# Лабораторная работа №4 по курсу «Операционные системы»

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Постановка задачи

**Вариант 10.**

Цель работы

Приобретение практических навыков в:

1) Создании аллокаторов памяти и их анализу;

2) Создании динамических библиотек и программ, использующие динамические библиотеки.

Задание

Исследовать два аллокатора памяти: необходимо реализовать два алгоритма аллокации памяти и сравнить их по следующим характеристикам: – Фактор использования – Скорость выделения блоков – Скорость освобождения блоков – Простота использования аллокатора Требуется создать две динамические библиотеки, реализующие два аллокатора, соответственно. Библиотеки загружаются в память с помощью интерфейса ОС (dlopen / LoadLibrary) для работы с динамическими библиотеками. Выбор библиотеки, реализующей аллокатор, осуществляется чтением первого аргумента при запуске программы (argv[1]). Этот аргумент должен содержать путь до динамической библиотеки (относительный или абсолютный). Если аргумент не передан или по переданному пути библиотеки не оказалось, то указатели на функции, реализующие API аллокатора ниже, должны быть присвоены функциям, которые оборачивают системный аллокатор ОС (mmap / VirtualAlloc) в этот API.

Общий метод и алгоритм решения Использованные системные вызовы:

1. **\*int munmap(void addr, size\_t length); -** Удаляет отображения, созданные с помощью mmap.
2. **\*int dlclose(void handle);** - Закрывает динамическую библиотеку, открытую с помощью dlopen, и освобождает ресурсы, связанные с этим дескриптором.
3. **\*\*void dlopen(const char filename, int flag);** - Открывает динамическую библиотеку и возвращает дескриптор для последующего использования.
4. **\*\*void mmap(void addr, size\_t length, int prot, int flags, int fd, off\_t offset);** – создает новое отображение памяти или изменяет существующее**.**
5. **int write(int \_Filehandle, const void \*\_Buf, unsigned int \_MaxCharCount) –** выводит информацию в Filehandle.

Описание программы

1. main.c

Открывает динамические библиотеки и получает нужные функции. Если в библиотеке не нашлось нужных функций, то вместо них будут использоваться аварийные оберточные функции. Далее как пример функция выделяет и освобождает память массива.

1. buddy.c

Файл в котором реализована логика работы аллокатора блоками по 2^n.

* 1. Вся память при инициализации разбивается на блоки которые равны степени двойки.
  2. Все блоки хранятся в списке свободных элементов.
  3. Каждый блок хранит указатель на следующий свободный блок.
  4. При освобождении нужно добавить этот блок в список свободных элементов в нужную позицию.
  5. Для выделения памяти выбираем блок N[log2(size)] и возвращаем указатель на первый элемент, помечая блок занятым.

1. ffit.c

**Обзор доступных блоков:** Алгоритм поддерживает список или структуру данных, представляющую доступные, свободные блоки памяти. Эти блоки обычно хранятся в порядке их адресов в памяти.

**Поиск первого подходящего блока:** Когда поступает запрос на выделение блока памяти определенного размера, алгоритм последовательно перебирает блоки свободной памяти, начиная с первого блока в списке.

**Выделение памяти:**

* 1. Если текущий просматриваемый блок свободной памяти имеет размер, *равный или больший*, чем запрошенный размер, то этот блок выбирается для выделения.
  2. Если размер блока *точно равен* запрошенному, то весь блок выделяется и удаляется из списка свободных блоков.
  3. Если размер блока *больше* запрошенного, то блок разделяется на два:
     1. Один блок выделяется запрошенного размера.
     2. Остаток блока (если таковой есть) остается свободным и его размер и адрес обновляются в списке свободных блоков.

**Если подходящий блок не найден:** Если ни один из свободных блоков не подходит по размеру для запроса, то алгоритм не может выполнить выделение памяти, и обычно возвращается сообщение об ошибке или нуль-указатель, в зависимости от реализации.

**Повторение процесса:** Процесс повторяется при каждом запросе на выделение памяти.

**Освобождение памяти:** Когда блок памяти освобождается, он добавляется обратно в список свободных блоков. Обычно при этом проводится попытка слить соседние свободные блоки, если таковые есть, чтобы уменьшить фрагментацию памяти.

#include <stdio.h>

#include <stdlib.h>

#include <math.h>

#include <dlfcn.h>

#include <string.h>

#include <sys/time.h>

#include <sys/mman.h>

typedef struct Allocator Allocator;

typedef Allocator\* (\*allocator\_create\_fn)(void \*memory, size\_t size);

typedef void (\*allocator\_destroy\_fn)(Allocator \*allocator);

typedef void\* (\*allocator\_alloc\_fn)(Allocator \*allocator, size\_t size);

typedef void (\*allocator\_free\_fn)(Allocator \*allocator, void \*memory);

Allocator \*standard\_allocator\_create(void \*memory, size\_t size) {

(void)size;

(void)memory;

return memory;

}

void \*standard\_allocator\_alloc(Allocator \*allocator, size\_t size) {

(void)allocator;

size\_t \*memory = mmap(NULL, size + sizeof(size\_t), PROT\_READ | PROT\_WRITE, MAP\_SHARED | MAP\_ANONYMOUS, -1, 0);

if (memory == MAP\_FAILED) {

return NULL;

}

\*memory = (size\_t)(size + sizeof(size\_t));

return memory + 1;

}

void standard\_allocator\_free(Allocator \*allocator, void \*memory) {

(void)allocator;

if (memory == NULL)

return;

size\_t \*mem = (size\_t \*)memory - 1;

munmap(mem, \*mem);

}

void standard\_allocator\_destroy(Allocator \*allocator) { (void)allocator; }

void testAllocator( allocator\_create\_fn create, allocator\_destroy\_fn destroy, allocator\_alloc\_fn cmalloc, allocator\_free\_fn cfree, char\* name ) {

printf( "===== %s =====\n", name );

void\* memory;

double avgMemoryUsable = 0;

double probes = 0;

struct timeval begin;

gettimeofday( &begin, NULL );

double time\_taken;

int def = !strcmp( name, "DEFAULT" );

for( size\_t i = 128; i < 32768 \* 8; i \*= 2 ) {

memory = mmap(NULL, i, PROT\_READ | PROT\_WRITE, MAP\_SHARED | MAP\_ANONYMOUS, -1, 0);

Allocator\* alloc = create( memory, i );

double bytesAllocated = 0;

while( (!def || bytesAllocated < 8192 ) && cmalloc( alloc, 16 ) ) bytesAllocated += 16;

// printf( "DEBUG: %zu %.2f \n", i, bytesAllocated );

avgMemoryUsable += bytesAllocated / i;

destroy( alloc );

munmap(memory, i);

probes++;

}

struct timeval end;

gettimeofday( &end, NULL );

time\_taken = (end.tv\_sec - begin.tv\_sec);

time\_taken += (end.tv\_usec - begin.tv\_usec) \* 1e-6;

printf( "Average Memory Efficiency: %f\n", avgMemoryUsable / probes \* 100 );

printf( "Allocation speed test (Different sizes, full drain): %f\n", time\_taken );

memory = mmap(NULL, 32768 \* 1024 \* 4, PROT\_READ | PROT\_WRITE, MAP\_SHARED | MAP\_ANONYMOUS, -1, 0);

if( !memory ) printf( "No mem :(\n" );

Allocator\* alloc = create( memory, 32768 \* 1024 \* 4 );

void\* allocated[10000];

size\_t i = 0;

while( i < 10000 && (allocated[i++]=cmalloc( alloc, 16 )) );

gettimeofday( &begin, NULL );

for( size\_t i = 0; i < 10000; i++ ) {

cfree( alloc, allocated[i] );

}

gettimeofday( &end, NULL );

time\_taken = (end.tv\_sec - begin.tv\_sec);

time\_taken += (end.tv\_usec - begin.tv\_usec) \* 1e-6;

printf( "Free speed test (One size, 10K elements): %f\n", time\_taken );

printf( "===== === =====\n" );

munmap(memory, 32768 \* 1024 \* 4);

}

int main(int argc, char \*argv[]) {

if (argc < 2) {

testAllocator( standard\_allocator\_create, standard\_allocator\_destroy, standard\_allocator\_alloc, standard\_allocator\_free, "DEFAULT" );

}else{

void \*handle = dlopen(argv[1], RTLD\_NOW);

if (!handle) {

testAllocator( standard\_allocator\_create, standard\_allocator\_destroy, standard\_allocator\_alloc, standard\_allocator\_free, "DEFAULT" );

}else{

allocator\_create\_fn allocator\_create = (allocator\_create\_fn)dlsym(handle, "allocator\_create");

allocator\_destroy\_fn allocator\_destroy = (allocator\_destroy\_fn)dlsym(handle, "allocator\_destroy");

allocator\_alloc\_fn allocator\_alloc = (allocator\_alloc\_fn)dlsym(handle, "allocator\_alloc");

allocator\_free\_fn allocator\_free = (allocator\_free\_fn)dlsym(handle, "allocator\_free");

if (!allocator\_create || !allocator\_destroy || !allocator\_alloc || !allocator\_free) {

dlclose(handle);

testAllocator( standard\_allocator\_create, standard\_allocator\_destroy, standard\_allocator\_alloc, standard\_allocator\_free, "DEFAULT" );

return 1;

}else{

testAllocator( allocator\_create, allocator\_destroy, allocator\_alloc, allocator\_free, argv[1] );

dlclose(handle);

return 0;

}

}

}

} #include <stdio.h>

#include <stdlib.h>

#include <sys/mman.h>

#include <math.h>

#define MIN\_BLOCK\_SIZE 32

#define MAX\_BLOCK\_INDEX 24

typedef struct Block {

size\_t size;

struct Block\* next;

} Block;

typedef struct TwonAllocator {

void\* memory;

size\_t total\_size;

Block\* free\_lists[MAX\_BLOCK\_INDEX];

} TwonAllocator;

size\_t round\_to\_power\_of\_two(size\_t size) {

size\_t power = MIN\_BLOCK\_SIZE;

while (power < size) {

power <<= 1;

}

return power;

}

int get\_power\_of\_two(size\_t size) {

return (int)(log2(size));

}

void\* allocator\_create(void\* const memory, const size\_t size) {

if (!memory || size < MIN\_BLOCK\_SIZE) {

return NULL;

}

TwonAllocator\* allocator = (TwonAllocator\*)mmap(

NULL, sizeof(TwonAllocator), PROT\_READ | PROT\_WRITE, MAP\_PRIVATE | MAP\_ANONYMOUS, -1, 0);

if (allocator == MAP\_FAILED) {

return NULL;

}

size\_t total\_size = round\_to\_power\_of\_two(size);

size\_t max\_size = 1 << (MAX\_BLOCK\_INDEX - 1);

if (total\_size > max\_size) {

munmap(allocator, sizeof(TwonAllocator));

return NULL;

}

allocator->memory = memory;

allocator->total\_size = total\_size;

for (size\_t i = 0; i < MAX\_BLOCK\_INDEX; i++) {

allocator->free\_lists[i] = NULL;

}

Block\* initial\_block = (Block\*)allocator->memory;

initial\_block->size = total\_size;

initial\_block->next = NULL;

int index = get\_power\_of\_two(total\_size) - get\_power\_of\_two(MIN\_BLOCK\_SIZE);

allocator->free\_lists[index] = initial\_block;

return allocator;

}

void allocator\_destroy(void\* const twon\_allocator) {

if (!twon\_allocator) return;

TwonAllocator\* allocator = (TwonAllocator\*)twon\_allocator;

munmap(allocator, sizeof(TwonAllocator));

}

void\* allocator\_alloc(void\* const twon\_allocator, const size\_t size) {

if (!twon\_allocator || size == 0) return NULL;

TwonAllocator\* allocator = (TwonAllocator\*)twon\_allocator;

size\_t block\_size = round\_to\_power\_of\_two(size);

size\_t max\_size = 1 << (MAX\_BLOCK\_INDEX - 1);

if (block\_size > max\_size) {

return NULL;

}

int index = get\_power\_of\_two(block\_size) - get\_power\_of\_two(MIN\_BLOCK\_SIZE);

if (index < 0 || index >= MAX\_BLOCK\_INDEX) {

return NULL;

}

while (index < MAX\_BLOCK\_INDEX && !allocator->free\_lists[index]) {

index++;

}

if (index >= MAX\_BLOCK\_INDEX) {

return NULL;

}

Block\* block = allocator->free\_lists[index];

allocator->free\_lists[index] = block->next;

while (block->size > block\_size) {

size\_t new\_size = block->size >> 1;

Block\* buddy = (Block\*)((char\*)block + new\_size);

buddy->size = new\_size;

buddy->next =

allocator->free\_lists[get\_power\_of\_two(new\_size) - get\_power\_of\_two(MIN\_BLOCK\_SIZE)];

allocator->free\_lists[get\_power\_of\_two(new\_size) - get\_power\_of\_two(MIN\_BLOCK\_SIZE)] =

buddy;

block->size = new\_size;

}

return (void\*)((char\*)block + sizeof(Block));

}

void allocator\_free(void\* const twon\_allocator, void\* const memory) {

if (!twon\_allocator || !memory) return;

TwonAllocator\* allocator = (TwonAllocator\*)twon\_allocator;

Block\* block = (Block\*)((char\*)memory - sizeof(Block));

size\_t block\_size = block->size;

int index = get\_power\_of\_two(block\_size) - get\_power\_of\_two(MIN\_BLOCK\_SIZE);

if (index < 0 || index >= MAX\_BLOCK\_INDEX) return;

block->next = allocator->free\_lists[index];

allocator->free\_lists[index] = block;

} #include <stdio.h>

#include <stdlib.h>

#include <stddef.h>

#include <stdint.h>

#include <math.h>

typedef struct FreeBlock {

size\_t size;

struct FreeBlock \*next;

} FreeBlock;

typedef struct Allocator {

void \*memory;

size\_t size;

FreeBlock \*free\_list;

} Allocator;

Allocator\* allocator\_create(void \*const memory, const size\_t size) {

Allocator \*allocator = (Allocator \*)memory;

allocator->size = size;

allocator->free\_list = (FreeBlock \*)((char \*)memory + sizeof(Allocator));

allocator->free\_list->size = size - sizeof(Allocator);

allocator->free\_list->next = NULL;

return allocator;

}

void allocator\_destroy(Allocator \*const allocator) {

}

void\* allocator\_alloc(Allocator \*const allocator, const size\_t size) {

FreeBlock \*prev = NULL;

FreeBlock \*curr = allocator->free\_list;

while (curr != NULL) {

if (curr->size >= size) {

if (curr->size > size + sizeof(FreeBlock)) {

FreeBlock \*new\_block = (FreeBlock \*)((char \*)curr + size);

new\_block->size = curr->size - size;

new\_block->next = curr->next;

curr->size = size;

curr->next = new\_block;

}

if (prev == NULL) {

allocator->free\_list = curr->next;

} else {

prev->next = curr->next;

}

return (void \*)((char \*)curr + sizeof(FreeBlock));

}

prev = curr;

curr = curr->next;

}

return NULL;

}

void allocator\_free(Allocator \*const allocator, void \*const memory) {

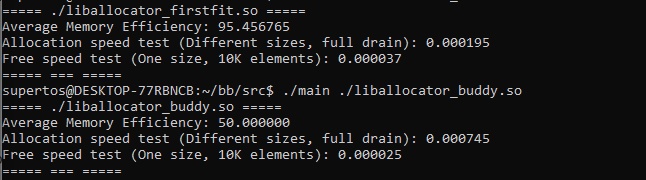
FreeBlock \*block = (FreeBlock \*)((char \*)memory - sizeof(FreeBlock));

block->next = allocator->free\_list;

allocator->free\_list = block;

}

# Сравнение сортировок



Более того, First-Fit алгоритм более удобен, так как работает быстро при любых размерах выделяемого пространства, в то время как алгоритм выделения 2^n требует знания самого ходового размера.

# Протокол работы программы

execve("./main", ["./main", "liballocator\_firstfit.co"], 0x7ffeafe36d38 /\* 24 vars \*/) = 0

brk(NULL) = 0x5555f3da1000

arch\_prctl(0x3001 /\* ARCH\_??? \*/, 0x7fff616830f0) = -1 EINVAL (Invalid argument)

mmap(NULL, 8192, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_ANONYMOUS, -1, 0) = 0x7f007b5fd000

access("/etc/ld.so.preload", R\_OK) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/etc/ld.so.cache", O\_RDONLY|O\_CLOEXEC) = 3

newfstatat(3, "", {st\_mode=S\_IFREG|0644, st\_size=17571, ...}, AT\_EMPTY\_PATH) = 0

mmap(NULL, 17571, PROT\_READ, MAP\_PRIVATE, 3, 0) = 0x7f007b5f8000

close(3) = 0

openat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/libc.so.6", O\_RDONLY|O\_CLOEXEC) = 3

read(3, "\177ELF\2\1\1\3\0\0\0\0\0\0\0\0\3\0>\0\1\0\0\0P\237\2\0\0\0\0\0"..., 832) = 832

pread64(3, "\6\0\0\0\4\0\0\0@\0\0\0\0\0\0\0@\0\0\0\0\0\0\0@\0\0\0\0\0\0\0"..., 784, 64) = 784

pread64(3, "\4\0\0\0 \0\0\0\5\0\0\0GNU\0\2\0\0\300\4\0\0\0\3\0\0\0\0\0\0\0"..., 48, 848) = 48

pread64(3, "\4\0\0\0\24\0\0\0\3\0\0\0GNU\0I\17\357\204\3$\f\221\2039x\324\224\323\236S"..., 68, 896) = 68

newfstatat(3, "", {st\_mode=S\_IFREG|0755, st\_size=2220400, ...}, AT\_EMPTY\_PATH) = 0

pread64(3, "\6\0\0\0\4\0\0\0@\0\0\0\0\0\0\0@\0\0\0\0\0\0\0@\0\0\0\0\0\0\0"..., 784, 64) = 784

mmap(NULL, 2264656, PROT\_READ, MAP\_PRIVATE|MAP\_DENYWRITE, 3, 0) = 0x7f007b3cf000

mprotect(0x7f007b3f7000, 2023424, PROT\_NONE) = 0

mmap(0x7f007b3f7000, 1658880, PROT\_READ|PROT\_EXEC, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0x28000) = 0x7f007b3f7000

mmap(0x7f007b58c000, 360448, PROT\_READ, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0x1bd000) = 0x7f007b58c000

mmap(0x7f007b5e5000, 24576, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0x215000) = 0x7f007b5e5000

mmap(0x7f007b5eb000, 52816, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED|MAP\_ANONYMOUS, -1, 0) = 0x7f007b5eb000

close(3) = 0

mmap(NULL, 12288, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_ANONYMOUS, -1, 0) = 0x7f007b3cc000

arch\_prctl(ARCH\_SET\_FS, 0x7f007b3cc740) = 0

set\_tid\_address(0x7f007b3cca10) = 76592

set\_robust\_list(0x7f007b3cca20, 24) = 0

rseq(0x7f007b3cd0e0, 0x20, 0, 0x53053053) = 0

mprotect(0x7f007b5e5000, 16384, PROT\_READ) = 0

mprotect(0x5555df720000, 4096, PROT\_READ) = 0

mprotect(0x7f007b637000, 8192, PROT\_READ) = 0

prlimit64(0, RLIMIT\_STACK, NULL, {rlim\_cur=8192\*1024, rlim\_max=RLIM64\_INFINITY}) = 0

munmap(0x7f007b5f8000, 17571) = 0

openat(AT\_FDCWD, "/etc/ld.so.cache", O\_RDONLY|O\_CLOEXEC) = 3

newfstatat(3, "", {st\_mode=S\_IFREG|0644, st\_size=17571, ...}, AT\_EMPTY\_PATH) = 0

mmap(NULL, 17571, PROT\_READ, MAP\_PRIVATE, 3, 0) = 0x7f007b5f8000

close(3) = 0

openat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/glibc-hwcaps/x86-64-v4/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/glibc-hwcaps/x86-64-v4", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/glibc-hwcaps/x86-64-v3/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/glibc-hwcaps/x86-64-v3", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/glibc-hwcaps/x86-64-v2/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/glibc-hwcaps/x86-64-v2", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/tls/haswell/avx512\_1/x86\_64/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/tls/haswell/avx512\_1/x86\_64", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/tls/haswell/avx512\_1/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/tls/haswell/avx512\_1", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/tls/haswell/x86\_64/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/tls/haswell/x86\_64", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/tls/haswell/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/tls/haswell", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/tls/avx512\_1/x86\_64/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/tls/avx512\_1/x86\_64", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/tls/avx512\_1/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/tls/avx512\_1", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/tls/x86\_64/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/tls/x86\_64", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/tls/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/tls", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/haswell/avx512\_1/x86\_64/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/haswell/avx512\_1/x86\_64", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/haswell/avx512\_1/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/haswell/avx512\_1", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/haswell/x86\_64/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/haswell/x86\_64", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/haswell/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/haswell", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/avx512\_1/x86\_64/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/avx512\_1/x86\_64", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/avx512\_1/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/avx512\_1", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/x86\_64/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/x86\_64", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/x86\_64-linux-gnu/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/lib/x86\_64-linux-gnu", {st\_mode=S\_IFDIR|0755, st\_size=20480, ...}, 0) = 0

openat(AT\_FDCWD, "/usr/lib/x86\_64-linux-gnu/glibc-hwcaps/x86-64-v4/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/usr/lib/x86\_64-linux-gnu/glibc-hwcaps/x86-64-v4", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/x86\_64-linux-gnu/glibc-hwcaps/x86-64-v3/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/usr/lib/x86\_64-linux-gnu/glibc-hwcaps/x86-64-v3", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/x86\_64-linux-gnu/glibc-hwcaps/x86-64-v2/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/usr/lib/x86\_64-linux-gnu/glibc-hwcaps/x86-64-v2", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/x86\_64-linux-gnu/tls/haswell/avx512\_1/x86\_64/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/usr/lib/x86\_64-linux-gnu/tls/haswell/avx512\_1/x86\_64", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/x86\_64-linux-gnu/tls/haswell/avx512\_1/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/usr/lib/x86\_64-linux-gnu/tls/haswell/avx512\_1", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/x86\_64-linux-gnu/tls/haswell/x86\_64/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/usr/lib/x86\_64-linux-gnu/tls/haswell/x86\_64", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/x86\_64-linux-gnu/tls/haswell/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/usr/lib/x86\_64-linux-gnu/tls/haswell", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/x86\_64-linux-gnu/tls/avx512\_1/x86\_64/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/usr/lib/x86\_64-linux-gnu/tls/avx512\_1/x86\_64", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/x86\_64-linux-gnu/tls/avx512\_1/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/usr/lib/x86\_64-linux-gnu/tls/avx512\_1", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/x86\_64-linux-gnu/tls/x86\_64/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/usr/lib/x86\_64-linux-gnu/tls/x86\_64", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/x86\_64-linux-gnu/tls/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/usr/lib/x86\_64-linux-gnu/tls", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/x86\_64-linux-gnu/haswell/avx512\_1/x86\_64/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/usr/lib/x86\_64-linux-gnu/haswell/avx512\_1/x86\_64", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/x86\_64-linux-gnu/haswell/avx512\_1/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/usr/lib/x86\_64-linux-gnu/haswell/avx512\_1", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/x86\_64-linux-gnu/haswell/x86\_64/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/usr/lib/x86\_64-linux-gnu/haswell/x86\_64", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/x86\_64-linux-gnu/haswell/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/usr/lib/x86\_64-linux-gnu/haswell", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/x86\_64-linux-gnu/avx512\_1/x86\_64/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/usr/lib/x86\_64-linux-gnu/avx512\_1/x86\_64", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/x86\_64-linux-gnu/avx512\_1/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/usr/lib/x86\_64-linux-gnu/avx512\_1", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/x86\_64-linux-gnu/x86\_64/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/usr/lib/x86\_64-linux-gnu/x86\_64", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/x86\_64-linux-gnu/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/usr/lib/x86\_64-linux-gnu", {st\_mode=S\_IFDIR|0755, st\_size=20480, ...}, 0) = 0

openat(AT\_FDCWD, "/lib/glibc-hwcaps/x86-64-v4/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/lib/glibc-hwcaps/x86-64-v4", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/glibc-hwcaps/x86-64-v3/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/lib/glibc-hwcaps/x86-64-v3", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/glibc-hwcaps/x86-64-v2/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/lib/glibc-hwcaps/x86-64-v2", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/tls/haswell/avx512\_1/x86\_64/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/lib/tls/haswell/avx512\_1/x86\_64", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/tls/haswell/avx512\_1/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/lib/tls/haswell/avx512\_1", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/tls/haswell/x86\_64/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/lib/tls/haswell/x86\_64", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/tls/haswell/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/lib/tls/haswell", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/tls/avx512\_1/x86\_64/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/lib/tls/avx512\_1/x86\_64", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/tls/avx512\_1/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/lib/tls/avx512\_1", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/tls/x86\_64/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/lib/tls/x86\_64", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/tls/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/lib/tls", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/haswell/avx512\_1/x86\_64/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/lib/haswell/avx512\_1/x86\_64", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/haswell/avx512\_1/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/lib/haswell/avx512\_1", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/haswell/x86\_64/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/lib/haswell/x86\_64", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/haswell/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/lib/haswell", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/avx512\_1/x86\_64/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/lib/avx512\_1/x86\_64", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/avx512\_1/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/lib/avx512\_1", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/x86\_64/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/lib/x86\_64", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/lib/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/lib", {st\_mode=S\_IFDIR|0755, st\_size=4096, ...}, 0) = 0

openat(AT\_FDCWD, "/usr/lib/glibc-hwcaps/x86-64-v4/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/usr/lib/glibc-hwcaps/x86-64-v4", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/glibc-hwcaps/x86-64-v3/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/usr/lib/glibc-hwcaps/x86-64-v3", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/glibc-hwcaps/x86-64-v2/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/usr/lib/glibc-hwcaps/x86-64-v2", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/tls/haswell/avx512\_1/x86\_64/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/usr/lib/tls/haswell/avx512\_1/x86\_64", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/tls/haswell/avx512\_1/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/usr/lib/tls/haswell/avx512\_1", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/tls/haswell/x86\_64/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/usr/lib/tls/haswell/x86\_64", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/tls/haswell/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/usr/lib/tls/haswell", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/tls/avx512\_1/x86\_64/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/usr/lib/tls/avx512\_1/x86\_64", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/tls/avx512\_1/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/usr/lib/tls/avx512\_1", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/tls/x86\_64/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/usr/lib/tls/x86\_64", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/tls/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/usr/lib/tls", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/haswell/avx512\_1/x86\_64/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/usr/lib/haswell/avx512\_1/x86\_64", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/haswell/avx512\_1/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/usr/lib/haswell/avx512\_1", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/haswell/x86\_64/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/usr/lib/haswell/x86\_64", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/haswell/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/usr/lib/haswell", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/avx512\_1/x86\_64/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/usr/lib/avx512\_1/x86\_64", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/avx512\_1/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/usr/lib/avx512\_1", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/x86\_64/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/usr/lib/x86\_64", 0x7fff616826a0, 0) = -1 ENOENT (No such file or directory)

openat(AT\_FDCWD, "/usr/lib/liballocator\_firstfit.co", O\_RDONLY|O\_CLOEXEC) = -1 ENOENT (No such file or directory)

newfstatat(AT\_FDCWD, "/usr/lib", {st\_mode=S\_IFDIR|0755, st\_size=4096, ...}, 0) = 0

getrandom("\xc3\x82\x21\xf2\x8f\xbd\x8c\xaf", 8, GRND\_NONBLOCK) = 8

brk(NULL) = 0x5555f3da1000

brk(0x5555f3dc2000) = 0x5555f3dc2000

munmap(0x7f007b5f8000, 17571) = 0

newfstatat(1, "", {st\_mode=S\_IFCHR|0620, st\_rdev=makedev(0x88, 0), ...}, AT\_EMPTY\_PATH) = 0

write(1, "===== DEFAULT =====\n", 20===== DEFAULT =====

) = 20

mmap(NULL, 128, PROT\_READ|PROT\_WRITE, MAP\_SHARED|MAP\_ANONYMOUS, -1, 0) = 0x7f007b636000

mmap(NULL, 24, PROT\_READ|PROT\_WRITE, MAP\_SHARED|MAP\_ANONYMOUS, -1, 0) = 0x7f007b5fc000

mmap(NULL, 24, PROT\_READ|PROT\_WRITE, MAP\_SHARED|MAP\_ANONYMOUS, -1, 0) = 0x7f007b5fb000

mmap(NULL, 24, PROT\_READ|PROT\_WRITE, MAP\_SHARED|MAP\_ANONYMOUS, -1, 0) = 0x7f007b5fa000

mmap(NULL, 24, PROT\_READ|PROT\_WRITE, MAP\_SHARED|MAP\_ANONYMOUS, -1, 0) = 0x7f007b5f9000

munmap(0x7f007b636000, 128) = 0

write(1, "Average Memory Efficiency: 50.00"..., 37Average Memory Efficiency: 50.000000

) = 37

write(1, "Allocation speed test (Different"..., 62Allocation speed test (Different sizes, full drain): 0.001729

) = 62

mmap(NULL, 134217728, PROT\_READ|PROT\_WRITE, MAP\_SHARED|MAP\_ANONYMOUS, -1, 0) = 0x7f00733cc000

mmap(NULL, 24, PROT\_READ|PROT\_WRITE, MAP\_SHARED|MAP\_ANONYMOUS, -1, 0) = 0x7f007b636000

munmap(0x7f007b636000, 24) = 0

write(1, "Free speed test (One size, 10K e"..., 51Free speed test (One size, 10K elements): 0.000325

) = 51

write(1, "===== === =====\n", 16===== === =====

) = 16

munmap(0x7f00733cc000, 134217728) = 0

exit\_group(0) = ?

+++ exited with 0 +++

# Вывод

В рамках лабораторной работы была разработана программа, демонстрирующая работу аллокатора передаваемого в качестве аргумента при вызове программы. Было реализовано 2 аллокатора и проведена работа по сравнениб их работоспособности