

Операционные системы
ДЗ 8. Отчёт
Работа на 10 баллов

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1 Результаты работы программы на 9 баллов

```
frolovbuk@LAPTOP-KORFAB50: ~/hw8/9points
Writer: bye!!!
frolovbuk@LAPTOP-KORFAB50:~/hw8/10points$ ./writer
Object is open: name = /posix-shar-object, id = 0x3
Memory size set and = 64
mmap checkout
checking: writer_number = 1
Writer 44970: I am first for this work! :)
Producer 44970 writes value = 8 to cell [0]
Producer 44970 writes value = 1 to cell [1]
Producer 44970 writes value = 8 to cell [2]
Producer 44970 writes value = 9 to cell [3]
Producer 44970 writes value = 3 to cell [4]
Producer 44970 writes value = 5 to cell [5]
^[Producer 44970 writes value = 6 to cell [6]
Producer 44970 writes value = 7 to cell [7]
Producer 44970 writes value = 9 to cell [8]
^CWriter(SIGTERM) <--- Reader(SIGINT)
Reader: bye!!!
frolovbuk@LAPTOP-KORFAB50:~/hw8/10points$ cd ../9points
frolovbuk@LAPTOP-KORFAB50:~/hw8/9points$ ./reader
Object is open: name = /posix-shar-object, id = 0x3
Memory size set and = 64
Consumer 42409: Reads value = 0 from cell [2], factorial = 1
Consumer 42409: Reads value = 3 from cell [4], factorial = 6
Consumer 42409: Reads value = 9 from cell [5], factorial = 362880
Consumer 42409: Reads value = 8 from cell [7], factorial = 40320
Consumer 42409: Reads value = 9 from cell [8], factorial = 362880
Consumer 42409: Reads value = 3 from cell [0], factorial = 6
Consumer 42409: Reads value = 9 from cell [2], factorial = 362880
Consumer 42409: Reads value = 7 from cell [3], factorial = 5040
Reader(SIGTERM) <--- WriterOrReader(SIGINT)
Reader: bye!!!
frolovbuk@LAPTOP-KORFAB50:~/hw8/10points$ ./reader
Consumer 42571 started
Memory object is opened: name = /posix-shar-object, id = 0x3
Memory size set and = 64
Consumer 42571: Reads value = 5 from cell [0], factorial = 120
Consumer 42571: Reads value = 3 from cell [1], factorial = 6
Reader(SIGTERM) <--- WriterOrReader(SIGINT)
Reader: bye!!!
frolovbuk@LAPTOP-KORFAB50:~/hw8/10points$ cd ../9points
frolovbuk@LAPTOP-KORFAB50:~/hw8/9points$ ./reader
Consumer 46113 started
Memory object is opened: name = /posix-shar-object, id = 0x3
Memory size set and = 60
Consumer 46113: Reads value = 0 from cell [0], factorial = 1
Consumer 46113: Reads value = 8 from cell [1], factorial = 40320
^CReader(SIGINT) <--- Writer(SIGTERM)
Reader: bye!!!
frolovbuk@LAPTOP-KORFAB50:~/hw8/9points$
```

2 Результаты работы программы на 10 баллов

Проверка на то, что в системе может быть максимум 2 читателя:

```
frolovbuk@LAPTOP-KORFAB50: ~/hw8/10points
Producer 42395 writes value = 3 to cell [1]
Producer 42395 writes value = -1 to cell [2]
Producer 42395 writes value = 1 to cell [3]
Producer 42395 writes value = 7 to cell [4]
Producer 42395 writes value = -1 to cell [5]
Producer 42395 writes value = -1 to cell [6]
Producer 42395 writes value = 7 to cell [7]
Producer 42395 writes value = 1 to cell [8]
Producer 42395 writes value = -1 to cell [9]
Producer 42395 writes value = -1 to cell [0]
Producer 42395 writes value = -1 to cell [1]
Producer 42395 writes value = -1 to cell [2]
Producer 42395 writes value = 3 to cell [3]
Producer 42395 writes value = 6 to cell [4]
Producer 42395 writes value = 7 to cell [5]
-

frolovbuk@LAPTOP-KORFAB50:~/hw8/10points
frolovbuk@LAPTOP-KORFAB50:~/hw8/10points$ cd ../hw8/10points
frolovbuk@LAPTOP-KORFAB50:~/hw8/10points$ ./reader
Consumer 42513 started
Memory object is opened: name = /posix-shar-object, id = 0x3
Memory size set and = 64
Reader 42513: I have lost this work :(
frolovbuk@LAPTOP-KORFAB50:~/hw8/10points$

frolovbuk@LAPTOP-KORFAB50:~/hw8/10points
Consumer 40849: Reads value = 3 from cell [0], factorial = 6
Consumer 40849: Reads value = 1 from cell [1], factorial = 24
Consumer 40849: Reads value = 4 from cell [2], factorial = 24
Consumer 40849: Reads value = 10 from cell [4], factorial = 362880
Consumer 40849: Reads value = 9 from cell [5], factorial = 362880
Consumer 40849: Reads value = 7 from cell [6], factorial = 5040
Reader(SIGTERM) <--- Writer(SIGINT)
Reader: bye!!!
frolovbuk@LAPTOP-KORFAB50:~/hw8/10points$ gcc -o reader reader.c common.c
^[[frolovbuk@LAPTOP-KORFAB50:~/hw8/10points$ gcc -o writer writer.c common.c
frolovbuk@LAPTOP-KORFAB50:~/hw8/10points$ ./reader
Consumer 42409 started
Memory object is opened: name = /posix-shar-object, id = 0x3
Memory size set and = 64
Consumer 42409: Reads value = 0 from cell [0], factorial = 1
Consumer 42409: Reads value = 2 from cell [1], factorial = 2
Consumer 42409: Reads value = 2 from cell [2], factorial = 2
Consumer 42409: Reads value = 0 from cell [3], factorial = 1
Consumer 42409: Reads value = 10 from cell [4], factorial = 362880
Consumer 42409: Reads value = 3 from cell [6], factorial = 6
Consumer 42409: Reads value = 7 from cell [8], factorial = 5040
Consumer 42409: Reads value = 2 from cell [9], factorial = 2
Reader(SIGTERM) <--- Writer(SIGINT)
sem_unlink: Incorrect unlink of reader semaphore: No such file or directory
Reader: bye!!!
frolovbuk@LAPTOP-KORFAB50:~/hw8/10points$ ./reader
Consumer 40867 started
Memory object is opened: name = /posix-shar-object, id = 0x3
Memory size set and = 64
Consumer 40867: Reads value = 6 from cell [3], factorial = 720
Consumer 40867: Reads value = 2 from cell [7], factorial = 2
^CReader(SIGINT) <--- Writer(SIGTERM)
Reader(SIGINT) <--- AnotherReader(SIGTERM)
sem_unlink: Incorrect unlink of reader semaphore: No such file or directory
Reader: bye!!!
frolovbuk@LAPTOP-KORFAB50:~/hw8/10points$ ./reader
Consumer 42443 started
Memory object is opened: name = /posix-shar-object, id = 0x3
Memory size set and = 64
Consumer 42443: Reads value = 0 from cell [5], factorial = 1
Consumer 42443: Reads value = 4 from cell [7], factorial = 24
Consumer 42443: Reads value = 10 from cell [0], factorial = 362880
Consumer 42443: Reads value = 3 from cell [1], factorial = 6
Consumer 42443: Reads value = 5 from cell [2], factorial = 120
Consumer 42443: Reads value = 7 from cell [4], factorial = 5040
Consumer 42443: Reads value = 3 from cell [5], factorial = 6
Consumer 42443: Reads value = 9 from cell [6], factorial = 362880
Consumer 42443: Reads value = 1 from cell [8], factorial = 1
Consumer 42443: Reads value = 3 from cell [3], factorial = 6
Consumer 42443: Reads value = 7 from cell [5], factorial = 5040
```

Завершение процессов из писателя (через комбинацию Ctrl + C):

```
frolovbuk@LAPTOP-KORFABSO: ~/hw8/10points
Producer 42395 writes value = -1 to cell [0]
Producer 42395 writes value = -1 to cell [0]
Producer 42395 writes value = -1 to cell [1]
Producer 42395 writes value = -1 to cell [2]
Producer 42395 writes value = 3 to cell [3]
Producer 42395 writes value = 6 to cell [4]
Producer 42395 writes value = 7 to cell [5]
Producer 42395 writes value = -1 to cell [6]
Producer 42395 writes value = 8 to cell [7]
Producer 42395 writes value = 0 to cell [8]
Producer 42395 writes value = 5 to cell [9]
Producer 42395 writes value = 2 to cell [0]
Producer 42395 writes value = 1 to cell [1]
Producer 42395 writes value = 0 to cell [2]
Producer 42395 writes value = -1 to cell [3]
Producer 42395 writes value = 5 to cell [4]
Producer 42395 writes value = 2 to cell [5]
Producer 42395 writes value = 7 to cell [6]
Producer 42395 writes value = 9 to cell [7]
Producer 42395 writes value = 2 to cell [8]
Producer 42395 writes value = 2 to cell [4]
Producer 42395 writes value = 4 to cell [5]
^CWriter(SIGINT) --> Readers(SIGTERM)
Writer: bye!!!
frolovbuk@LAPTOP-KORFABSO:~/hw8/10points$

Consumer 42443: Reads value = 10 from cell [0], factorial = 362880
Consumer 42443: Reads value = 3 from cell [1], factorial = 6
Consumer 42443: Reads value = 5 from cell [2], factorial = 120
Consumer 42443: Reads value = 7 from cell [4], factorial = 5040
Consumer 42443: Reads value = 3 from cell [5], factorial = 6
Consumer 42443: Reads value = 9 from cell [6], factorial = 362880
Consumer 42443: Reads value = 1 from cell [8], factorial = 1
Consumer 42443: Reads value = 3 from cell [3], factorial = 6
Consumer 42443: Reads value = 7 from cell [5], factorial = 5040
Consumer 42443: Reads value = 1 from cell [6], factorial = 1
Consumer 42443: Reads value = 8 from cell [7], factorial = 40320
Consumer 42443: Reads value = 5 from cell [9], factorial = 120
Consumer 42443: Reads value = 1 from cell [1], factorial = 1
Consumer 42443: Reads value = 8 from cell [3], factorial = 40320
Consumer 42443: Reads value = 2 from cell [6], factorial = 2
Consumer 42443: Reads value = 5 from cell [9], factorial = 120
Consumer 42443: Reads value = 7 from cell [1], factorial = 5040
Consumer 42443: Reads value = 2 from cell [4], factorial = 2
Reader(SIGTERM) <--- WriterOrReader(SIGINT)
Reader: bye!!!
sem_unlink: Incorrect unlink of reader semaphore: No such file or directory
frolovbuk@LAPTOP-KORFABSO:~/hw8/10points$
```

Завершение процессов из читателя (через комбинацию Ctrl + C):

```
frolovbuk@LAPTOP-KORFABSO: ~/hw8/10points
Producer 42395 writes value = 1 to cell [1]
Producer 42395 writes value = 0 to cell [2]
Producer 42395 writes value = 8 to cell [3]
Producer 42395 writes value = 3 to cell [4]
Producer 42395 writes value = -1 to cell [5]
Producer 42395 writes value = 2 to cell [6]
Producer 42395 writes value = 8 to cell [7]
Producer 42395 writes value = -1 to cell [8]
Producer 42395 writes value = 5 to cell [9]
Producer 42395 writes value = 3 to cell [0]
Producer 42395 writes value = 7 to cell [1]
Producer 42395 writes value = 2 to cell [4]
Producer 42395 writes value = 4 to cell [5]
^CWriter(SIGINT) --> Readers(SIGTERM)
Writer: bye!!!
frolovbuk@LAPTOP-KORFABSO:~/hw8/10points$ ./writer
Object is open: name = /posix-shar-object, id = 0x3
Memory size set and = 64
mmap checkout
checking: writer_number = 1
Writer 43556: I am first for this work! :)
Producer 43556 writes value = 5 to cell [0]
Producer 43556 writes value = 3 to cell [1]
Producer 43556 writes value = 1 to cell [2]
Producer 43556 writes value = 1 to cell [3]
Writer(SIGTERM) <--- Reader(SIGINT)
Writer: bye!!!
frolovbuk@LAPTOP-KORFABSO:~/hw8/10points$

Consumer 42443: Reads value = 5 from cell [2], factorial = 120
Consumer 42443: Reads value = 7 from cell [4], factorial = 5040
Consumer 42443: Reads value = 3 from cell [5], factorial = 6
Consumer 42443: Reads value = 9 from cell [6], factorial = 362880
Consumer 42443: Reads value = 1 from cell [8], factorial = 1
Consumer 42443: Reads value = 3 from cell [3], factorial = 6
Consumer 42443: Reads value = 7 from cell [5], factorial = 5040
Consumer 42443: Reads value = 2 from cell [6], factorial = 1
Consumer 42443: Reads value = 8 from cell [7], factorial = 40320
Consumer 42443: Reads value = 5 from cell [9], factorial = 120
Consumer 42443: Reads value = 1 from cell [1], factorial = 1
Consumer 42443: Reads value = 8 from cell [3], factorial = 40320
Consumer 42443: Reads value = 2 from cell [6], factorial = 2
Consumer 42443: Reads value = 5 from cell [9], factorial = 120
Consumer 42443: Reads value = 7 from cell [1], factorial = 5040
Consumer 42443: Reads value = 2 from cell [4], factorial = 2
Reader(SIGTERM) <--- WriterOrReader(SIGINT)
Reader: bye!!!
sem_unlink: Incorrect unlink of reader semaphore: No such file or directory
frolovbuk@LAPTOP-KORFABSO:~/hw8/10points$

Consumer 43571 started
Memory object is opened: name = /posix-shar-object, id = 0x3
Memory size set and = 64
Consumer 43571: Reads value = 5 from cell [0], factorial = 120
Consumer 43571: Reads value = 3 from cell [1], factorial = 6
Reader(SIGTERM) <--- WriterOrReader(SIGINT)
Reader: bye!!!
frolovbuk@LAPTOP-KORFABSO:~/hw8/10points$

Consumer 43583 started
Memory object is opened: name = /posix-shar-object, id = 0x3
Memory size set and = 64
Consumer 43583: Reads value = 1 from cell [2], factorial = 1
Consumer 43583: Reads value = 1 from cell [3], factorial = 1
^CReader(SIGINT) --> Writer(SIGTERM)
Reader(SIGINT) <--- AnotherReader(SIGTERM)
sem_unlink: Incorrect unlink of reader semaphore: No such file or directory
Reader: bye!!!
frolovbuk@LAPTOP-KORFABSO:~/hw8/10points$
```

3 Замечания по работе программы

1. В работе на 10 баллов в одном из читателей выпадает ошибка *sem_unlink: Incorrect unlink of reader semaphore: No such file or directory*, что логично, так как unlink семафора был уже выполнен другим читателем
2. Обе программы переписаны на циклический буфер, реализованный на обычном массиве с контролем индексации в случае переполнения (взятие остатка по размеру буфера), а также с хранением указателей next_read и next_write, указывающих на индекс следующего прочитанного и следующего записанного значения соответственно
3. В программе на 10 баллов структура shared_memory теперь содержит массив из 2 элементов на pid читателей, а передача сигналов от читателя к читателю в случае завершения программы в одном из читателей осуществляется через глобальную переменную, отвечающую за номер читателя с использованием простейшей арифметики остатков. Это делается во избежание отправки сигнала процессом самому себе же