

HW6. (Array of Structures)

(Open Source Programming 2019, Spring English class) **Class number: 060**

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1. Explanation for your codes (50 Points)

(1) Explain of key variables: extern and static variables must be explained.

A. This Program has two Key variable : typedef Struct Contact PB PhoneBook[MAX=50], int size. This variables are global variable, use all of source code such as register, search, delete, print. I define this global variable with extern variable in header file, can use all of source code that if include phone.h.

And each Program has static variable. Register.c has static int try that check user's password input trial count, this variable shared in inside of register.c but another source code cannot access this variable. This is static variable's characteristic. Search.c, Delete.c has static char array temp that store name that compare with Phonebook's name, static int I that store search index number information. Finally main(phoneBookMain.c) has static variable int count_service, and implementation of extern variables size, password, PhoneBook.

(2) Describe the main data structure

A. I use structure type array structure, that named PhoneBook[MAX=50]; I consider using linked list, pointer, but this assignment require fixed number of Array(but not say only use array). This array is composed of this structure.

[Name[10byte]]PhoneNumber[15byte]]...[Name[10byte]]PhoneNumber[15byte]]

(3) Explain how to implement functions.

1. phone.h

```
1 // array of sturcure
2 #ifndef _PHONE_H_
3 #define _PHONE_H_
4
5 # define MAX 50
6 # define N_MAX 10
7 # define PN_MAX 15 //include \n & \0 // can save maximum 13
8 # define PSWD_MAX 10
9 typedef struct Contact
10 {
11     char Name[N_MAX];
12     char PhoneNumber[PN_MAX];
13 }PB;
14
15 extern PB PhoneBook[MAX]; //phonebook can store maximum 50 PB
16 extern char password[PSWD_MAX]; //use for phoneBookregistration
17 extern int size; // store the actual numbers of PhoneBook
18
19 #endif
```

➔ this header file contain basic variable of this Program.

Implement PhoneBook's base structure Contact,

Define PB array PhoneBook with extern variable, can store 50 Contacts. Char array password, int size store current array size and define several Constant with number for easily change number of elements

2. phoneBookMain.c

```

1 #include <stdio.h>
2 #include "service.h"
3
4 static int count_service = 0; // Total number of service requests
5 int size = 0; //global variable
6 PB PhoneBook[MAX]; //global variable
7 char password[PSWD_MAX]; //global variable by phone.h's extern
8
9 int main()
10 {
11     int service; // a variable for storing user's request
12     printf("regist your password(to 10 charactor) : ");
13     fgets(password,PSWD_MAX,stdin);
14     do
15     {
16         printf("===== Telephone Book Management =====");
17         printf("\n <<<1. Register\t 2. Print All \t 3. Search \t 4. Delete \t 5. Exit >>>\n");
18
19         printf(" Please enter your service number (1-5)> ");
20         scanf("%d", &service);
21         getchar();
22         switch(service)
23         {
24             case 1: registerPhoneData(); break; // invoke find_ID
25             case 2: printAll(); break;
26             case 3: searchByName(); break;
27             case 4: deleteByName(); break;
28             case 5: break;
29             default : printf("You got wrong Number!\n"); break;
30         }
31         count_service++;
32     } while (service != 5); // if Exit is not entered, the loop continues
33     return 0;
34 }

```

➔ This code include main function, and role of Selection Service and UI. Input selection from user, and execute matched function. While user input exit select.

1 : register
2 : print
3 : search
4 : delete
5 : exit
others : wrong selection.

Line 20's getchar() role flush buffer.

3. register.c

```

1 #include <stdio.h>
2 #include <string.h>
3 #include "phone.h"
4
5 static int try = 0;
6
7 int checkPassword();
8
9 void registerPhoneData(){
10     printf("Registration\n");
11     int check = checkPassword(); //check == 0 no problem
12     if(check) return; //check == 1 can't access
13     printf("New User Name: ");
14     fgets(PhoneBook[size].Name,N_MAX,stdin); //contain \n
15     PhoneBook[size].Name[strlen(PhoneBook[size].Name)-1]='\0';//delete \n
16     printf("PhoneNumber : ");
17     fgets(PhoneBook[size].PhoneNumber,PN_MAX,stdin);
18     PhoneBook[size].PhoneNumber[strlen(PhoneBook[size].PhoneNumber)-1]='\0';//
19     size++;
20     printf("Registered...\n");
21 }
22
23 int checkPassword(){
24     char temp[PSWD_MAX];
25     printf("type your password(to 10 charactor)");
26     printf("password : ");
27     fgets(temp,PSWD_MAX,stdin);
28     if(strcmp(temp,password)){
29         try++;
30         printf(">> Not Matched!!! \n");
31         printf("password : ");
32         fgets(temp,PSWD_MAX,stdin);
33         while((try<4)&&(strcmp(temp,password)))
34         {
35             switch(try){
36                 case 2:
37                     printf(">> Not Matched(twice)!!! \n");
38                     printf("password : ");
39                     fgets(temp,PSWD_MAX,stdin);
40                     break;
41                 case 3:
42                     printf(">> Not Matched(third)!!! \n");
43                     printf("password : ");
44                     fgets(temp,PSWD_MAX,stdin);
45                     break;
46             }
47             try++;
48         }
49         if(try==4){
50             printf(">> Your are not allow to access PhoneBook.\n");
51             return 1;
52         }
53     }
54     try = 0;
55     return 0;
56 }

```

➔ this code role register.

And assignment require check password process, I append checkPassword function, devide password checking process from registration process

➔ I use fgets function instead of gets function because of checking string size.

And append Line 15, Line 18 -> prevent print \n charactor.

➔ Use while loop and if condition, compare password and check trial count

4. print.c

```

1 #include <stdio.h>
2 #include <string.h>
3 #include "phone.h"
4
5 void printAll(){
6     printf("<<Print all contents in the PhoneBook>>\n");
7     for(int x = 0; x < size; x++){
8         if(strlen(PhoneBook[x].Name)>6) //control line tab's
9             printf("%s \t %s \n",PhoneBook[x].Name,PhoneBook[x].PhoneNumber);
10        else
11            printf("%s \t\t %s \n",PhoneBook[x].Name,PhoneBook[x].PhoneNumber);
12    }
13 }
14
15

```

I use if-else condition for controlling tab size with name string length.

5. search.c

```

1 #include <stdio.h>
2 #include <string.h>
3 #include "phone.h"
4
5 static char temp[N_MAX];
6 static int i = 0;
7 void searchByName(){
8     printf("Search by Name\n");
9     printf(">> Enter a name to search : ");
10    fgets(temp,N_MAX,stdin);
11    temp[strlen(temp)-1] = '\0'; //remove \n
12    while(i < size){
13        if(!strcmp(temp,PhoneBook[i].Name)) break;
14        i++;
15    }
16    if(i!=size){
17        if(strlen(PhoneBook[i].Name)>6)
18            printf("%s \t %s\n",PhoneBook[i].Name,
19                PhoneBook[i].PhoneNumber);
20        else
21            printf("%s \t\t %s\n",PhoneBook[i].Name,
22                PhoneBook[i].PhoneNumber);
23    }
24    else
25        printf("Oops! %s is not in the PhoneBook!\n",temp);
26    i = 0;
27 }

```

- I use static variable for store string name for comparing name in PhoneBook, and index (originally I define static int index but string.h has char index -> crash!).
- Using fgets store name for search, compare with strcmp function in string.h. If find same string in phonebook, break loop and then index not same with size -> matched case!
- All loop complete -> index same with size -> that case mismatch

6. delete.c

```

1 #include <stdio.h>
2 #include <string.h>
3 #include "phone.h"
4
5 static char temp[N_MAX];
6 static int i = 0;
7
8 void deleteNSort();
9
10 void deleteByName(){
11     printf("Delete by Name\n");
12     printf(">> Enter a name to delete : ");
13     fgets(temp,N_MAX,stdin);
14     temp[strlen(temp)-1] = '\0'; //delete \n
15     while(i < size){
16         if(!strcmp(temp,PhoneBook[i].Name)) break;
17         i++;
18     }
19     if(i!=size)
20         deleteNSort();
21     else
22         printf("Oops! %s is not in the PhoneBook!\n",temp);
23     i = 0;
24 }
25
26 void deleteNSort(){
27     if(i==size) return;
28     while(i<size-1){
29         strcpy(PhoneBook[i].Name,PhoneBook[i+1].Name);
30         strcpy(PhoneBook[i].PhoneNumber,PhoneBook[i+1].PhoneNumber);
31         i++;
32     }
33     size--;
34     printf("%s is deleted...\n",temp);
35 }

```

<same with search.c>

- I use static variable for store string name for comparing name in PhoneBook, and index (originally I define static int index but string.h has char index -> crash!).
- I divide delete and sort section from search and delete
- Deletebyname -> search name same with input name
- If find name on phonebook -> execute deletensort, Else -> exit.
- deleteNSort() use strcpy's copy feature and remove previous data

➔ search matched index on static variable i, from that index to end of array, strcpy from next element to previous element and finally decrease size.

7. service.h

```
1
2 #ifndef _SERVICE_H_
3 #define _SERVICE_H_
4
5 #include "phone.h"
6
7 void registerPhoneData();//implemented in register.c
8 void printAll();//implemented in search.c
9 void searchByName();//implemented in search.c
10 void deleteByName();//implemented in delete.c
11
12 #endif
```

→ this code define function of main feature that register, print, search, delete for main source file.

(4) Describe makefile

This is my makefile based on last homework5's makefile.

```
1 CC=gcc
2 CFLAGS = -Wall -g -c
3 INCLUDE = -I.
4
5 OBJS = phoneBookMain.o register.o print.o search.o delete.o
6 all = phonebook
7 %.o: %.c
8     $(CC) $(INCLUDE) $(CFLAGS) $<
9 phonebook: $(OBJS)
10    $(CC) -o phonebook $^
11 clean:
12    rm -f phonebook $(OBJS)
```

Macro variable :

CC, CFLAGS, INCLUDE ->

Setting of gcc

OBJS -> Object Files

All -> select main

%.o: %.c -> compile each c source code to same name of object file.

phonebook : link all OBJS to executable file named phonebook

clean : remove all object file and executable file.

2. Program Execution (20 points)

(1) Types of operating systems and compilers used

A. OS : Ubuntu 18.04.2 LTS based on debian linux

GCC : gcc (Ubuntu 7.3.0-27ubuntu1~18.04) 7.3.0

=> I can check Ubuntu version with 'cat /etc/*release' and gcc version with 'gcc --version' command

(2) How to compile and execute the program //create makefile, make,

A. I can compile with gcc and make makefile & use make command -> make executable file(named phonebook) -> execute ./phonebook

```
adrain@ubuntu:~/homework6/osp-eng-hw6-NgaAdrain$ make
gcc -I. -Wall -g -c phoneBookMain.c
gcc -I. -Wall -g -c register.c
gcc -I. -Wall -g -c print.c
gcc -I. -Wall -g -c search.c
gcc -I. -Wall -g -c delete.c
gcc -o phonebook phoneBookMain.o register.o print.o search.o delete.o
adrain@ubuntu:~/homework6/osp-eng-hw6-NgaAdrain$ make clean
rm -f phonebook phoneBookMain.o register.o print.o search.o delete.o
adrain@ubuntu:~/homework6/osp-eng-hw6-NgaAdrain$ ls
delete.c HeeSeok Jeong 201524582.txt makefile phoneBookMain.c phone.h print.c README.md register.c search.c service.h
adrain@ubuntu:~/homework6/osp-eng-hw6-NgaAdrain$ make
gcc -I. -Wall -g -c phoneBookMain.c
gcc -I. -Wall -g -c register.c
gcc -I. -Wall -g -c print.c
gcc -I. -Wall -g -c search.c
gcc -I. -Wall -g -c delete.c
gcc -o phonebook phoneBookMain.o register.o print.o search.o delete.o
```

→ Make execute compile to c -> object file, link all object file -> executable file and make clean execute remove all object file and executable file.

(3) Include a screen capture for illustrating how the program works

- Register & Print

➔ Execute Program, first user register password -> execute register service check correction of password

```
adrain@ubuntu:~/homework6/osp-eng-hw6-NgaAdrain$ ./phonebook
regist your password(to 10 charactor) : 123456
===== Telephone Book Management =====
<<<1. Register  2. Print All  3. Search    4. Delete    5. Exit >>>
Please enter your service number (1-5)> 1
Registration
type your password(to 10 charactor)password : 123456
New User Name: IronMan
PhoneNumber : 010-1234-1234
Registered...
===== Telephone Book Management =====
<<<1. Register  2. Print All  3. Search    4. Delete    5. Exit >>>
Please enter your service number (1-5)> 1
Registration
type your password(to 10 charactor)password : 123456
New User Name: Hulk
PhoneNumber : 011-456-7532
Registered...
===== Telephone Book Management =====
<<<1. Register  2. Print All  3. Search    4. Delete    5. Exit >>>
Please enter your service number (1-5)> 2
<<Print all contents in the PhoneBook>>
IronMan      010-1234-1234
Hulk         011-456-7532
```

➔ After check password right -> add User Name & PhoneNumber

➔ Can check added information with print all service

```
adrain@ubuntu:~/homework6/osp-eng-hw6-NgaAdrain$ ./phonebook
regist your password(to 10 charactor) : 123456
===== Telephone Book Management =====
<<<1. Register  2. Print All  3. Search    4. Delete    5. Exit >>>
Please enter your service number (1-5)> 1
Registration
type your password(to 10 charactor)password : 123
>> Not Matched!!!
password : 456
>> Not Matched(twice)!!!
password : 789
>> Not Matched(third)!!!
password : 12345
>> Your are not allow to access PhoneBook.
```

➔ This is password error case. We can try maximum 4 times, and if password incorrect, escape this function.

- Search

```
===== Telephone Book Management =====
<<<1. Register  2. Print All  3. Search    4. Delete    5. Exit >>>
Please enter your service number (1-5)> 3
Search by Name
>> Enter a name to search : Hulk
Hulk      011-456-7532
```

➔ Input name and same name exist on PhoneBook, print information of name.

```
===== Telephone Book Management =====
<<<1. Register  2. Print All  3. Search    4. Delete    5. Exit >>>
Please enter your service number (1-5)> 3
Search by Name
>> Enter a name to search : IronM
Oops! IronM is not in the PhoneBook!
```

➔ If input name not in the phone book -> error message print.

- Delete

<Correct case>

```
===== Telephone Book Management =====
<<<1. Register  2. Print All  3. Search      4. Delete      5. Exit >>>
Please enter your service number (1-5)> 4
Delete by Name
>> Enter a name to delete : IronMan
IronMan is deleted...
===== Telephone Book Management =====
<<<1. Register  2. Print All  3. Search      4. Delete      5. Exit >>>
Please enter your service number (1-5)> 2
<<Print all contents in the PhoneBook>>
Hulk                011-456-7532
===== Telephone Book Management =====
<<<1. Register  2. Print All  3. Search      4. Delete      5. Exit >>>
Please enter your service number (1-5)> █
```

→ Input name, can delete information of name -> this can check on print all service

```
===== Telephone Book Management =====
<<<1. Register  2. Print All  3. Search      4. Delete      5. Exit >>>
Please enter your service number (1-5)> 4
Delete by Name
>> Enter a name to delete : Hul
Oops! Hul is not in the PhoneBook!
===== Telephone Book Management =====
<<<1. Register  2. Print All  3. Search      4. Delete      5. Exit >>>
Please enter your service number (1-5)> █
```

→ If input name not in the phone book -> error message print.

3. Github repository(20 points)

- (1) include github commands for cloning, adding, committing and pushing

→ 1st I can check my status with 'git status' command

```
adrain@ubuntu:~/homework6/osp-eng-hw6-NgaAdrain$ git status
On branch master
Your branch is ahead of 'origin/master' by 2 commits.
(use "git push" to publish your local commits)

Changes not staged for commit:
  (use "git add/rm <file>..." to update what will be committed)
  (use "git checkout -- <file>..." to discard changes in working directory)

        modified:   delete.c
        deleted:    delete.o
        modified:   phone.h
        modified:   phoneBookMain.c
        deleted:    phoneBookMain.o
        deleted:    phonebook
        modified:   print.c
        deleted:    print.o
        modified:   register.c
        deleted:    register.o
        modified:   search.c
        deleted:    search.o
        modified:   service.h

no changes added to commit (use "git add" and/or "git commit -a")
adrain@ubuntu:~/homework6/osp-eng-hw6-NgaAdrain$ git add *
adrain@ubuntu:~/homework6/osp-eng-hw6-NgaAdrain$ git commit -m "19/05/19 Complete"
[master adfe79b] 19/05/19 Complete
7 files changed, 9 insertions(+), 10 deletions(-)
```

→ 2nd then I can add my files for push with 'git add *' command(use * wild card)

→ 3rd and commit added file to local repository for push with command 'git commit' and add comment with -m option.

```

adrain@ubuntu:~/homework6/osp-eng-hw6-NgaAdrain$ git status
On branch master
Your branch is ahead of 'origin/master' by 3 commits.
  (use "git push" to publish your local commits)

nothing to commit, working tree clean
adrain@ubuntu:~/homework6/osp-eng-hw6-NgaAdrain$ git push
Username for 'https://github.com': NgaAdrain
Password for 'https://NgaAdrain@github.com':
Counting objects: 24, done.
Delta compression using up to 2 threads.
Compressing objects: 100% (24/24), done.
Writing objects: 100% (24/24), 6.19 KiB | 2.06 MiB/s, done.
Total 24 (delta 20), reused 0 (delta 0)
remote: Resolving deltas: 100% (20/20), completed with 14 local objects.
To https://github.com/pnusystemprog/osp-eng-hw6-NgaAdrain
   05ba4cb..adfe79b  master -> master

```

- ➔ 4th check my status with 'git status' command,
- ➔ Finally use 'git push', I can push my files from local repository to remote repository.

(2) After pushing the source code and the makefile to your github directory, include the screen capture image of the Github repository

- ➔ After my commit, push all activity, I can check my comment "19/05/17 Complete

osp-eng-hw6-NgaAdrain created by GitHub Classroom Edit

Manage topics

12 commits 1 branch 0 releases 2 contributors

Branch: master New pull request Create new file Upload files Find File Clone or download +

NgaAdrain 19/05/19 Complete Latest commit adfe79b 2 hours ago

HeeSeok_jeong_201524582.txt	Add Student Information	4 days ago
README.md	README.md	11 hours ago
delete.c	19/05/19 Complete	2 hours ago
delete.o	19/05/17 Complete	2 hours ago
makefile	19/05/17 Complete	2 hours ago
phone.h	19/05/19 Complete	2 hours ago
phoneBookMain.c	19/05/19 Complete	2 hours ago
phoneBookMain.o	19/05/17 Complete	2 hours ago
phonebook	19/05/17 Complete	2 hours ago
print.c	19/05/19 Complete	2 hours ago
print.o	19/05/17 Complete	2 hours ago
register.c	19/05/19 Complete	2 hours ago
register.o	19/05/17 Complete	2 hours ago
search.c	19/05/19 Complete	2 hours ago
search.o	19/05/17 Complete	2 hours ago
service.h	19/05/19 Complete	2 hours ago

- ➔ This is result.

4. Discussion (10 points)

- What you learned while doing your homework (contents other than class hours),

A. I can practice using github include clone, add, commit, push, and process of git that <1st. clone from remote repository to local repository(include pull) 2nd. After modify, create, delete add file to track 3rd. commit tracked file to local repository, finally push from local repository to remote repository.> , know concept of extern variable and static variable, how 2 use that variable with header file, and review making and using makefile.

- Describe difficulties during homework

A. I have some difficulties with extern variable that how can I use that variable?(usage) and that solved with google search. And gets has security problem(with buffer overflow) I use fgets but problem occurred from fgets includes `\n` character -> that invoke `printf` function show weird result. Because of this problem I spend a lots of time to debug for solving this problem, and I can resolve this problem temporary that increase `phonenumbers`'s size, and when register data add process that remove last `\n` character. And tab size occur uncomfortable view on print function that over 6 character on name, print length set different. -> this problem also resolve temporary that make condition when over 6 character, same or less than 6 character, append `\t` character once vs twice.

So. This assignment quite simple problem, but it was good chance to practicing what we learned.

Thanks for reading my report.