Московский Авиационный Институт (Национальный Исследовательский Университет)

Институт №8 “Компьютерные науки и прикладная математика” Кафедра №806 “Вычислительная математика и программирование”

# Лабораторная работа №2 по курсу

**«Операционные системы»**

Группа: М8О-213Б-23

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**Вариант 13.**

# Постановка задачи

**Наложить K раз фильтр, использующий матрицу свертки, на матрицу, состоящую из вещественных чисел. Размер окна задается пользователем.**

# Общий метод и алгоритм решения

Использованные системные вызовы:

* write() – записываем число байт из буфера в указанный файловый дескриптор
* read() - чтение данных из файлового дескриптора
* pthread\_mutex\_lock() – блокируем мьютекс
* pthread\_mutex\_unlock() – разблокируем мьютекс
* pthread\_mutex\_init() – инициализируем мьютекс
* pthread\_create() – создаем новый поток с атрибутами
* pthread\_join() – ожидаем завершение потока
* pthread\_mutex\_destroy() – уничтожаем незаблокированный мьютекс

Создадим структуру матрицы, куда из файла будем вводить значения из матрицы.

Генерируем матрицу свертки, размер которой задается ключом программы. Создаем потоки, количество которых задается ключом. В зависимости от количества потоков делим ряды матрицы между ними, каждый поток считает свой участок матрицы и записывает результат в новую матрицу. Для наглядности работы программы, выводим информацию по каждому потоку(когда начал и когда закончил работу), чтобы потоки не мешали друг другу выводить данные используем мьютекс. Если было введено K > 1, в изначальную матрицу копируем полученную матрицу, повторяем тот же алгоритм. После сохраняем результат в файл.

|  |  |
| --- | --- |
| Количество потоков (К) | Производительность |
| 1 | 5.93с |
| 3 | 5.67с |
| 5 | 5.40с |

# Код программы

**main.c**

#include <pthread.h> #include <unistd.h> #include <stdlib.h> #include <time.h> #include <fcntl.h> #include <stdio.h> #include <string.h>

pthread\_mutex\_t print\_mutex = PTHREAD\_MUTEX\_INITIALIZER;

typedef struct Matrix { float\*\* matrix;

int rows; int columns;

} Matrix;

typedef struct ThreadData { float\*\* input;

float\*\* kernel; float\*\* output; int start\_row; int end\_row; int rows;

int cols;

int kernel\_size; int id;

} ThreadData;

float\*\* allocate\_matrix(int rows, int cols) {

float\*\* matrix = (float\*\*)malloc(rows \* sizeof(float\*)); for (int i = 0; i < rows; i++) {

matrix[i] = (float\*)calloc(cols, sizeof(float));

}

return matrix;

}

Matrix\* CreateMatrix(int rows, int cols) { Matrix\* m = (Matrix\*)malloc(sizeof(Matrix));

m->matrix = allocate\_matrix(rows + 2, cols + 2); m->rows = rows + 2;

m->columns = cols + 2;

return m;

}

void FreeMatrix(Matrix\* m) {

for (int i = 0; i < m->rows; i++) { free(m->matrix[i]);

}

free(m->matrix); free(m);

}

Matrix\* ProcessFile(const char\* filename) { int file = open(filename, O\_RDONLY);

if (file < 0) {

char msg[] = "Ошибка: не удалось открыть файл.\n"; write(STDERR\_FILENO, msg, sizeof(msg) - 1);

return NULL;

}

int rows, cols; char buffer[100];

int len = read(file, buffer, sizeof(buffer)); buffer[len] = '\0';

sscanf(buffer, "%d %d", &rows, &cols);

Matrix\* m = CreateMatrix(rows, cols);

for (int i = 0; i < rows; i++) {

for (int j = 0; j < cols; j++) {

len = read(file, buffer, sizeof(buffer)); buffer[len] = '\0';

sscanf(buffer, "%f", &m->matrix[i + 1][j + 1]);

}

}

close(file); return m;

}

void\* ApplyConvolutionThread(void\* arg) { ThreadData\* data = (ThreadData\*)arg; int offset = data->kernel\_size / 2; pthread\_mutex\_lock(&print\_mutex); char msg[100];

snprintf(msg, sizeof(msg), "Работает %d поток с %d по %d ряд\n", data->id, data->start\_row, data->end\_row);

write(STDOUT\_FILENO, msg, strlen(msg)); pthread\_mutex\_unlock(&print\_mutex);

for (int i = data->start\_row; i < data->end\_row; i++) { for (int j = offset; j < data->cols - offset; j++) {

float sum = 0.0;

int row\_offset = i - offset; int col\_offset = j - offset;

for (int ki = 0; ki < data->kernel\_size; ki++) {

for (int kj = 0; kj < data->kernel\_size; kj++) {

sum += data->input[row\_offset + ki][col\_offset + kj] \* data-

>kernel[ki][kj];

}

}

data->output[i][j] = sum;

}

}

pthread\_mutex\_lock(&print\_mutex);

snprintf(msg, sizeof(msg), "%d поток закончил работу\n", data->id); write(STDOUT\_FILENO, msg, strlen(msg)); pthread\_mutex\_unlock(&print\_mutex);

return NULL;

}

void save\_matrix\_to\_file(float\*\* matrix, int rows, int cols, const char\* filename) {

int file = open(filename, O\_WRONLY | O\_CREAT | O\_TRUNC, 0644); if (file < 0) {

char msg[] = "Ошибка: не удалось сохранить файл.\n"; write(STDERR\_FILENO, msg, sizeof(msg) - 1);

return;

}

char buffer[50];

for (int i = 1; i < rows - 1; i++) {

for (int j = 1; j < cols - 1; j++) {

int len = snprintf(buffer, sizeof(buffer), "%6.2f ", matrix[i][j]); write(file, buffer, len);

}

write(file, "\n", 1);

}

close(file);

}

void ApplyConvolution(float\*\* input, float\*\* kernel, float\*\* output, int rows, int cols, int kernel\_size, int num\_threads) {

pthread\_t threads[num\_threads]; ThreadData thread\_data[num\_threads];

int offset = kernel\_size / 2;

int rows\_per\_thread = (rows - 2 \* offset) / num\_threads; int extra\_rows = (rows - 2 \* offset) % num\_threads;

for (int t = 0; t < num\_threads; t++) { thread\_data[t].id = t; thread\_data[t].input = input; thread\_data[t].kernel = kernel; thread\_data[t].output = output; thread\_data[t].rows = rows; thread\_data[t].cols = cols;

thread\_data[t].kernel\_size = kernel\_size; thread\_data[t].start\_row = t \* rows\_per\_thread + offset; thread\_data[t].end\_row = (t + 1) \* rows\_per\_thread + offset;

if (t == num\_threads - 1) { thread\_data[t].end\_row += extra\_rows;

}

pthread\_create(&threads[t], NULL, ApplyConvolutionThread, &thread\_data[t]);

}

for (int t = 0; t < num\_threads; t++) { pthread\_join(threads[t], NULL);

}

}

int main(int argc, char\* argv[]) { if (argc != 4) {

char msg[] = "Usage: ./main <count> <kernel size> <max\_threads>\n"; write(STDERR\_FILENO, msg, sizeof(msg) - 1);

return 1;

}

int K = atoi(argv[1]);

int kernel\_size = atoi(argv[2]); int count\_thread = atoi(argv[3]);

Matrix\* m = ProcessFile("gen.txt"); clock\_t start, end;

double cpu\_time\_used; start = clock();

if (kernel\_size > m->rows || kernel\_size > m->columns || kernel\_size % 2 == 0) {

char msg[] = "Некорректный размер окна свёртки.\n"; write(STDERR\_FILENO, msg, sizeof(msg) - 1);

return -1;

}

float\*\* kernel = allocate\_matrix(kernel\_size, kernel\_size); for (int i = 0; i < kernel\_size; i++) {

for (int j = 0; j < kernel\_size; j++) {

kernel[i][j] = 1.0 / (kernel\_size \* kernel\_size);

}

}

float\*\* output = allocate\_matrix(m->rows, m->columns);

for (int k = 0; k < K; k++) {

ApplyConvolution(m->matrix, kernel, output, m->rows, m->columns, kernel\_size, count\_thread);

float\*\* temp = m->matrix; m->matrix = output; output = temp;

}

end = clock();

cpu\_time\_used = ((double)(end - start)) / CLOCKS\_PER\_SEC; printf("%lf\n", cpu\_time\_used);

save\_matrix\_to\_file(m->matrix, m->rows, m->columns, "output\_matrix.txt"); pthread\_mutex\_destroy(&print\_mutex);

FreeMatrix(m); free(output); free(kernel);

return 0;

}

# Протокол работы программы

**Некорректный ввод:**

**traktor@traktor-MaiBook-X-series:~/OS/MAI\_OS/lab02$ ./a.out 13 Usage: ./main <count> <kernel size> <max\_threads>**

**10 раз, 3х3 окно, максимум 2 потока:**

**traktor@traktor-MaiBook-X-series:~/OS/MAI\_OS/lab02$ ./a.out 10 3 2**

**Работает 1 поток с 251 по 501 ряд**

**Работает 0 поток с 1 по 251 ряд**

**0 поток закончил работу**

**1 поток закончил работу Работает 0 поток с 1 по 251 ряд**

**Работает 1 поток с 251 по 501 ряд**

**0 поток закончил работу**

**1 поток закончил работу Работает 1 поток с 251 по 501 ряд**

**Работает 0 поток с 1 по 251 ряд 1 поток закончил работу**

**0 поток закончил работу Работает 0 поток с 1 по 251 ряд**

**Работает 1 поток с 251 по 501 ряд 1 поток закончил работу**

**0 поток закончил работу Работает 0 поток с 1 по 251 ряд**

**Работает 1 поток с 251 по 501 ряд 1 поток закончил работу**

**0 поток закончил работу Работает 0 поток с 1 по 251 ряд**

**Работает 1 поток с 251 по 501 ряд 1 поток закончил работу**

**0 поток закончил работу Работает 1 поток с 251 по 501 ряд**

**Работает 0 поток с 1 по 251 ряд**

**0 поток закончил работу**

**1 поток закончил работу Работает 0 поток с 1 по 251 ряд**

**Работает 1 поток с 251 по 501 ряд**

**0 поток закончил работу**

**1 поток закончил работу Работает 0 поток с 1 по 251 ряд**

**Работает 1 поток с 251 по 501 ряд**

**0 поток закончил работу**

**1 поток закончил работу Работает 0 поток с 1 по 251 ряд**

**Работает 1 поток с 251 по 501 ряд**

**0 поток закончил работу**

**1 поток закончил работу**

**Strace:**

strace -f ./main 3 3 3

**execve("./main", ["./main", "3", "3", "3"], 0x7fffd47b0810 /\* 79 vars \*/) = 0**

brk(NULL) = 0x5b306c263000

mmap(NULL, 8192, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_ANONYMOUS, -1, 0) = 0x723016222000

access("/etc/ld.so.preload", R\_OK) = -1 ENOENT (Нет такого файла или каталога) openat(AT\_FDCWD, "/etc/ld.so.cache", O\_RDONLY|O\_CLOEXEC) = 3

fstat(3, {st\_mode=S\_IFREG|0644, st\_size=73955, ...}) = 0

mmap(NULL, 73955, PROT\_READ, MAP\_PRIVATE, 3, 0) = 0x72301620f000

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\0\220\243\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 fstat(3, {st\_mode=S\_IFREG|0755, st\_size=2125328, ...}) = 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, 2170256, PROT\_READ, MAP\_PRIVATE|MAP\_DENYWRITE, 3, 0) = 0x723015e00000 mmap(0x723015e28000, 1605632, PROT\_READ|PROT\_EXEC, MAP\_PRIVATE|MAP\_FIXED| MAP\_DENYWRITE, 3, 0x28000) = 0x723015e28000

mmap(0x723015fb0000, 323584, PROT\_READ, MAP\_PRIVATE|MAP\_FIXED|MAP\_DENYWRITE, 3, 0x1b0000) = 0x723015fb0000

mmap(0x723015fff000, 24576, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED| MAP\_DENYWRITE, 3, 0x1fe000) = 0x723015fff000

mmap(0x723016005000, 52624, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_FIXED| MAP\_ANONYMOUS, -1, 0) = 0x723016005000

close(3) = 0

mmap(NULL, 12288, PROT\_READ|PROT\_WRITE, MAP\_PRIVATE|MAP\_ANONYMOUS, -1, 0) = 0x72301620c000

arch\_prctl(ARCH\_SET\_FS, 0x72301620c740) = 0 set\_tid\_address(0x72301620ca10) = 117489

set\_robust\_list(0x72301620ca20, 24) = 0

rseq(0x72301620d060, 0x20, 0, 0x53053053) = 0

mprotect(0x723015fff000, 16384, PROT\_READ) = 0

mprotect(0x5b306c020000, 4096, PROT\_READ) = 0

mprotect(0x72301625a000, 8192, PROT\_READ) = 0

prlimit64(0, RLIMIT\_STACK, NULL, {rlim\_cur=8192\*1024, rlim\_max=RLIM64\_INFINITY}) = 0 munmap(0x72301620f000, 73955) = 0

**openat(AT\_FDCWD, "gen.txt", O\_RDONLY) = 3 read(3, "10 10\n91.78 92.73 1.61 42.26 81."..., 100) = 100**

getrandom("\x7d\x64\xb1\xb5\xad\x76\x73\xe4", 8, GRND\_NONBLOCK) = 8 brk(NULL) = 0x5b306c263000

brk(0x5b306c284000) = 0x5b306c284000 read(3, "14.09 29.04 57.49 92.21 84.69 69"..., 100) = 100

read(3, "85.97 36.80 8.64 33.25 61.40 82."..., 100) = 100

read(3, "4.45 55.14 41.29 75.15 89.68 36."..., 100) = 100

read(3, "2.10 4.49 3.57 38.45 91.77 58.37"..., 100) = 100

read(3, ".36 55.22 59.64 67.33 6.25 88.16"..., 100) = 100

read(3, "44 24.70 88.27 68.98 20.86 14.79"..., 100) = 100

read(3, "43 46.34 82.95 11.50 38.20 83.99"..., 100) = 100

read(3, "5.30 3.78 2.23 64.23 34.72 25.77"..., 100) = 100

read(3, ".56 93.06 43.97 38.42 36.03 27.8"..., 100) = 100

read(3, "7 43.36 19.94 33.13 90.47 52.45 "..., 100) = 100

read(3, "1 94.02 81.59 23.83 99.33 25.32 "..., 100) = 100

read(3, " 93.12 62.32 24.95 65.85 12.40 3"..., 100) = 100

read(3, "17 51.31 86.01 43.94 55.14 41.37"..., 100) = 100

read(3, "0.71 15.45 25.40 55.74 31.07 17."..., 100) = 100

read(3, "8.62 72.08 23.62 43.19 22.98 5.7"..., 100) = 100

read(3, "0.26 49.67 70.84 5.96 6.11 3.00 "..., 100) = 100

read(3, " 97.25 49.46 3.03 61.06 27.51 56"..., 100) = 100

read(3, "34.09 29.80 71.68 75.75 39.30 56"..., 100) = 100

read(3, "0 91.69 54.51 81.87 67.24 55.84 "..., 100) = 100

read(3, ".55 57.72 22.14 78.47 71.36 75.6"..., 100) = 100

read(3, "35 60.53 20.03 62.93 30.82 71.72"..., 100) = 100

read(3, "9.41 41.73 90.71 57.00 46.87 82."..., 100) = 100

read(3, "20.55 14.23 95.18 3.38 71.30 64."..., 100) = 100

read(3, " 1.42 5.70 62.79 29.39 35.26 59."..., 100) = 100

read(3, "77.41 50.78 61.25 11.48 32.20 45"..., 100) = 100

read(3, " 45.60 75.09 98.57 4.57 49.58 94"..., 100) = 100

read(3, "7 10.83 14.13 32.01 69.04 20.69 "..., 100) = 100

read(3, "46 83.54 42.99 24.88 69.96 70.48"..., 100) = 100

read(3, ".46 73.95 69.52 45.82 18.29 86.2"..., 100) = 100

read(3, "6.39 28.80 21.96 39.18 50.43 21."..., 100) = 100

read(3, ".81 25.13 42.47 9.78 21.89 21.62"..., 100) = 100

read(3, ".73 19.49 40.19 13.64 22.69 86.2"..., 100) = 100

read(3, "37 28.40 67.63 7.49 65.37 0.29 8"..., 100) = 100

read(3, " 40.43 53.07 50.02 1.02 96.87 24"..., 100) = 100

read(3, " 6.21 65.79 31.02 17.03 40.24 60"..., 100) = 100

read(3, " 17.65 68.15 32.95 65.97 9.80 38"..., 100) = 100

read(3, "7 15.40 87.22 10.97 40.18 42.48 "..., 100) = 100

read(3, "22 45.86 58.99 31.10 63.69 2.03 "..., 100) = 100

read(3, "16 28.51 37.25 30.58 20.08 29.73"..., 100) = 100

read(3, "3.18 27.88 21.13 45.59 7.26 0.80"..., 100) = 100

read(3, "4 30.02 37.14 18.33 59.88 17.73 "..., 100) = 100

read(3, ".44 74.44 71.92 18.60 42.28 72.1"..., 100) = 100

read(3, "4.59 92.98 50.10 51.36 63.77 7.6"..., 100) = 100

read(3, "7.24 49.65 59.86 78.94 67.31 82."..., 100) = 100

read(3, "8.74 64.98 40.53 65.21 59.64 37."..., 100) = 100

read(3, ".91 88.23 50.06 54.97 43.37 66.5"..., 100) = 100

read(3, ".72 64.17 87.74 81.68 68.47 75.8"..., 100) = 100

read(3, "54.41 69.38 80.65 84.52 63.12 40"..., 100) = 100

read(3, "3 4.72 99.57 62.36 50.30 88.12 7"..., 100) = 100

read(3, " 29.80 63.44 83.21 52.67 3.04 70"..., 100) = 100

read(3, "5 20.38 0.81 74.57 87.53 85.28 6"..., 100) = 100

read(3, "5 84.65 90.20 92.67 99.73 42.17 "..., 100) = 100

read(3, "78.35 93.62 70.46 70.81 27.36 27"..., 100) = 100

read(3, " 45.89 37.43 13.39 27.63 30.36 1"..., 100) = 100

read(3, "37 24.16 59.35 92.72 18.36 82.98"..., 100) = 100

read(3, "3.57 3.46 4.40 37.32 25.94 64.98"..., 100) = 100

read(3, ".43 92.39 68.64 30.68 28.66 14.7"..., 100) = 100

read(3, "7.56 49.62 50.02 39.06 5.58 5.46"..., 100) = 100

read(3, "0.63 80.50 95.23 25.09 50.51 41."..., 100) = 100

read(3, " 35.24 68.58 78.28 70.80 68.49 3"..., 100) = 100

read(3, " 21.29 98.53 24.06 90.76 55.65 2"..., 100) = 100

read(3, "0 3.27 93.89 1.40 59.51 88.60 7."..., 100) = 100

read(3, " 0.82 44.91 11.18 81.28 38.32 12"..., 100) = 100

read(3, " 4.73 39.83 19.25 79.92 35.03 11"..., 100) = 100

read(3, "92.75 85.86 94.19 67.86 40.37 3."..., 100) = 100

read(3, "5.49 83.22 38.07 98.12 0.58 38.6"..., 100) = 100

read(3, "21.39 87.88 33.21 21.19 71.80 78"..., 100) = 100

read(3, "7 38.83 18.67 76.53 50.31 1.28 2"..., 100) = 100

read(3, "75 82.74 33.26 31.58 61.06 99.82"..., 100) = 100

read(3, "8 96.32 20.64 13.43 60.74 75.31 "..., 100) = 100

read(3, "0 45.55 54.94 70.44 93.28 28.31 "..., 100) = 100

read(3, "4 47.17 91.88 13.59 33.98 57.20 "..., 100) = 100

read(3, ".35 78.90 54.61 56.26 54.78 56.0"..., 100) = 100

read(3, "5.88 58.02 92.92 49.68 52.40 34."..., 100) = 100

read(3, "9.20 64.60 77.00 39.54 95.94 45."..., 100) = 100

read(3, "2.22 41.31 30.68 47.47 9.95 45.3"..., 100) = 100

read(3, "0.65 94.05 59.78 0.64 17.27 74.1"..., 100) = 100

read(3, ".02 78.57 58.85 45.79 28.52 67.8"..., 100) = 100

read(3, ".13 12.42 30.02 69.63 96.74 0.82"..., 100) = 100

read(3, "53 11.04 6.77 38.02 55.81 66.50 "..., 100) = 100

read(3, ".58 46.42 20.56 58.61 30.26 84.7"..., 100) = 100

read(3, "83.71 47.25 89.21 24.72 85.00 46"..., 100) = 100

read(3, "5.50 30.45 33.56 49.44 27.35 87."..., 100) = 100

read(3, "19.29 51.43 78.77 86.13 70.27 44"..., 100) = 100

read(3, " 92.28 1.98 77.49 39.61 6.33 42."..., 100) = 100

read(3, "3.49 74.67 24.78 43.71 53.48 15."..., 100) = 100

read(3, "32 14.84 26.15 44.67 41.46 79.66"..., 100) = 100

read(3, "2.31 16.71 33.62 80.02 77.29 36."..., 100) = 100

read(3, "41.31 83.24 89.14 72.51 94.34 16"..., 100) = 100

read(3, "2.90 2.48 89.14 44.81 96.29 70.7"..., 100) = 100

read(3, "0.54 9.54 94.93 57.22 16.85 6.90"..., 100) = 100

read(3, ".07 34.89 49.93 61.31 31.00 40.0"..., 100) = 100

read(3, "2.51 25.06 79.24 14.97 42.84 46."..., 100) = 100

read(3, "79.72 66.53 39.07 31.22 76.96 65"..., 100) = 100

read(3, " 3.29 89.44 52.00 29.20 69.37 19"..., 100) = 100

read(3, "1 68.75 70.88 92.39 83.43 47.19 "..., 100) = 100

read(3, "26 9.55 23.73 3.33 0.78 63.07 42"..., 100) = 100

read(3, "90.26 32.02 71.02 87.04 32.93 59"..., 100) = 100

read(3, " 27.52 11.42 22.47 20.16 62.97 2"..., 100) = 100

read(3, "0 45.24 3.89 56.66 50.59 63.79 9"..., 100) = 100

close(3) = 0

clock\_gettime(CLOCK\_PROCESS\_CPUTIME\_ID, {tv\_sec=0, tv\_nsec=2007604}) = 0 rt\_sigaction(SIGRT\_1, {sa\_handler=0x723015e99520, sa\_mask=[], sa\_flags=SA\_RESTORER| SA\_ONSTACK|SA\_RESTART|SA\_SIGINFO, sa\_restorer=0x723015e45320}, NULL, 8) = 0

rt\_sigprocmask(SIG\_UNBLOCK, [RTMIN RT\_1], NULL, 8) = 0

mmap(NULL, 8392704, PROT\_NONE, MAP\_PRIVATE|MAP\_ANONYMOUS|MAP\_STACK, -1, 0) = 0x723015400000

mprotect(0x723015401000, 8388608, PROT\_READ|PROT\_WRITE) = 0

rt\_sigprocmask(SIG\_BLOCK, ~[], [], 8) = 0 **clone3({flags=CLONE\_VM|CLONE\_FS|CLONE\_FILES|CLONE\_SIGHAND|CLONE\_THREAD| CLONE\_SYSVSEM|CLONE\_SETTLS|CLONE\_PARENT\_SETTID|CLONE\_CHILD\_CLEARTID,**

**child\_tid=0x723015c00990, parent\_tid=0x723015c00990, exit\_signal=0, stack=0x723015400000, stack\_size=0x7fff80, tls=0x723015c006c0}strace: Process 117490 attached**

**=> {parent\_tid=[117490]}, 88) = 117490**

[pid 117489] rt\_sigprocmask(SIG\_SETMASK, [], NULL, 8) = 0

**[pid 117489] mmap(NULL, 8392704, PROT\_NONE, MAP\_PRIVATE|MAP\_ANONYMOUS|**

**MAP\_STACK, -1, 0 <unfinished ...>**

[pid 117490] rseq(0x723015c00fe0, 0x20, 0, 0x53053053 <unfinished ...> [pid 117489] <... mmap resumed>) = 0x723014a00000

[pid 117490] <... rseq resumed>) = 0

**[pid 117489] mprotect(0x723014a01000, 8388608, PROT\_READ|PROT\_WRITE <unfinished ...>**

[pid 117490] set\_robust\_list(0x723015c009a0, 24 <unfinished ...> [pid 117489] <... mprotect resumed>) = 0

[pid 117490] <... set\_robust\_list resumed>) = 0

[pid 117489] rt\_sigprocmask(SIG\_BLOCK, ~[], <unfinished ...> [pid 117490] rt\_sigprocmask(SIG\_SETMASK, [], <unfinished ...> [pid 117489] <... rt\_sigprocmask resumed>[], 8) = 0

[pid 117490] <... rt\_sigprocmask resumed>NULL, 8) = 0

**[pid 117489] clone3({flags=CLONE\_VM|CLONE\_FS|CLONE\_FILES|CLONE\_SIGHAND| CLONE\_THREAD|CLONE\_SYSVSEM|CLONE\_SETTLS|CLONE\_PARENT\_SETTID|**

**CLONE\_CHILD\_CLEARTID, child\_tid=0x723015200990, parent\_tid=0x723015200990, exit\_signal=0, stack=0x723014a00000, stack\_size=0x7fff80, tls=0x7230152006c0} <unfinished ...>** [pid 117490] write(1, "\320\240\320\260\320\261\320\276\321\202\320\260\320\265\321\202 0 \

320\277\320\276\321\202\320\276\320\272 \321\201"..., 49strace: Process 117491 attached

<unfinished ...>

[pid 117489] <... clone3 resumed> => {parent\_tid=[117491]}, 88) = 117491 [pid 117489] rt\_sigprocmask(SIG\_SETMASK, [], <unfinished ...>

[pid 117491] rseq(0x723015200fe0, 0x20, 0, 0x53053053 <unfinished ...> [pid 117489] <... rt\_sigprocmask resumed>NULL, 8) = 0

[pid 117490] <... write resumed>) = 49

**[pid 117489] mmap(NULL, 8392704, PROT\_NONE, MAP\_PRIVATE|MAP\_ANONYMOUS|**

**MAP\_STACK, -1, 0 <unfinished ...>**

[pid 117491] <... rseq resumed>) = 0

[pid 117489] <... mmap resumed>) = 0x723014000000

[pid 117490] write(1, "0 \320\277\320\276\321\202\320\276\320\272 \ 320\267\320\260\320\272\320\276\320\275\321\207\320\270\320\273 \321\200"..., 43 <unfinished ...>

**[pid 117489] mprotect(0x723014001000, 8388608, PROT\_READ|PROT\_WRITE <unfinished ...>**

[pid 117491] set\_robust\_list(0x7230152009a0, 24 <unfinished ...> [pid 117489] <... mprotect resumed>) = 0

[pid 117490] <... write resumed>) = 43

[pid 117489] rt\_sigprocmask(SIG\_BLOCK, ~[], <unfinished ...> [pid 117491] <... set\_robust\_list resumed>) = 0

[pid 117489] <... rt\_sigprocmask resumed>[], 8) = 0

[pid 117490] rt\_sigprocmask(SIG\_BLOCK, ~[RT\_1], <unfinished ...>

**[pid 117489] clone3({flags=CLONE\_VM|CLONE\_FS|CLONE\_FILES|CLONE\_SIGHAND| CLONE\_THREAD|CLONE\_SYSVSEM|CLONE\_SETTLS|CLONE\_PARENT\_SETTID|**

**CLONE\_CHILD\_CLEARTID, child\_tid=0x723014800990, parent\_tid=0x723014800990, exit\_signal=0, stack=0x723014000000, stack\_size=0x7fff80, tls=0x7230148006c0} <unfinished ...>** [pid 117491] rt\_sigprocmask(SIG\_SETMASK, [], <unfinished ...>

[pid 117490] <... rt\_sigprocmask resumed>NULL, 8) = 0

[pid 117491] <... rt\_sigprocmask resumed>NULL, 8) = 0 strace: Process 117492 attached

[pid 117489] <... clone3 resumed> => {parent\_tid=[117492]}, 88) = 117492

[pid 117490] madvise(0x723015400000, 8368128, MADV\_DONTNEED <unfinished ...>

[pid 117491] write(1, "\320\240\320\260\320\261\320\276\321\202\320\260\320\265\321\202 1 \

320\277\320\276\321\202\320\276\320\272 \321\201"..., 49 <unfinished ...> [pid 117489] rt\_sigprocmask(SIG\_SETMASK, [], <unfinished ...>

[pid 117492] rseq(0x723014800fe0, 0x20, 0, 0x53053053 <unfinished ...> [pid 117490] <... madvise resumed>) = 0

[pid 117489] <... rt\_sigprocmask resumed>NULL, 8) = 0 [pid 117492] <... rseq resumed>) = 0

[pid 117491] <... write resumed>) = 49

**[pid 117489] futex(0x723015c00990, FUTEX\_WAIT\_BITSET|FUTEX\_CLOCK\_REALTIME, 117490, NULL, FUTEX\_BITSET\_MATCH\_ANY <unfinished ...>**

[pid 117492] set\_robust\_list(0x7230148009a0, 24 <unfinished ...> [pid 117490] exit(0 <unfinished ...>

[pid 117492] <... set\_robust\_list resumed>) = 0

[pid 117491] write(1, "1 \320\277\320\276\321\202\320\276\320\272 \ 320\267\320\260\320\272\320\276\320\275\321\207\320\270\320\273 \321\200"..., 43 <unfinished ...>

[pid 117492] rt\_sigprocmask(SIG\_SETMASK, [], <unfinished ...> [pid 117490] <... exit resumed>) = ?

[pid 117492] <... rt\_sigprocmask resumed>NULL, 8) = 0 [pid 117491] <... write resumed>) = 43

**[pid 117492] futex(0x5b306c021040, FUTEX\_WAIT\_PRIVATE, 2, NULL <unfinished ...> [pid 117489] <... futex resumed>) = 0**

**[pid 117491] futex(0x5b306c021040, FUTEX\_WAKE\_PRIVATE, 1 <unfinished ...> [pid 117490] +++ exited with 0 +++**

**[pid 117489] futex(0x723015200990, FUTEX\_WAIT\_BITSET|FUTEX\_CLOCK\_REALTIME, 117491, NULL, FUTEX\_BITSET\_MATCH\_ANY <unfinished ...>**

**[pid 117492] <... futex resumed>) = -1 EAGAIN (Ресурс временно недоступен) [pid 117491] <... futex resumed>) = 0**

[pid 117492] write(1, "\320\240\320\260\320\261\320\276\321\202\320\260\320\265\321\202 2 \

320\277\320\276\321\202\320\276\320\272 \321\201"..., 50 <unfinished ...> [pid 117491] rt\_sigprocmask(SIG\_BLOCK, ~[RT\_1], <unfinished ...>

[pid 117492] <... write resumed>) = 50

[pid 117491] <... rt\_sigprocmask resumed>NULL, 8) = 0

[pid 117492] futex(0x5b306c021040, FUTEX\_WAKE\_PRIVATE, 1 <unfinished ...> [pid 117491] madvise(0x723014a00000, 8368128, MADV\_DONTNEED <unfinished ...> [pid 117492] <... futex resumed>) = 0

[pid 117491] <... madvise resumed>) = 0

[pid 117492] write(1, "2 \320\277\320\276\321\202\320\276\320\272 \ 320\267\320\260\320\272\320\276\320\275\321\207\320\270\320\273 \321\200"..., 43 <unfinished ...>

[pid 117491] exit(0 <unfinished ...>

[pid 117492] <... write resumed>) = 43 [pid 117491] <... exit resumed>) = ?

[pid 117492] rt\_sigprocmask(SIG\_BLOCK, ~[RT\_1], <unfinished ...> [pid 117491] +++ exited with 0 +++

[pid 117489] <... futex resumed>) = 0

[pid 117492] <... rt\_sigprocmask resumed>NULL, 8) = 0

**[pid 117489] futex(0x723014800990, FUTEX\_WAIT\_BITSET|FUTEX\_CLOCK\_REALTIME, 117492, NULL, FUTEX\_BITSET\_MATCH\_ANY <unfinished ...>**

[pid 117492] madvise(0x723014000000, 8368128, MADV\_DONTNEED) = 0

[pid 117492] exit(0) = ?

[pid 117489] <... futex resumed>) = 0 [pid 117492] +++ exited with 0 +++ rt\_sigprocmask(SIG\_BLOCK, ~[], [], 8) = 0

**clone3({flags=CLONE\_VM|CLONE\_FS|CLONE\_FILES|CLONE\_SIGHAND|CLONE\_THREAD| CLONE\_SYSVSEM|CLONE\_SETTLS|CLONE\_PARENT\_SETTID|CLONE\_CHILD\_CLEARTID,**

**child\_tid=0x723014800990, parent\_tid=0x723014800990, exit\_signal=0, stack=0x723014000000, stack\_size=0x7fff80, tls=0x7230148006c0}strace: Process 117493 attached**

**=> {parent\_tid=[117493]}, 88) = 117493**

[pid 117493] rseq(0x723014800fe0, 0x20, 0, 0x53053053 <unfinished ...> [pid 117489] rt\_sigprocmask(SIG\_SETMASK, [], <unfinished ...>

[pid 117493] <... rseq resumed>) = 0

[pid 117489] <... rt\_sigprocmask resumed>NULL, 8) = 0

[pid 117493] set\_robust\_list(0x7230148009a0, 24 <unfinished ...> [pid 117489] rt\_sigprocmask(SIG\_BLOCK, ~[], <unfinished ...> [pid 117493] <... set\_robust\_list resumed>) = 0

[pid 117489] <... rt\_sigprocmask resumed>[], 8) = 0

[pid 117493] rt\_sigprocmask(SIG\_SETMASK, [], <unfinished ...>

**[pid 117489] clone3({flags=CLONE\_VM|CLONE\_FS|CLONE\_FILES|CLONE\_SIGHAND| CLONE\_THREAD|CLONE\_SYSVSEM|CLONE\_SETTLS|CLONE\_PARENT\_SETTID|**

**CLONE\_CHILD\_CLEARTID, child\_tid=0x723015200990, parent\_tid=0x723015200990, exit\_signal=0, stack=0x723014a00000, stack\_size=0x7fff80, tls=0x7230152006c0} <unfinished ...>**

[pid 117493] <... rt\_sigprocmask resumed>NULL, 8) = 0

[pid 117493] write(1, "\320\240\320\260\320\261\320\276\321\202\320\260\320\265\321\202 0 \

320\277\320\276\321\202\320\276\320\272 \321\201"..., 49strace: Process 117494 attached

<unfinished ...>

[pid 117489] <... clone3 resumed> => {parent\_tid=[117494]}, 88) = 117494 [pid 117494] rseq(0x723015200fe0, 0x20, 0, 0x53053053 <unfinished ...> [pid 117489] rt\_sigprocmask(SIG\_SETMASK, [], <unfinished ...>

[pid 117493] <... write resumed>) = 49

[pid 117489] <... rt\_sigprocmask resumed>NULL, 8) = 0 [pid 117494] <... rseq resumed>) = 0

[pid 117489] rt\_sigprocmask(SIG\_BLOCK, ~[], <unfinished ...>

[pid 117493] write(1, "0 \320\277\320\276\321\202\320\276\320\272 \ 320\267\320\260\320\272\320\276\320\275\321\207\320\270\320\273 \321\200"..., 43 <unfinished ...>

[pid 117489] <... rt\_sigprocmask resumed>[], 8) = 0

**[pid 117494] set\_robust\_list(0x7230152009a0, 24 <unfinished ...>**

**[pid 117489] clone3({flags=CLONE\_VM|CLONE\_FS|CLONE\_FILES|CLONE\_SIGHAND| CLONE\_THREAD|CLONE\_SYSVSEM|CLONE\_SETTLS|CLONE\_PARENT\_SETTID|**

**CLONE\_CHILD\_CLEARTID, child\_tid=0x723015c00990, parent\_tid=0x723015c00990, exit\_signal=0, stack=0x723015400000, stack\_size=0x7fff80, tls=0x723015c006c0} <unfinished ...>** [pid 117493] <... write resumed>) = 43

[pid 117494] <... set\_robust\_list resumed>) = 0

[pid 117493] rt\_sigprocmask(SIG\_BLOCK, ~[RT\_1], strace: Process 117495 attached

<unfinished ...>

[pid 117494] rt\_sigprocmask(SIG\_SETMASK, [], <unfinished ...> [pid 117493] <... rt\_sigprocmask resumed>NULL, 8) = 0

[pid 117489] <... clone3 resumed> => {parent\_tid=[117495]}, 88) = 117495 [pid 117495] rseq(0x723015c00fe0, 0x20, 0, 0x53053053 <unfinished ...> [pid 117494] <... rt\_sigprocmask resumed>NULL, 8) = 0

[pid 117489] rt\_sigprocmask(SIG\_SETMASK, [], <unfinished ...> [pid 117495] <... rseq resumed>) = 0

[pid 117493] madvise(0x723014000000, 8368128, MADV\_DONTNEED <unfinished ...> [pid 117489] <... rt\_sigprocmask resumed>NULL, 8) = 0

[pid 117495] set\_robust\_list(0x723015c009a0, 24 <unfinished ...>

[pid 117494] write(1, "\320\240\320\260\320\261\320\276\321\202\320\260\320\265\321\202 1 \

320\277\320\276\321\202\320\276\320\272 \321\201"..., 49 <unfinished ...>

**[pid 117489] futex(0x723014800990, FUTEX\_WAIT\_BITSET|FUTEX\_CLOCK\_REALTIME, 117493, NULL, FUTEX\_BITSET\_MATCH\_ANY <unfinished ...>**

[pid 117495] <... set\_robust\_list resumed>) = 0 [pid 117493] <... madvise resumed>) = 0 [pid 117494] <... write resumed>) = 49

[pid 117495] rt\_sigprocmask(SIG\_SETMASK, [], <unfinished ...> [pid 117494] write(1, "1 \320\277\320\276\321\202\320\276\320\272 \

320\267\320\260\320\272\320\276\320\275\321\207\320\270\320\273 \321\200"..., 43 <unfinished ...>

[pid 117493] exit(0 <unfinished ...>

[pid 117495] <... rt\_sigprocmask resumed>NULL, 8) = 0 [pid 117494] <... write resumed>) = 43

[pid 117493] <... exit resumed>) = ?

[pid 117495] futex(0x5b306c021040, FUTEX\_WAIT\_PRIVATE, 2, NULL <unfinished ...> [pid 117494] futex(0x5b306c021040, FUTEX\_WAKE\_PRIVATE, 1 <unfinished ...>

[pid 117489] <... futex resumed>) = 0

[pid 117495] <... futex resumed>) = -1 EAGAIN (Ресурс временно недоступен) [pid 117493] +++ exited with 0 +++

[pid 117494] <... futex resumed>) = 0

**[pid 117489] futex(0x723015200990, FUTEX\_WAIT\_BITSET|FUTEX\_CLOCK\_REALTIME, 117494, NULL, FUTEX\_BITSET\_MATCH\_ANY <unfinished ...>**

[pid 117495] write(1, "\320\240\320\260\320\261\320\276\321\202\320\260\320\265\321\202 2 \

320\277\320\276\321\202\320\276\320\272 \321\201"..., 50 <unfinished ...>

[pid 117494] rt\_sigprocmask(SIG\_BLOCK, ~[RT\_1], NULL, 8) = 0 [pid 117495] <... write resumed>) = 50

[pid 117494] madvise(0x723014a00000, 8368128, MADV\_DONTNEED <unfinished ...> **[pid 117495] futex(0x5b306c021040, FUTEX\_WAKE\_PRIVATE, 1 <unfinished ...>** [pid 117494] <... madvise resumed>) = 0

[pid 117495] <... futex resumed>) = 0 [pid 117494] exit(0 <unfinished ...>

[pid 117495] write(1, "2 \320\277\320\276\321\202\320\276\320\272 \ 320\267\320\260\320\272\320\276\320\275\321\207\320\270\320\273 \321\200"..., 43 <unfinished ...>

[pid 117494] <... exit resumed>) = ? [pid 117489] <... futex resumed>) = 0 [pid 117495] <... write resumed>) = 43 [pid 117494] +++ exited with 0 +++

**[pid 117489] futex(0x723015c00990, FUTEX\_WAIT\_BITSET|FUTEX\_CLOCK\_REALTIME, 117495, NULL, FUTEX\_BITSET\_MATCH\_ANY <unfinished ...>**

[pid 117495] rt\_sigprocmask(SIG\_BLOCK, ~[RT\_1], NULL, 8) = 0

[pid 117495] madvise(0x723015400000, 8368128, MADV\_DONTNEED) = 0

[pid 117495] exit(0) = ?

[pid 117489] <... futex resumed>) = 0 [pid 117495] +++ exited with 0 +++ rt\_sigprocmask(SIG\_BLOCK, ~[], [], 8) = 0

**clone3({flags=CLONE\_VM|CLONE\_FS|CLONE\_FILES|CLONE\_SIGHAND|CLONE\_THREAD| CLONE\_SYSVSEM|CLONE\_SETTLS|CLONE\_PARENT\_SETTID|CLONE\_CHILD\_CLEARTID,**

**child\_tid=0x723015c00990, parent\_tid=0x723015c00990, exit\_signal=0, stack=0x723015400000, stack\_size=0x7fff80, tls=0x723015c006c0}strace: Process 117496 attached**

**=> {parent\_tid=[117496]}, 88) = 117496**

[pid 117489] rt\_sigprocmask(SIG\_SETMASK, [], <unfinished ...>

[pid 117496] rseq(0x723015c00fe0, 0x20, 0, 0x53053053 <unfinished ...> [pid 117489] <... rt\_sigprocmask resumed>NULL, 8) = 0

[pid 117496] <... rseq resumed>) = 0

[pid 117489] rt\_sigprocmask(SIG\_BLOCK, ~[], <unfinished ...> [pid 117496] set\_robust\_list(0x723015c009a0, 24 <unfinished ...>

[pid 117489] <... rt\_sigprocmask resumed>[], 8) = 0 [pid 117496] <... set\_robust\_list resumed>) = 0

[pid 117489] clone3({flags=CLONE\_VM|CLONE\_FS|CLONE\_FILES|CLONE\_SIGHAND|

**CLONE\_THREAD|CLONE\_SYSVSEM|CLONE\_SETTLS|CLONE\_PARENT\_SETTID|**

**CLONE\_CHILD\_CLEARTID, child\_tid=0x723015200990, parent\_tid=0x723015200990, exit\_signal=0, stack=0x723014a00000, stack\_size=0x7fff80, tls=0x7230152006c0} <unfinished ...> [pid 117496] rt\_sigprocmask(SIG\_SETMASK, [], strace: Process 117497 attached**

**NULL, 8) = 0**

[pid 117489] <... clone3 resumed> => {parent\_tid=[117497]}, 88) = 117497 [pid 117497] rseq(0x723015200fe0, 0x20, 0, 0x53053053 <unfinished ...> [pid 117489] rt\_sigprocmask(SIG\_SETMASK, [], <unfinished ...>

[pid 117496] write(1, "\320\240\320\260\320\261\320\276\321\202\320\260\320\265\321\202 0 \

320\277\320\276\321\202\320\276\320\272 \321\201"..., 49 <unfinished ...> [pid 117489] <... rt\_sigprocmask resumed>NULL, 8) = 0

[pid 117497] <... rseq resumed>) = 0

[pid 117489] rt\_sigprocmask(SIG\_BLOCK, ~[], <unfinished ...> [pid 117496] <... write resumed>) = 49

[pid 117489] <... rt\_sigprocmask resumed>[], 8) = 0

[pid 117497] set\_robust\_list(0x7230152009a0, 24 <unfinished ...>

**[pid 117489] clone3({flags=CLONE\_VM|CLONE\_FS|CLONE\_FILES|CLONE\_SIGHAND| CLONE\_THREAD|CLONE\_SYSVSEM|CLONE\_SETTLS|CLONE\_PARENT\_SETTID|**

**CLONE\_CHILD\_CLEARTID, child\_tid=0x723014800990, parent\_tid=0x723014800990, exit\_signal=0, stack=0x723014000000, stack\_size=0x7fff80, tls=0x7230148006c0} <unfinished ...>** [pid 117496] write(1, "0 \320\277\320\276\321\202\320\276\320\272 \ 320\267\320\260\320\272\320\276\320\275\321\207\320\270\320\273 \321\200"..., 43 <unfinished ...>

[pid 117497] <... set\_robust\_list resumed>) = 0 strace: Process 117498 attached

[pid 117497] rt\_sigprocmask(SIG\_SETMASK, [], <unfinished ...> [pid 117496] <... write resumed>) = 43

[pid 117489] <... clone3 resumed> => {parent\_tid=[117498]}, 88) = 117498 [pid 117498] rseq(0x723014800fe0, 0x20, 0, 0x53053053 <unfinished ...> [pid 117496] rt\_sigprocmask(SIG\_BLOCK, ~[RT\_1], <unfinished ...>

[pid 117489] rt\_sigprocmask(SIG\_SETMASK, [], <unfinished ...> [pid 117498] <... rseq resumed>) = 0

[pid 117497] <... rt\_sigprocmask resumed>NULL, 8) = 0

[pid 117496] <... rt\_sigprocmask resumed>NULL, 8) = 0

[pid 117489] <... rt\_sigprocmask resumed>NULL, 8) = 0

[pid 117498] set\_robust\_list(0x7230148009a0, 24 <unfinished ...>

**[pid 117497] write(1, "\320\240\320\260\320\261\320\276\321\202\320\260\320\265\321\202 1 \**

**320\277\320\276\321\202\320\276\320\272 \321\201"..., 49 <unfinished ...>**

**[pid 117489] futex(0x723015c00990, FUTEX\_WAIT\_BITSET|FUTEX\_CLOCK\_REALTIME, 117496, NULL, FUTEX\_BITSET\_MATCH\_ANY <unfinished ...>**

[pid 117498] <... set\_robust\_list resumed>) = 0

[pid 117496] madvise(0x723015400000, 8368128, MADV\_DONTNEED <unfinished ...> [pid 117498] rt\_sigprocmask(SIG\_SETMASK, [], <unfinished ...>

[pid 117497] <... write resumed>) = 49

[pid 117498] <... rt\_sigprocmask resumed>NULL, 8) = 0 [pid 117496] <... madvise resumed>) = 0

**[pid 117498] futex(0x5b306c021040, FUTEX\_WAIT\_PRIVATE, 2, NULL <unfinished ...>**

[pid 117497] write(1, "1 \320\277\320\276\321\202\320\276\320\272 \ 320\267\320\260\320\272\320\276\320\275\321\207\320\270\320\273 \321\200"..., 43 <unfinished ...>

[pid 117496] exit(0 <unfinished ...>

[pid 117497] <... write resumed>) = 43 [pid 117496] <... exit resumed>) = ?

**[pid 117497] futex(0x5b306c021040, FUTEX\_WAKE\_PRIVATE, 1 <unfinished ...>**

[pid 117498] <... futex resumed>) = 0 [pid 117489] <... futex resumed>) = 0 [pid 117497] <... futex resumed>) = 1 [pid 117496] +++ exited with 0 +++

**[pid 117489] futex(0x723015200990, FUTEX\_WAIT\_BITSET|FUTEX\_CLOCK\_REALTIME, 117497, NULL, FUTEX\_BITSET\_MATCH\_ANY <unfinished ...>**

[pid 117498] write(1, "\320\240\320\260\320\261\320\276\321\202\320\260\320\265\321\202 2 \

320\277\320\276\321\202\320\276\320\272 \321\201"..., 50 <unfinished ...> [pid 117497] rt\_sigprocmask(SIG\_BLOCK, ~[RT\_1], <unfinished ...>

[pid 117498] <... write resumed>) = 50

[pid 117497] <... rt\_sigprocmask resumed>NULL, 8) = 0

**[pid 117498] futex(0x5b306c021040, FUTEX\_WAKE\_PRIVATE, 1 <unfinished ...>** [pid 117497] madvise(0x723014a00000, 8368128, MADV\_DONTNEED <unfinished ...> [pid 117498] <... futex resumed>) = 0

[pid 117497] <... madvise resumed>) = 0

[pid 117498] write(1, "2 \320\277\320\276\321\202\320\276\320\272 \ 320\267\320\260\320\272\320\276\320\275\321\207\320\270\320\273 \321\200"..., 43 <unfinished ...>

[pid 117497] exit(0 <unfinished ...>

[pid 117498] <... write resumed>) = 43 [pid 117497] <... exit resumed>) = ?

[pid 117498] rt\_sigprocmask(SIG\_BLOCK, ~[RT\_1], <unfinished ...> [pid 117497] +++ exited with 0 +++

[pid 117489] <... futex resumed>) = 0

[pid 117498] <... rt\_sigprocmask resumed>NULL, 8) = 0

**[pid 117489] futex(0x723014800990, FUTEX\_WAIT\_BITSET|FUTEX\_CLOCK\_REALTIME, 117498, NULL, FUTEX\_BITSET\_MATCH\_ANY <unfinished ...>**

[pid 117498] madvise(0x723014000000, 8368128, MADV\_DONTNEED) = 0

[pid 117498] exit(0) = ? [pid 117498] +++ exited with 0 +++

<... futex resumed>) = 0 clock\_gettime(CLOCK\_PROCESS\_CPUTIME\_ID, {tv\_sec=0, tv\_nsec=3169522}) = 0 fstat(1, {st\_mode=S\_IFREG|0664, st\_size=831, ...}) = 0

**openat(AT\_FDCWD, "output\_matrix.txt", O\_WRONLY|O\_CREAT|O\_TRUNC, 0644) = 3**

|  |  |
| --- | --- |
| write(3, " 7.57 ", 7) | = 7 |
| write(3, " 11.48 ", 7) | = 7 |
| write(3, " 11.61 ", 7) | = 7 |
| write(3, " 10.52 ", 7) | = 7 |
| write(3, " 11.20 ", 7) | = 7 |
| write(3, " 13.15 ", 7) | = 7 |
| write(3, " 13.61 ", 7) | = 7 |
| write(3, " 11.16 ", 7) | = 7 |
| write(3, " 6.73 ", 7) | = 7 |
| write(3, " 2.81 ", 7) | = 7 |
| write(3, "\n", 1) | = 1 |
| write(3, " 11.21 ", 7) | = 7 |
| write(3, " 17.49 ", 7) | = 7 |
| write(3, " 18.54 ", 7) | = 7 |
| write(3, " 17.83 ", 7) | = 7 |
| write(3, " 19.08 ", 7) | = 7 |
| write(3, " 21.68 ", 7) | = 7 |
| write(3, " 22.06 ", 7) | = 7 |
| write(3, " 18.21 ", 7) | = 7 |
| write(3, " 11.49 ", 7) | = 7 |
| write(3, " 5.07 ", 7) | = 7 |
| write(3, "\n", 1) | = 1 |
| write(3, " 10.67 ", 7) | = 7 |
| write(3, " 17.77 ", 7) | = 7 |
| write(3, " 20.51 ", 7) | = 7 |
| write(3, " 21.15 ", 7) | = 7 |
| write(3, " 22.11 ", 7) | = 7 |
| write(3, " 23.56 ", 7) | = 7 |
| write(3, " 23.41 ", 7) | = 7 |
| write(3, " 19.81 ", 7) | = 7 |
| write(3, " 13.57 ", 7) | = 7 |
| write(3, " 6.51 ", 7) | = 7 |
| write(3, "\n", 1) | = 1 |
| write(3, " 8.20 ", 7) | = 7 |
| write(3, " 15.12 ", 7) | = 7 |
| write(3, " 19.45 ", 7) | = 7 |
| write(3, " 21.66 ", 7) | = 7 |
| write(3, " 21.95 ", 7) | = 7 |
| write(3, " 21.59 ", 7) | = 7 |
| write(3, " 20.79 ", 7) | = 7 |
| write(3, " 18.52 ", 7) | = 7 |
| write(3, " 14.35 ", 7) | = 7 |
| write(3, " 7.73 ", 7) | = 7 |
| write(3, "\n", 1) | = 1 |
| write(3, " 6.52 ", 7) | = 7 |
| write(3, " 13.40 ", 7) | = 7 |
| write(3, " 18.81 ", 7) | = 7 |
| write(3, " 21.82 ", 7) | = 7 |
| write(3, " 20.95 ", 7) | = 7 |
| write(3, " 18.80 ", 7) | = 7 |
| write(3, " 17.27 ", 7) | = 7 |

|  |  |
| --- | --- |
| write(3, " 16.55 ", 7) | = 7 |
| write(3, " 14.55 ", 7) | = 7 |
| write(3, " 8.73 ", 7) | = 7 |
| write(3, "\n", 1) | = 1 |
| write(3, " 5.94 ", 7) | = 7 |
| write(3, " 12.61 ", 7) | = 7 |
| write(3, " 18.27 ", 7) | = 7 |
| write(3, " 22.03 ", 7) | = 7 |
| write(3, " 21.08 ", 7) | = 7 |
| write(3, " 18.44 ", 7) | = 7 |
| write(3, " 16.15 ", 7) | = 7 |
| write(3, " 16.28 ", 7) | = 7 |
| write(3, " 15.33 ", 7) | = 7 |
| write(3, " 9.91 ", 7) | = 7 |
| write(3, "\n", 1) | = 1 |
| write(3, " 6.17 ", 7) | = 7 |
| write(3, " 12.73 ", 7) | = 7 |
| write(3, " 18.30 ", 7) | = 7 |
| write(3, " 22.28 ", 7) | = 7 |
| write(3, " 21.61 ", 7) | = 7 |
| write(3, " 19.08 ", 7) | = 7 |
| write(3, " 16.42 ", 7) | = 7 |
| write(3, " 16.75 ", 7) | = 7 |
| write(3, " 15.92 ", 7) | = 7 |
| write(3, " 10.56 ", 7) | = 7 |
| write(3, "\n", 1) | = 1 |
| write(3, " 6.54 ", 7) | = 7 |
| write(3, " 12.78 ", 7) | = 7 |
| write(3, " 18.05 ", 7) | = 7 |
| write(3, " 21.92 ", 7) | = 7 |
| write(3, " 22.05 ", 7) | = 7 |
| write(3, " 20.35 ", 7) | = 7 |
| write(3, " 18.07 ", 7) | = 7 |
| write(3, " 18.17 ", 7) | = 7 |
| write(3, " 16.58 ", 7) | = 7 |
| write(3, " 10.75 ", 7) | = 7 |
| write(3, "\n", 1) | = 1 |
| write(3, " 6.05 ", 7) | = 7 |
| write(3, " 11.53 ", 7) | = 7 |
| write(3, " 16.18 ", 7) | = 7 |
| write(3, " 19.12 ", 7) | = 7 |
| write(3, " 19.43 ", 7) | = 7 |
| write(3, " 18.29 ", 7) | = 7 |
| write(3, " 17.00 ", 7) | = 7 |
| write(3, " 16.93 ", 7) | = 7 |
| write(3, " 14.91 ", 7) | = 7 |
| write(3, " 9.28 ", 7) | = 7 |
| write(3, "\n", 1) | = 1 |
| write(3, " 3.86 ", 7) | = 7 |
| write(3, " 7.26 ", 7) | = 7 |
| write(3, " 10.13 ", 7) | = 7 |
| write(3, " 11.77 ", 7) | = 7 |
| write(3, " 12.05 ", 7) | = 7 |
| write(3, " 11.54 ", 7) | = 7 |
| write(3, " 11.07 ", 7) | = 7 |
| write(3, " 10.94 ", 7) | = 7 |
| write(3, " 9.36 ", 7) | = 7 |

write(3, " 5.64 ", 7) = 7

write(3, "\n", 1) = 1

close(3) = 0

write(1, "0.001162\n", 9) = 9

exit\_group(0) = ?

+++ exited with 0 +++

# Вывод

Язык Си с поддержкой библиотек позволяет создавать многопоточные приложения, предоставляя инструменты для работы с потоками и механизмы ограничения для обеспечения безопасности. Это делает разработку на Си более разнообразной и увлекательной.