366	7 waiters 8 waiters 1 lbyte_rar 2 waiters 2 waiters 4 waiters 5 waiters 6 waiters 7 waiters 8 waiters 1 latomic_t 1 waiters 2 waiters	2353 2372 2348 rges 1 entities 1E+06 154610 132311 350358 332401 333138 427728 427728 427728 73684 59973	1078 1068 1128 2 entities 520411 528860 77004 61955 197264 1935857 200036 193048 2 entities 73841 73969	736 748 754 3 entities 4 355319 135038 35554 119189 92625 87038 129553 127801 3 entities 4 73987 64406	531 541 560 4 entitie: 5 265540 145833 38425 64402 95750 64402 95750 64402 95750 64402 95895 94760 4 entitie: 5 73157 62273	433 444 421 231000 235155 25111 40300 66667 54242 58470 74075 entitics 6 74473 77340	360 358 370 6 entities 1 148776 154452 50603 47368 38116 58424 48473 60352 6 entities 1 74293 61615	302 310 314 entities 8 151066 190226 43209 27307 43134 43134 43134 43134 43134 43134 43134 43134 43134 43134 43134 51701 42841 42841 66668	271 275 253 entities 31804 35331 15566 15535 36534 37733 38208 36561 37733 38208 36661	6 waiters 7 waiters 8 waiters 1 byte_rang 1 waiters 2 waiters 3 waiters 4 waiters 6 waiters 6 waiters 8 waiters 1 atomic_ap 1 waiters 2 waiters 2 waiters	6373 6467 6432 entities 1E+06 2E+06 2E+06 2E+06 2E+06 2E+06 2E+06 2E+06 2E+06 3E+06 2E+06 3E+06	3141 3151 3187 2 entities 3 651134 732533 665134 6307535 640373 661316 661316 2 entities 3 87425	2066 2085 2105 3 entities 445110 506283 4455385 4456376 4456376 414241 414863 406077 3 entities 87534 113221	1526 1553 1561 4 entities 335650 330064 3338737 306652 291692 291692 293693 293931 4 entities 87810 114158	1213 1232 1240 5 entities 235706 284546 235706 235466 215476 2230367 215476 223037 215476 215576 2155776 215576 215576 215576 215576 215576 2155776 2155776 2155776 2155776 21557776 215577777777777777777777777777777777777	999 1025 1018 6 entitie: T 221729 225784 123784 173782 178984 177217 177074 6 entitie: T 87427 114243	861 864 862 190568 159063 159063 159063 159053 159053 159312 153112 153112 153112 153112	747 746 141714 58436 58053 35206 131952 22833 30403 90403 90403 12943	6 waiter: 7 waiters 8 waiters 1 byte_ran 1 waiters 2 waiters 3 waiters 4 waiters 5 waiters 5 waiters 6 waiters 8 waiters 1 waiters 2 waiters 1 waiters 2 waiters 8 waiters 1 waiters 2 waiters 1 waiters 2 waiters	5741 5632 5863 1 entities 12:06 20:07 20:0	2743 2786 2843 2 entitie: 656683 780903 795368 740913 701754 69313 701754 693917 665967 647714 2 entitie: 87503 100838	1816 1792 1872 3 entities 4 437435 4485963 4495761 441650 425566 417782 407690 401734 3 entities 4 87204 112204	1358 1385 4 entitie: 32385 362693 356799 299441 288513 288313 289314 299441 299447 299447 299447 299447 299447 299447 299447	1076 1085 251656 287461 256000 223149 213805 222022 212315 215734 5 entities 87233 32625	885 862 199013 214017 216854 179101 176361 1726361 172387 6 entitics: 86652 94208	744 741 7 entities 167644 198650 185515 153863 154379 150800 151625 146291 7 entities 87439 103463	641 643 8 entities 163807 155709 160322 134874 131910 132539 129728 129728 129728 129703 129728 129703 129728 129703 129728 129703 129728 129703 129728 129768 129768 129758 1297578 1297578 1297578 1297578 1297578 129757
2 waiters 3 waiters 4 waiters 5 waiters 6 waiters 7 waiters 8 waiters Istomic_a 1 waiters 2 waiters 3 waiters	1 entities 531620 873678 1E+06 1E+06 1E+06 1E+06 1E+06 1E+06 1E+06 1E+06 1e+06 2002	297724 443791 493416 535494 528127 504259 508833 511027 2 entities 63195	3 entities 201182 287517 316330 348619 341437 337239 336061 335178 3 entities 63276 77032	1020 4 entities 151854 213171 227890 245531 250581 250581 246345 247347 4 entities 62353 82316	777 5 entities ( 105881 163548 183447 192878 191613 186329 189047 5 entities ( 63238 82866 83382	640 677 6 entitics 1 101030 138431 151368 155370 158116 160244 157043 153060 6 entitics 1 62377 82033	543 543 7 entities 8 84476 129306 138553 130326 136273 130326 136273 132393 7 entities 8 63535 84138 84138 84360	470 517 76541 105803 11830 118315 118840 114355 118271 118271 8 entities 63185	7 waiters 8 waiterd 1 byte_rar 2 waiterd 3 waiters 2 waiterd 4 waiters 5 waiters 5 waiters 6 waiters 1 waiters 1 stomic_1 1 waiters 2 waiterd 3 waiterd	2353 2372 2348 des 1 entities 1E+06 194610 132311 350356 332401 333186 427728 oppend 1 entities 73664 59973 69173	1078 1068 1128 2 entities 520411 528660 77004 61955 197264 193048 193048 2 entities 73841 73969 68034	736 748 754 3 entities 4 355973 355973 35954 119189 92625 87038 129953 127801 3 entities 4 73967 64406 60841	531 541 560 4 entities 5 266540 145833 38425 64457 95835 94760 4 entities 5 73157 62273 68588	433 444 421 211000 235155 25111 40300 66667 54242 58470 74075 entities 6 74473 77340 68673	360 358 370 6 entitie: 1 148776 154452 50603 47368 38116 58424 48473 60952 6 entitie: 1 74293 61615 66553	302 310 314 (entities 8 151066 1 30226 43203 27307 43134 43134 43134 43134 43134 43134 42841 (entities 8 73735 666668 68832	271 275 253 (31804 35334) 35334 15566 16535 36534 37733 36208 36861 36861	6 waiters 7 waiters 8 waiters 1 byte_rang 2 waiters 2 waiters 4 waiters 6 waiters 6 waiters 1 waiters 1 waiters 2 waiters 3 waiters 2 waiters 2 waiters 2 waiters 2 waiters 3 waiters	6373 6467 6432 entities 1E+06 2E+06 2E+06 2E+06 2E+06 2E+06 2E+06 2E+06 2E+06 3E+06 2E+06 3E+06	3141 3151 3187 2 entities 3 651134 732533 665134 6307535 640373 661316 661316 2 entities 3 87425	2066 2085 2105 445110 006289 4453835 445838 445838 445838 445838 445838 445838 445838 445838 445838 445838 445838 406077 414241 414863 406077 414241 414863 405077 405777 40777 407777 407777 407777 4077777777	1526 1553 1561 4 entitics 335650 370064 338797 306652 297692 297692 293699 293919 285931 4 entitics 87810 114158 102488	1213 1232 1240 5 entities 235706 284546 2376625 230367 225880 215476 223037 215476 223037 215476 223037 215480 5 entities 5 entities 5 entities 102042	999 1025 1018 6 entitie: 7 221729 225984 221715 183784 173784 173784 177217 175984 177217 177074 6 entitie: 7 87427 114243 102238	861 864 862 190568 190568 190568 1959059 182034 157505 153433 153433 153433 153112 153112 153112 153112 153112	747 746 entities 141714 153741 153436 35206 35005 3500	6 waiter: 7 waiters 8 waiters 1 waiters 2 waiters 2 waiters 5 waiters 6 waiters 8 waiters 8 waiters 1 waiters 2 waiters 2 waiters 3 waiters 2 waiters 2 waiters 2 waiters	5741 5832 5863 (es) 1 entities 1E+06 2E+06 2E+06 2E+06 2E+06 2E+06 2E+06 2E+06 2E+06 2E+06 2E+06 2E+06 2E+06 3E+06 2E+06 2E+06 3E+06 2E+06 3E+05	2743 2786 2849 2 entitie: 656689 780909 795368 740913 701754 691817 665967 641714 2 entitie: 87509	1816 1792 1872 3 entities 4 437435 4386363 435761 441650 425566 417782 407890 401734 3 entities 4 87204 112204 101729	1358 1385 4 entitie: 323985 362693 356799 289341 288508 288313 287003 279177 4 entitie: 86837 94047 101960	1076 1085 251656 287461 287461 287461 287461 22912 213805 22022 212915 215734 5 entities 87233	885 862 199013 214017 216854 179101 176361 1726361 172387 6 entitics: 86652 94208	744 741 7 entities 167644 198650 153669 153669 154379 150580 151625 146231 7 entities 87439 103463 102037	641 643 8 entities 163807 155709 160322 134874 131910 132539 129728 129728 129703 8 entities 87161 113740 101015
2 waiters 3 waiters 4 waiters 5 waiters 6 waiters 7 waiters 8 waiters !atomic_a 1 waiters 2 waiters	1 entities 531620 873678 1E+06 1E+06 1E+06 1E+06 1E+06 1E+06 1E+06 1E+06 8000 1 entities 62262 78468 83437 86871	297724 443791 433416 535494 528127 504259 508833 511027 2 entities 63195 80924 83374 83374	3 entities 201182 287517 316390 348619 341437 337299 336061 335178 3 entities 63276 77032 82644 87234	1020 4 entities 151854 213171 227890 245531 250581 250581 246945 247347 4 entities 62955 82316 82316 81890	777 5 entities ( 105881 163548 183447 197498 191613 186329 183047 5 entities ( 63238 82866 83382	640 677 6 entitics 1 101030 138431 151368 155370 158116 160244 157043 153060 6 entitics 1 62377 82033 82322	543 543 7 entities 8 84476 120916 138553 137599 130326 130526 130529 130299 7 entities 8 63535 84138 83060 87496	470 517 76541 105609 114300 114305 115316 115316 118815 63185 75966 83705	7 waiters 8 waiters 1 lbyte_rar 2 waiters 2 waiters 4 waiters 5 waiters 6 waiters 7 waiters 8 waiters 1 latomic_t 1 waiters 2 waiters	2353 2372 2348 Mges 1 entities 154610 152611 350358 332401 333198 427728 append 1 entities 73684 59973 66103 66103	1078 1068 1128 2 entities 520411 528860 77004 61955 197264 195857 200036 193048 2 entities 73841 73863 68054 63258	736 748 754 3 entities 4 355319 135038 35554 119189 32625 87038 129553 127801 3 entities 4 73987 64406	531 541 560 4 entities 5 266540 145833 38425 64457 95835 94760 4 entities 5 73157 62273 68588	433 444 421 entities 6 211000 235155 25111 40900 66667 54242 58470 74075 entities 6 74473 77340 68673 636123	360 358 370 6 entitic 1 148776 154452 50603 41368 38116 58424 48473 60952 6 entitic 1 74293 61615 6553	302 310 314 (entities 8 151066 1 90226 43203 27307 43134 38474 42841 42841 42841 42841 42841 66668 668322 668324	271 275 253 253 31504 35361 15655 36534 37733 38208 36861 entities 74128 51723 66809	6 waiters 7 waiters 8 waiters 1 byte_rang 1 waiters 2 waiters 3 waiters 5 waiters 6 waiters 6 waiters 8 waiters 1 waiters 1 waiters 2 waiters 2 waiters 3 waiters 4 waiters 2 waiters 4 waiters 3 waiters 2 waiters 3 waiters 4 waiters	6373 6467 6432 es entities 1E+06 2E+	3141 3151 3187 2 entities 3 651134 732533 807535 748231 633743 633743 633743 643374 6633743 6633743 6633743 6633743 675096 661316 2 entities 3 87425 112755 102457	2066 2085 2105 445110 506283 445385 445838445838 445868 44586868 445868 44586868 445868 4458686868686686686666666	1526 1553 1561 4 entities 335650 330064 3338737 306652 291692 291692 293693 293931 4 entities 87810 114158	1213 1232 1240 5 entities 235706 284546 235706 235466 215476 2230367 215476 223037 215476 215576 2155776 215576 215576 215576 215576 215576 2155776 2155776 2155776 2155776 21557776 215577777777777777777777777777777777777	999 1025 1018 6 entitie: T 221729 225784 123784 173782 178984 177217 177074 6 entitie: T 87427 114243	861 864 862 190568 159063 159063 159063 153034 157505 153433 153737 151001 153112 153112 153112 153112 153112 101394 95761	747 746 141714 58436 58053 35206 131952 22833 30403 90403 90403 12943	6 waiter: 7 waiters 8 waiters 1 byte_ran 1 waiters 2 waiters 3 waiters 4 waiters 5 waiters 5 waiters 6 waiters 8 waiters 1 waiters 1 waiters 2 waiters 1 waiters 2 waiters 8 waiters 1 waiters 2 waiters 1 waiters 2 waiters	5741 5832 5869 995 1 entities 12=06 22=06 22=06 22=06 22=06 22=06 22=06 22=06 22=06 1 entities 86370 100335 96164	2743 2786 2643 2 entities 655663 780303 795368 740313 701754 631817 665367 647714 2 entities 87503 1008386 100846	1816 1792 1872 3 entities 4 437435 4485963 4495761 441650 425566 417782 407690 401734 3 entities 4 87204 112204	1358 1385 4 entitie: 32385 362693 356799 299441 288513 288313 289314 299441 299447 299447 299447 299447 299447 299447 299447	1076 1085 251656 287461 258000 229149 213805 229022 213805 21566 213805 214010000000000000000000000000000000000	885 882 5 entities 199019 214017 216859 182145 176361 176361 176361 176387 6 entities 86852 94206 101260	744 741 7 entities 167644 198650 185515 153863 154379 150800 151625 146291 7 entities 87439 103463	641 643 8 entities 163807 155709 160322 134874 131910 132539 129728 129728 129728 129703 129728 129703 129728 129703 129728 129703 129728 129703 129728 129768 129728 12976768 129768 1297676 1297676 1297676 12976
2 waiters 3 waiters 4 waiters 5 waiters 6 waiters 7 waiters 8 waiters 1 stomic_a 1 waiters 2 waiters 3 waiters 4 waiters	1 entities 531620 873678 1E+06 1E+06 1E+06 1E+06 1E+06 1E+06 1E+06 1E+06 1E+06 30437 83437 86871 76252	297724 443791 433416 535494 528127 504259 508833 511027 2 entities 63195 80924 83374 83374	3 entities 201182 287517 316390 348619 341437 337299 336061 335178 3 entities 63276 77032 82644 87234	1020 4 entitie: 151854 213171 227830 245531 245353 250788 250788 250788 250788 24545 247347 4 entitie: 62859 82316 81830 818427	777 5 entitics ( 105861 163548 183447 192678 191613 186329 183047 5 entitics ( 62238 82866 83882 85681	640 677 6 entities 138431 151368 155370 158116 160244 157049 153060 6 entities 6 entities 82932 82954	543 543 7 entities 8 84476 120790 129916 138553 130326 136279 132993 132993 7 entities 8 63535 84138 83060 87496 87496	470 517 8 entities 76541 105809 114330 114330 114355 118210 118840 114355 118211 8 entities 63185 75866 83705 888683	7 waiters 8 waiters Hoyte_rar 1 waiters 2 waiters 2 waiters 4 waiters 5 waiters 5 waiters 7 waiters 8 waiters 1 stomic 1 waiters 2 waiters 3 waiters 4 waiters 2 waiters 4 waiters	2353 2372 2348 dges 1 entities 18+06 18+06 132401 350358 332401 350358 332401 350358 332401 350358 427728 427728 427728 427728 59973 63046 55039	1078 1068 1128 2 entitie: 520411 52860 137264 13585 137264 135857 200036 133048 2 entitie: 73841 73863 68034 63258 55300	736 748 748 35979 135038 35554 135038 35554 119189 32625 87038 129353 127801 3 entities 64406 60841 63254 55353	531 541 560 4 entitie: 5 266540 145833 38425 64402 93750 64402 93750 64457 93595 94760 4 entitie: 5 73157 62279 665588 65073 55254	433 444 421 entities 6 211000 235155 25111 40900 66667 54242 58470 74075 entities 6 74473 77340 68673 636123	360 358 370 6 entities 1 148776 154452 50603 47368 38116 58424 48473 60952 68424 48473 60952 61615 66559 63038	302 310 314 (entities 8 151066 30226 43203 27307 43134 43134 43134 43134 43134 43134 43134 43134 51701 42841 38474 51701 56668 683034 63034 43526	271 275 253 31804 35331 15566 16535 36534 37733 33206 33206 33206 534 37733 33206 534 37733 33206 53206 51723 56803 51723 56803 52386	6 woiters 7 woiters 8 woiters 1 byte_rang 1 woiters 2 woiters 4 woiters 5 woiters 6 woiters 1 woiters 1 woiters 2 woiters 2 woiters 3 woiters 2 woiters 3 woiters 2 woiters 3 woiters 3 woiters 3 woiters 5 woiters 3 woiters 5 woiters 5 woiters 3 woiters 5 woiters 5 woiters 1 woiters	6373 6467 6432 eentities 1E+06 2E+06 2E+06 2E+06 2E+06 2E+06 2E+06 2E+06 87128 83044 101447 94863	3141 3151 3187 2 entities 2 651134 732533 807535 630373 630375 630375 630375 630375 6305755 6305755 6305755 6305755 63057555 630575555 6305755555555555555555555555555555555555	2066 2085 2105 445110 066289 485385 445638 426576 414241 414863 406077 87594 113221 101626 95791	1526 1553 1561 4 entitics 335650 335650 336652 297692 297692 297692 297692 297692 297692 297693 2990919 285919 28592 285919 2859219 2859319 28595519 2859519 2859519 2859519 2859519 28595	1213 1232 1240 5 entities 235706 284546 276625 230367 228800 215476 223037 215080 5 entities 87317 112836 102042 95350	999 1025 1018 6 entities 7 221729 225984 221715 189784 177984 177984 1778984 177717 177074 6 entities 7 87427 114243 102238 95189	361 864 862 190568 159069 159069 159069 159055 153433 15705 153433 157001 153112 153112 153112 153112 153112 15312 15312 101394 95761 81572	747 746 141714 153741 153741 153741 553456 55055 35206 313152 32803 30403 00435 85345 12943 014356	6 waiter: 7 waiters 8 waiters 1 waiters 2 waiters 4 waiters 4 waiters 6 waiters 6 waiters 1 waiters 8 waiters 1 waiters 8 waiters 1 waiters 2 waiters 2 waiters 2 waiters 2 waiters 2 waiters 2 waiters 4 waiters 5 waiters 5 waiters 5 waiters 6 waiters 6 waiters 6 waiters 8 waiters	5741 5832 5869 995 1 entities 12=06 22=06 22=06 22=06 22=06 22=06 22=06 22=06 22=06 1 entities 86370 100335 96164	2743 2786 2843 2 entities 65663 780909 795368 740913 701754 6631817 665367 641714 2 entities 87509 100838 102446 36415	1816 1792 1872 3 entities 4 437435 486363 425566 441650 425566 441782 40734 401734 3 entities 4 87204 112204 101729 96510	1358 1385 32385 362693 356799 299441 288508 288313 287003 279177 4 entities 86837 34047 101960 96234	1076 1085 251656 287461 256000 229149 213805 212915 213794 5 entities 87233 92625 101811 95838 81967	885 882 6 entities 139013 214017 216853 182145 175631 175631 175631 175631 175631 175631 175853 186852 86852 94208 101260 95418	744 741 7 entities 167644 198650 185515 153363 154313 150580 151625 146231 7 entities 87453 103463 102037 96236	641 643 8 entities 163807 155709 160322 134874 131910 132539 129728 129728 129103 8 entities 87161 113740 101015 95848
2 waiters 3 waiters 4 waiters 5 waiters 6 waiters 8 waiters 1 waiters 2 waiters 2 waiters 3 waiters 4 waiters 5 waiters	1 entities 531620 873678 1E+06 1E+06 1E+06 1E+06 1E+06 1E+06 1E+06 1E+06 1E+06 1E+06 8262 78468 83437 86871 76522 71977 70143	297724 443791 433416 535434 528127 504259 508833 511027 2 entities 63195 80924 83374 83374 87444 87340 70866 69803	3 entitie: 201182 287517 316330 348613 341437 337233 335178 3 entitie: 63216 77032 82644 87234 75874 75874 75874 75874 75874	1020 4 entities 151854 23171 227830 245531 245531 245345 247347 4 entities 62859 82316 81830 83427 76025 71940	777 5 entities ( 105881 165548 183447 197498 192878 191613 186329 189047 5 entities ( 63288 82866 83382 85661 76158 72910	640 677 6 entities 1 101030 138451 151368 155366 1555666 1555666 1555666 1555666 1555666 1555666 155	543 543 7 entities 8 84476 120790 129916 138553 130926 136279 132999 130926 136279 132999 132999 7 entities 8 63535 84138 83060 87496 87496 87496 87496	470 517 5 entities 76541 105505 114330 114330 115316 115316 53185 53185 53185 75566 83305 88689 71022	7 waiters 8 waiters 1 waiters 2 waiters 2 waiters 3 waiters 5 waiters 6 waiters 8 waiters 1 waiters 1 waiters 2 waiters 3 waiters 3 waiters 5 waiters 5 waiters 5 waiters 5 waiters 5 waiters	2353 2312 2346 iges 1E+06 184610 132311 33240 33240 332500 335500 35500 35500 355000 355000 355000 35500000000	1078 1068 1128 2 entities 520411 52860 197264 19555 197264 195857 200036 193048 2 entities 73841 73863 68034 63258 55300 55666	736 748 754 3 entities 4 355919 355919 355919 355919 355919 355919 35038 129953 129953 129953 129953 127801 3 entities 4 73967 64406 63214 63254 55759 556260	531 540 560 4 entitice 5 266540 145633 38425 64402 95750 64457 95895 34760 4 entitice 5 73157 62273 62273 663686 663073 55254 54260	433 444 421 211000 235155 25111 40900 66667 54242 58470 74075 74075 63673 636273 63123 55513 555704	360 358 370 6 entitics 1 146776 154452 50603 47368 38116 58424 436473 60952 6 entitics 1 74293 61615 6553 63038 55300	302 314 314 314 3151066 30226 43203 21307 43134 338474 43203 21307 43134 338474 43203 21307 43134 338474 43203 21307 43347 43203 21307 43347 43203 21307 43347 43203 21307 43347 43203 21307 43347 43203 21307 43347 43203 21307 43347 43203 21307 43347 43203 21307 43347 43203 21307 43347 43203 21307 43347 43203 21307 43213 43214 43213 43214 43213 43214 43214 43213 43214 431	271 275 259 31804 35931 15568 16595 36594 37733 39208 36861 39733 39208 36861 51723 66809 662986 62986	6 waiters 7 waiters 8 waiters 1 byte_rang 1 waiters 2 waiters 2 waiters 4 waiters 4 waiters 5 waiters 8 waiters 1 waiters 8 waiters 2 waiters 8 waiters 1 waiters 8 waiters 2 waiters 8 waiters 9 waiters 1 waiters 9 waiters 2 waiters 9 waiters 1 waiters 9 waiters 1 waiters 9 waiters 1 waiters 2 waiters 1 waiters 1 waiters 1 waiters 1 waiters 2 waiters 2 waiters 1 waiters 1 waiters 2 waiters	6373 6467 6432 estitics 1E+06 2E+06 2E+06 2E+06 2E+06 2E+06 2E+06 2E+06 2E+06 2E+06 3E+06 2E+06 2E+06 3E+06 2E+06 3E+06 2E+06 3E+06 2E+06 3E+06 2E+06 3E+06 2E+06 3E+06	3141 3151 3151 2 entities 3 651134 732533 630735 630373 630735 6630373 675096 661316 6630373 675096 661316 2 entities 2 81425 112755 102457 95024 81554 81554	2066 2085 2105 445110 506289 445335 445335 445335 445335 445335 4456376 414241 414863 406077 63594 113221 106266 95791 81788 79837 81788 79837	1526 1553 1561 4 entities 335650 3306652 297692 293692 293693 293931 4 entities 87810 114158 102488 36045 81304	1213 1232 1240 5 entities 235706 284546 276625 230967 225880 215476 223037 215080 5 entities 87317 112896 102042 95350 81746	999 1025 1018 6 entities 7 221729 225384 221715 183784 173782 178384 177217 173782 178384 177217 17774 6 entities 7 81427 114243 102238 95189 80855	861 864 862 190568 159063 157505 157505 157303 157505 153433 153737 151002 153112 153112 87141 115829 101394 85761 81572 79955	747 746 entities 141714 153741 153741 153741 153741 153741 153741 15345 15206 131952 22833 30403 entities 86341 12343 01436 95345 95345	6 waiter: 7 waiters 8 waiters 1 waiters 2 waiters 2 waiters 2 waiters 5 waiters 6 waiters 6 waiters 1 waiters 1 waiters 3 waiters 3 waiters 3 waiters	5741 5832 5863 1 entities 12:+06 22:+06 22:+06 22:+06 22:+06 22:+06 22:+06 22:+06 12:entities 10:9122 100335 96164 81541	2743 2786 2643 2643 2643 780903 795368 740935 701754 691817 647114 2 entities 87503 100838 102446 396415 82173	1816 1732 1872 3 entities 4 437435 4485963 4495761 4415783 4417782 407890 401734 3 entities 4 87204 112204 101729 36510 81938 81935 80443	1358 1385 4 entities 323985 362693 299441 288508 288508 288008 288003 279177 4 entities 86897 94047 101960 36234 81945	1076 1085 251656 287461 256000 229149 213805 212915 213794 5 entities 87233 92625 101811 95838 81967	885 882 6 entitice 199013 214017 216859 182145 173101 176361 175361 172387 6 entitice 86852 94208 101260 96418 81865 80917	744 741 7 entities 167644 198505 185515 153363 150505 151625 146231 7 entities 87433 103463 102037 96236 81573	641 643 163807 155703 160322 134874 131910 1328728 128728 128103 8 entities 87161 113740 101015 95848 81407

# Thank you

And let the questions begin!

Github: https://github.com/ned14/boost.afio

Ref docs: <u>https://ned14.github.io/boost.afio/</u>