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CptS 360

Pre-Lab 1 Report

Part 1

(A) Observe the 6 cases

Case	a.out	TEXT	DATA	BSS
1	7236	1507	304	8
2	7240	1507	308	4
3	7236	1507	304	40032
4	47260	1507	40328	4
5	7316	1710	308	8
6	7328	1523	304	40068

1.
Which variables are in DATA?
a, b, c, g = 3 and g[100000] = {4}
Which variables are in BSS?
g, d[10000]

2.
Which sections are in a.out?
Data and Text
Which sections are not in a.out?
BSS

Why?
Data contains the initialized static and global data while Text contains the code that will be run.
Data and Text are both in a,out. BSS contains unitialized global and static local variables so it is not in a.out. It's size is recorded in the a.out header.

(B) For each case, use "cc -m32 static t.c" to generate a.out and observe the section sizes

Case	a.out	TEXT	DATA	BSS
1	657628	581866	11264	3344
2	657628	581866	11264	3344
3	657628	581866	11264	43344
4	697660	581866	51296	3344
5	657628	581914	11264	3344
6	657720	581882	11264	43376

What do you see?

All sections are considerably larger

Why?

The static sections are much larger because static linking includes all the needed library function code and data in the a.out. The first set of cases were much smaller because they were dynamically linked. This means the library functions are not included.

Part 2

Code:

```
/************* t.c file ********************/
#include <stdio.h>
#include <stdlib.h>

int *FP;

int main(int argc, char *argv[ ], char *env[ ])
{
   int a,b,c;
   printf("enter main\n");

   printf("&argc=%x argv=%x env=%x\n", &argc, argv, env);
   printf("&a=%8x &b=%8x &c=%8x\n", &a, &b, &c);

   //(1). Write C code to print values of argc and argv[] entries
   printf("Number of arguments: %d\n", argc);

   printf("Contents of argv[]: ");
   int i = 0;
   while(i < argc) {
      printf("%s ", argv[i]);
      i++;
   }
   printf("\n");

   a=1; b=2; c=3;
   A(a,b);
   printf("exit main\n");
}

int A(int x, int y)
{
   int d,e,f;
   printf("enter A\n");
   // write C code to PRINT ADDRESS OF d, e, f
   d=4; e=5; f=6;

   printf("Address of d: %8X, ", &d);
```

```
    printf("Address of e: %8X, ", &e);
    printf("Address of f: %8X\n", &f);

    B(d,e);
    printf("exit A\n");
}

int B(int x, int y)
{
    int g,h,i;
    printf("enter B\n");
    // write C code to PRINT ADDRESS OF g,h,i
    g=7; h=8; i=9;

    printf("Address of g: %8X, ", &g);
    printf("Address of h: %8X, ", &h);
    printf("Address of i: %8X\n", &i);

    C(g,h);
    printf("exit B\n");
}

int C(int x, int y)
{
    int u, v, w, i, *p;

    printf("enter C\n");
    // write C cdoe to PRINT ADDRESS OF u,v,w,i,p;
    u=10; v=11; w=12; i=13;

    printf("Address of u: %8X, ", &u);
    printf("Address of v: %8X, ", &v);
    printf("Address of w: %8X, ", &w);
    printf("Address of i: %8X, ", &i);
    printf("Address of p: %8X, ", &p);

    FP = (int *)getebp();  // FP = stack frame pointer of the C() function


    //(2). Write C code to print the stack frame link list.
    printf("Contents of frame pointer link list:\n");
    while(FP != 0){
        printf("\tFP -> %8X -> \n", FP);
        FP = *FP;
    }
    printf("\tFP -> %8X\n", FP);
```

```
   p = (int *)&p;

   //(3). Print the stack contents from p to the frame of main()
   //    YOU MAY JUST PRINT 128 entries of the stack contents.
   printf("Contents of p:\n");
   int count = 0;
   while (count < 128){
      printf("%d(p) -> %8X\n%d(p) = %d\n\n", count, p, count, *p);
      p++;
      count++;
   }


   //(4). On a hard copy of the print out, identify the stack contents
   //    as LOCAL VARIABLES, PARAMETERS, stack frame pointer of each function.
}
```

Output:

```
enter main
&argc=ffb03430 argv=ffb034c4 env=ffb034cc
&a=ffb033ec &b=ffb033f0 &c=ffb033f4
Number of arguments: 1
Contents of argv[]: ./a.out
enter A
Address of d: FFB033A0, Address of e: FFB033A4, Address of f: FFB033A8
enter B
Address of g: FFB03370, Address of h: FFB03374, Address of i: FFB03378
enter C
Address of u: FFB03334, Address of v: FFB03338, Address of w: FFB0333C, Address of i:
FFB03340, Address of p: FFB03344, Contents of frame pointer link list:
        FP -> FFB03358 -> C()
        FP -> FFB03388 ->  B()
        FP -> FFB033B8 -> A()
        FP -> FFB03418 -> main()
        FP ->       0 crt0()
Contents of p:
0(p) -> FFB03344
0(p) = -5229756

1(p) -> FFB03348
1(p) = 1

2(p) -> FFB0334C
2(p) = -426756608

3(p) -> FFB03350
3(p) = -5229520
```

4(p) -> FFB03354
4(p) = 1448525772

5(p) -> FFB03358 C() stack frame pointer
5(p) = -5229688

6(p) -> FFB0335C
6(p) = 1448519800

START C() PARAMETERS

7(p) -> FFB03360
7(p) = 7

8(p) -> FFB03364
8(p) = 8

END C() PARAMETERS

9(p) -> FFB03368
9(p) = -5229640

10(p) -> FFB0336C
10(p) = 1448519662

START B() LOCAL VARIABLES

11(p) -> FFB03370
11(p) = 7

12(p) -> FFB03374
12(p) = 8

13(p) -> FFB03378
13(p) = 9

END B() LOCAL VARIABLES

14(p) -> FFB0337C
14(p) = -426756608

15(p) -> FFB03380
15(p) = -5229520

16(p) -> FFB03384
16(p) = 1448525772

17(p) -> FFB03388 B() stack frame pointer
17(p) = -5229640

18(p) -> FFB0338C
18(p) = 1448519606

START B() PARAMETERS

19(p) -> FFB03390
19(p) = 4

20(p) -> FFB03394
20(p) = 5

END B() PARAMETERS

21(p) -> FFB03398
21(p) = -5229544

22(p) -> FFB0339C
22(p) = 1448519468

START A() LOCAL VARIABLES
23(p) -> FFB033A0
23(p) = 4

24(p) -> FFB033A4
24(p) = 5

25(p) -> FFB033A8
25(p) = 6

END A() LOCAL VARIABLES

26(p) -> FFB033AC
26(p) = -426756608

27(p) -> FFB033B0
27(p) = -5229520

28(p) -> FFB033B4
28(p) = 1448525772

29(p) -> FFB033B8 A() stack frame pointer
29(p) = -5229544

30(p) -> FFB033BC
30(p) = 1448519402

START A() PARAMETERS
31(p) -> FFB033C0

31(p) = 1

32(p) -> FFB033C4
32(p) = 2

END A() PARAMETERS

33(p) -> FFB033C8
33(p) = -5229584

34(p) -> FFB033CC
34(p) = -5229580

35(p) -> FFB033D0
35(p) = 9

36(p) -> FFB033D4
36(p) = -5225470

37(p) -> FFB033D8
37(p) = -5229364

38(p) -> FFB033DC
38(p) = -5229372

39(p) -> FFB033E0
39(p) = -135413760

40(p) -> FFB033E4
40(p) = -135413760

41(p) -> FFB033E8
41(p) = 0

42(p) -> FFB033EC
42(p) = 1

43(p) -> FFB033F0
43(p) = 2

44(p) -> FFB033F4
44(p) = 3

45(p) -> FFB033F8
45(p) = 1

46(p) -> FFB033FC
46(p) = -426756608

47(p) -> FFB03400
47(p) = 1

48(p) -> FFB03404
48(p) = -5229372

49(p) -> FFB03408
49(p) = -5229364

50(p) -> FFB0340C
50(p) = -5229520

51(p) -> FFB03410
51(p) = 0

52(p) -> FFB03414
52(p) = -135413760

53(p) -> FFB03418
53(p) = 0

54(p) -> FFB0341C
54(p) = -137232767

55(p) -> FFB03420
55(p) = -135413760

56(p) -> FFB03424
56(p) = -135413760

57(p) -> FFB03428
57(p) = 0

58(p) -> FFB0342C
58(p) = -137232767

59(p) -> FFB03430
59(p) = 1

60(p) -> FFB03434
60(p) = -5229372

61(p) -> FFB03438
61(p) = -5229364

62(p) -> FFB0343C
62(p) = -5229484

63(p) -> FFB03440

63(p) = 1

64(p) -> FFB03444
64(p) = -5229372

65(p) -> FFB03448
65(p) = -135413760

66(p) -> FFB0344C
66(p) = -135219366

67(p) -> FFB03450
67(p) = -5229376

68(p) -> FFB03454
68(p) = 0

69(p) -> FFB03458
69(p) = -135413760

70(p) -> FFB0345C
70(p) = 0

71(p) -> FFB03460
71(p) = 0

72(p) -> FFB03464
72(p) = 590937108

73(p) -> FFB03468
73(p) = -525592060

74(p) -> FFB0346C
74(p) = 0

75(p) -> FFB03470
75(p) = 0

76(p) -> FFB03474
76(p) = 0

77(p) -> FFB03478
77(p) = 64

78(p) -> FFB0347C
78(p) = -135122908

79(p) -> FFB03480
79(p) = 0

80(p) -> FFB03484
80(p) = 0

81(p) -> FFB03488
81(p) = -135219095

82(p) -> FFB0348C
82(p) = 1448525772

83(p) -> FFB03490
83(p) = 1

84(p) -> FFB03494
84(p) = 1448518816

85(p) -> FFB03498
85(p) = 0

86(p) -> FFB0349C
86(p) = 1448518865

87(p) -> FFB034A0
87(p) = 1448519133

88(p) -> FFB034A4
88(p) = 1

89(p) -> FFB034A8
89(p) = -5229372

90(p) -> FFB034AC
90(p) = 1448520272

91(p) -> FFB034B0
91(p) = 1448520368

92(p) -> FFB034B4
92(p) = -135218768

93(p) -> FFB034B8
93(p) = -5229380

94(p) -> FFB034BC
94(p) = -135120576

95(p) -> FFB034C0
95(p) = 1

96(p) -> FFB034C4
96(p) = -5225470

97(p) -> FFB034C8
97(p) = 0

98(p) -> FFB034CC
98(p) = -5225462

99(p) -> FFB034D0
99(p) = -5225440

100(p) -> FFB034D4
100(p) = -5223924

101(p) -> FFB034D8
101(p) = -5223890

102(p) -> FFB034DC
102(p) = -5223867

103(p) -> FFB034E0
103(p) = -5223850

104(p) -> FFB034E4
104(p) = -5223839

105(p) -> FFB034E8
105(p) = -5223807

106(p) -> FFB034EC
106(p) = -5223787

107(p) -> FFB034F0
107(p) = -5223772

108(p) -> FFB034F4
108(p) = -5223761

109(p) -> FFB034F8
109(p) = -5223720

110(p) -> FFB034FC
110(p) = -5223703

111(p) -> FFB03500
111(p) = -5223692

112(p) -> FFB03504

112(p) = -5223669

113(p) -> FFB03508
113(p) = -5223651

114(p) -> FFB0350C
114(p) = -5223618

115(p) -> FFB03510
115(p) = -5223532

116(p) -> FFB03514
116(p) = -5223487

117(p) -> FFB03518
117(p) = -5223470

118(p) -> FFB0351C
118(p) = -5223449

119(p) -> FFB03520
119(p) = -5223430

120(p) -> FFB03524
120(p) = -5223411

121(p) -> FFB03528
121(p) = -5223390

122(p) -> FFB0352C
122(p) = -5223307

123(p) -> FFB03530
123(p) = -5223280

124(p) -> FFB03534
124(p) = -5223252

125(p) -> FFB03538
125(p) = -5223239

126(p) -> FFB0353C
126(p) = -5223219

127(p) -> FFB03540
127(p) = -5223203

exit B
exit A

exit main