

Презентация к лабораторной работе №13

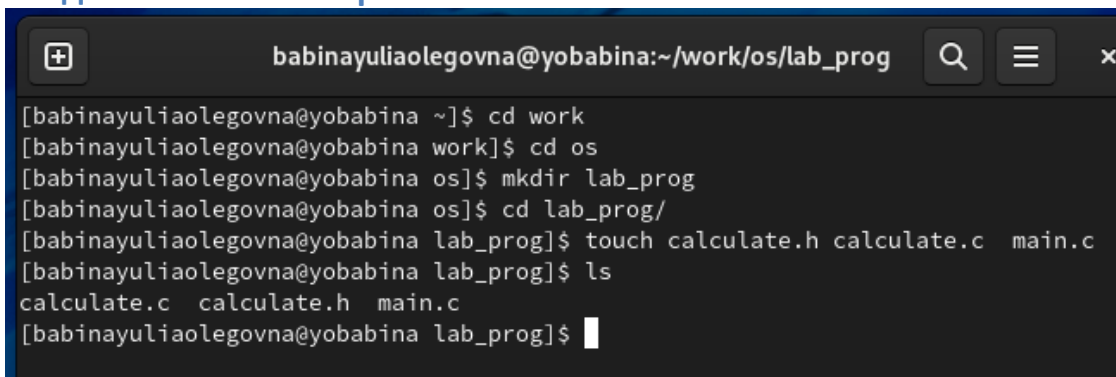
Бабина Ю.О.

Цель работы

Приобрести простейшие навыки разработки, анализа, тестирования и отладки приложений в ОС типа UNIX/Linux на примере создания на языке программирования С калькулятора с простейшими функциями.

Ход работы

Создание каталога и файла

A screenshot of a terminal window with a dark background. The title bar at the top shows the user 'babinayuliaolegovna@yobabina' and the current directory '~/work/os/lab_prog'. The terminal contains a series of commands and their outputs: 'cd work', 'cd os', 'mkdir lab_prog', 'cd lab_prog/', 'touch calculate.h calculate.c main.c', and 'ls'. The 'ls' command output shows 'calculate.c calculate.h main.c'. The prompt is currently at the 'lab_prog' directory.

```
[babinayuliaolegovna@yobabina ~]$ cd work
[babinayuliaolegovna@yobabina work]$ cd os
[babinayuliaolegovna@yobabina os]$ mkdir lab_prog
[babinayuliaolegovna@yobabina os]$ cd lab_prog/
[babinayuliaolegovna@yobabina lab_prog]$ touch calculate.h calculate.c main.c
[babinayuliaolegovna@yobabina lab_prog]$ ls
calculate.c calculate.h main.c
[babinayuliaolegovna@yobabina lab_prog]$
```

создание каталога и файла

Компиляция программы посредством gcc:

```
компиляция прервана.
[babinayuliaolegovna@yobabina lab_prog]$ gcc -c calculale.c
calculale.c:4:10: фатальная ошибка: calculate.h: Нет такого файла или каталога
  4 | #include "calculate.h"
    |
компиляция прервана.
[babinayuliaolegovna@yobabina lab_prog]$ gcc -c calculale.c
[babinayuliaolegovna@yobabina lab_prog]$ gcc -c main.c
main.c:2:10: фатальная ошибка: calculate.h: Нет такого файла или каталога
  2 | #include "calculate.h"
    |
компиляция прервана.
[babinayuliaolegovna@yobabina lab_prog]$ gcc -c main.c
[babinayuliaolegovna@yobabina lab_prog]$ gcc -cx calculale.o main.o -o calcul -l
m
gcc: ошибка: unrecognized command-line option «-cx»; did you mean «-c»?
[babinayuliaolegovna@yobabina lab_prog]$ gcc -c calculale.o main.o -o calcul -lm
gcc: предупреждение: calculale.o: входные файлы компоновки не использованы, поско
льку компоновка не выполнялась
gcc: предупреждение: main.o: входные файлы компоновки не использованы, поскольку
компоновка не выполнялась
[babinayuliaolegovna@yobabina lab_prog]$ gcc calculale.o main.o -o calcul -lm
[babinayuliaolegovna@yobabina lab_prog]$
```

компиляция

Пересборка проекта при помощи Makefile

```
make: «calculale.o» не требует обновления.
[babinayuliaolegovna@yobabina lab_prog]$ make calculale.o
gcc -g -c -o calculale.o calculale.c
[babinayuliaolegovna@yobabina lab_prog]$ make main.o
make: *** Нет правила для сборки цели «calculate.h», требуемой для «main.o». Ос
танов.
[babinayuliaolegovna@yobabina lab_prog]$ make main.o
gcc -c main.c -g
[babinayuliaolegovna@yobabina lab_prog]$ make calcul
gcc calculale.o main.o -o calcul -lm
[babinayuliaolegovna@yobabina lab_prog]$
```

сборка при помощи файла make

Отладка

```
babinayuliaolegovna@yobabina:~/work/os/lab_prog — gdb ./c...
[babinayuliaolegovna@yobabina ~]$ cd '/home/babinayuliaolegovna/work/os/lab_prog'
[babinayuliaolegovna@yobabina lab_prog]$ gdb ./calcul
GNU gdb (GDB) Fedora 11.2-3.fc36
Copyright (C) 2022 Free Software Foundation, Inc.
License GPLv3+: GNU GPL version 3 or later <http://gnu.org/licenses/gpl.html>
This is free software: you are free to change and redistribute it.
There is NO WARRANTY, to the extent permitted by law.
Type "show copying" and "show warranty" for details.
This GDB was configured as "x86_64-redhat-linux-gnu".
Type "show configuration" for configuration details.
For bug reporting instructions, please see:
<https://www.gnu.org/software/gdb/bugs/>.
Find the GDB manual and other documentation resources online at:
<http://www.gnu.org/software/gdb/documentation/>.

For help, type "help".
Type "apropos word" to search for commands related to "word"...
Reading symbols from ./calcul...
(gdb) 
```

запуск команды gdb./calcul

```
Reading symbols from ./calcul...
(gdb) run
Starting program: /home/babinayuliaolegovna/work/os/lab_prog/calcul

This GDB supports auto-downloading debuginfo from the following URLs:
https://debuginfod.fedoraproject.org/
Enable debuginfod for this session? (y or [n]) y
Debuginfod has been enabled.
To make this setting permanent, add 'set debuginfod enabled on' to .gdbinit.
Downloading separate debug info for /home/babinayuliaolegovna/work/os/lab_prog/s
ystem-supplied DSO at 0x7ffff7fc4000...
Downloading separate debug info for /lib64/libm.so.6...
Downloading separate debug info for /lib64/libc.so.6...
[Thread debugging using libthread_db enabled]
Using host libthread_db library "/lib64/libthread_db.so.1".
Число: 20
Операция (+,-,*,/,pow,sqrt,sin,cos,tan): *
Множитель: 5
100.00
```

запуск команды run

```
(gdb) list
1      #include <stdio.h>
2      #include "calcutale.h"
3
4      int
5      main (void)
6      {
7      float Numeral;
8      char Operation[4];
9      float Result;
10     printf("Число: ");
(gdb)
```

использование команды list

```
(gdb) list 12,15
12     printf("Операция (+,-,*,/,pow,sqrt,sin,cos,tan): ");
13     scanf("%s", Operation);
14     Result = Calculate(Numeral, Operation);
15     printf("%6.2f\n",Result);
(gdb)
```

использование команды list

```
(gdb) list calculale.c:20,29
20         return(Numeral - SecondNumeral);
21     }
22     else if(strncmp(Operation, "*", 1) == 0)
23     {
24         printf("Множитель: ");
25         scanf("%f",&SecondNumeral);
26         return(Numeral * SecondNumeral);
27     }
28     else if(strncmp(Operation, "/", 1) == 0)
29     {
(gdb)
```

использование команды list

```
(gdb) list calculale.c:15,22
15     }
16     else if(strncmp(Operation, "-", 1) == 0)
17     {
18         printf("Вычитаемое: ");
19         scanf("%f",&SecondNumeral);
20         return(Numeral - SecondNumeral);
21     }
22     else if(strncmp(Operation, "*", 1) == 0)
(gdb) break 18
Breakpoint 4 at 0x40120f: file calculale.c, line 18.
(gdb) info breakpoints
Num   Type             Disp Enb Address                  What
4     breakpoint      keep y   0x000000000040120f  in Calculate
                                           at calculale.c:18
(gdb)
```

использование команды list

```

at calculate.c:18
(gdb) run
Starting program: /home/babinayuliaolegovna/work/os/lab_prog/calcul
[Thread debugging using libthread_db enabled]
Using host libthread_db library "/lib64/libthread_db.so.1".
Число: 5
Операция (+,-,*,/,pow,sqrt,sin,cos,tan): -

Breakpoint 4, calculate (Numeral=5, Operation=0x7fffffffdec4 "-") at calculale.c
:18
18             printf("Вычитаемое: ");
(gdb)

```

установка точки останова

```

18             printf("Вычитаемое: ");
(gdb) backtrace
#0 calculate (Numeral=5, Operation=0x7fffffffdec4 "-") at calculale.c:18
#1 0x00000000004014eb in main () at main.c:14
(gdb)

```

команда backtrace

```

(gdb) print Numeral
$1 = 5
(gdb) display Numeral
1: Numeral = 5
(gdb)

```

проверка работы

```

(gdb) info breakpoints
Num   Type             Disp Enb Address                  What
4      breakpoint      keep y  0x000000000040120f in calculate
                                           at calculale.c:18
      breakpoint already hit 1 time
(gdb) delete 4
(gdb) info breakpoints
No breakpoints or watchpoints.
(gdb)

```

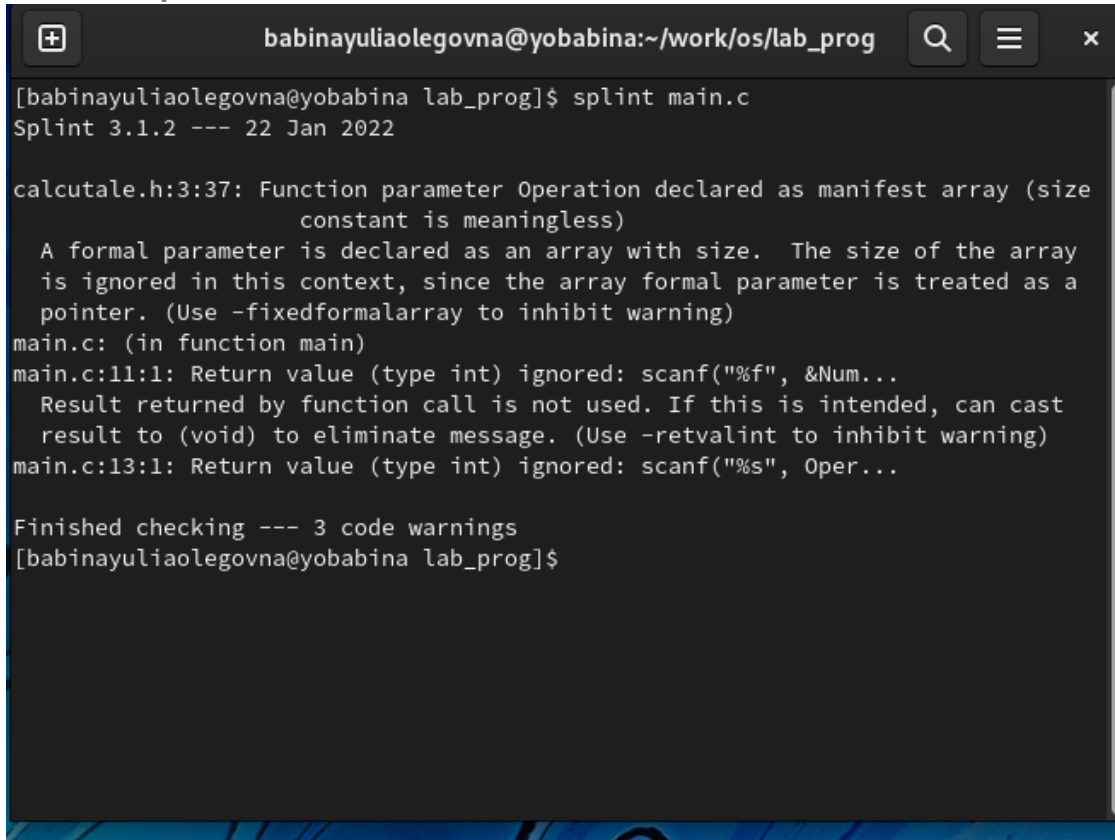
удаление точки останова

```
babinayuliaolegovna@yobabina:~/work/os/lab_prog
[babinayuliaolegovna@yobabina lab_prog]$ splint calcutale.c
Splint 3.1.2 --- 22 Jan 2022

calcutale.h:3:37: Function parameter Operation declared as manifest array (size
      constant is meaningless)
  A formal parameter is declared as an array with size.  The size of the array
  is ignored in this context, since the array formal parameter is treated as a
  pointer. (Use -fixedformalarray to inhibit warning)
calcutale.c:7:31: Function parameter Operation declared as manifest array (size
      constant is meaningless)
calcutale.c: (in function Calculate)
calcutale.c:13:6: Return value (type int) ignored: scanf("%f", &Sec...
  Result returned by function call is not used. If this is intended, can cast
  result to (void) to eliminate message. (Use -retvalint to inhibit warning)
calcutale.c:19:6: Return value (type int) ignored: scanf("%f", &Sec...
calcutale.c:25:6: Return value (type int) ignored: scanf("%f", &Sec...
calcutale.c:31:6: Return value (type int) ignored: scanf("%f", &Sec...
calcutale.c:32:9: Dangerous equality comparison involving float types:
      SecondNumeral == 0
  Two real (float, double, or long double) values are compared directly using
  == or != primitive. This may produce unexpected results since floating point
  representations are inexact. Instead, compare the difference to FLT_EPSILON
  or DBL_EPSILON. (Use -realcompare to inhibit warning)
calcutale.c:35:13: Return value type double does not match declared type float:
```

удаление точки останова

Утилита splint



```
[babinayuliaolegovna@yobabina lab_prog]$ splint main.c
Splint 3.1.2 --- 22 Jan 2022

calcutale.h:3:37: Function parameter Operation declared as manifest array (size
                    constant is meaningless)
    A formal parameter is declared as an array with size. The size of the array
    is ignored in this context, since the array formal parameter is treated as a
    pointer. (Use -fixedformalarray to inhibit warning)
main.c: (in function main)
main.c:11:1: Return value (type int) ignored: scanf("%f", &Num...
    Result returned by function call is not used. If this is intended, can cast
    result to (void) to eliminate message. (Use -retvalint to inhibit warning)
main.c:13:1: Return value (type int) ignored: scanf("%s", Oper...

Finished checking --- 3 code warnings
[babinayuliaolegovna@yobabina lab_prog]$
```

утилита splint

Вывод

В ходе данной лабораторной работы я приобрела простейшие навыки разработки, анализа, тестирования и отладки приложений в ОС типа UNIX/Linux на примере создания на языке программирования C калькулятора с простейшими функциями.