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ECE 357
11/06/2019

Problem 3 - Fixing your cat

<Source Code>

```
1  #include <stdio.h>
2  #include <string.h>
3  #include <stdlib.h>
4  #include <fcntl.h>
5  #include <errno.h>
6  #include <unistd.h>
7  #include <ctype.h>
8  #include <sys/signal.h>
9  #include <sys/wait.h>
10 #include <setjmp.h>
11
12 #define MAXSIZE 65536
13
14 jmp_buf report_jb;
15 int byte=0;
16 int n=2;
17 pid_t g, m, p;
18
19 int perr(char* op, char* file, char* para){
20     if(errno != 0){
21         fprintf(stderr, "Error: Failed to %s [%s] %s: %s\n", op, file, para, strerror(errno));
22         exit(errno);
23     }
24     return 0;
25 }
26
27 void kitty(int from, char* filename, int pipe_fg[], int pipe_gm[], struct sigaction report){
28     int r, w, jmp;
29     char buf[MAXSIZE];
30     int s = 0;
31     if((close(pipe_gm[1]))== -1) perr("close", "pipe_gm[1]", "");
32     if((close(pipe_gm[0]))== -1) perr("close", "pipe_gm[0]", "");
33     if((close(pipe_fg[0]))== -1) perr("close", "pipe_fg[0]", "");
34     while((r=read(from, buf, MAXSIZE))!=0){
```

```

35     if((setjmp(report_jb))!=0){
36         if((sigprocmask(SIG_UNBLOCK,&report.sa_mask,NULL))===-1)
37             perr("sigprocmask","report","for SIG_UNBLOCK");
38         break;
39     }
40     if(r<0) perr("read",filename,"for reading");
41     w=write(pipe_fg[1],buf,r);
42     if(w<0) perr("write",filename,"for writing");
43
44     while(w<r){
45         int pw=0;
46         if((pw = write(pipe_fg[1],buf+w,r-w))===-1)
47             perr("write",filename,"into pipe");
48         w = w+pw;
49     }
50     byte = byte+w;
51 }
52
53 if(s==0){
54     if((close(pipe_fg[1]))===-1) perr("close","pipe_fg[1]","");//
55     if(close(from)===-1) perr("close",filename,"");
56     s++;
57     if((waitpid(g, NULL, 0))===-1) perr("waitpid","g","");
58     if((waitpid(m, NULL, 0))===-1) perr("waitpid","m","");
59 }
60 }
61
62 void more(int pipe_fg[], int pipe_gm[]){
63     char *args[] = {"more", NULL};
64
65     if((close(pipe_fg[0]))===-1) perr("close","pipe_fg[0]","");
66     if((close(pipe_fg[1]))===-1) perr("close","pipe_fg[1]","");
67     if((close(pipe_gm[1]))===-1) perr("close","pipe_gm[1]","");
68
69     //stdin redirect
70     if((dup2(pipe_gm[0],0))===-1) perr("dup2","pipe_gm[0]","to stdin");
71     if((close(pipe_gm[0]))===-1) perr("close","pipe_gm[0]","");
72
73     if((execvp(args[0],args))===-1)perr("execvp","more","");
74 }
75
76 void grep(int pipe_fg[], int pipe_gm[], char* pattern){
77     char *args[] = {"grep", pattern, NULL};

```

```

78
79  if((close(pipe_fg[1]))== -1) perr("close","pipe_fg[1]","");
80  if((close(pipe_gm[0]))== -1) perr("close","pipe_gm[0]","");
81
82  //stdin redirect
83  if((dup2(pipe_fg[0],0))== -1) perr("dup2","pipe_fg[0]","to stdin");
84  if((close(pipe_fg[0]))== -1) perr("close","pipe_fg[0]","");
85  //stdout redirect
86  if((dup2(pipe_gm[1],1))== -1) perr("dup2","pipe_gm[1]","to stdout");
87  if((close(pipe_gm[1]))== -1) perr("close","pipe_gm[1]","");
88
89  if((execvp(args[0],args))== -1) perr("execvp","grep","");
90 }
91
92 void sig_report(int sn){
93     if(sn==SIGINT){
94         fprintf(stderr,"\nNumber of files: %d\n", n-1);
95         fprintf(stderr,"Number of bytes: %d\n\n", byte);
96     }
97     longjmp(report_jb, 1);
98 }
99
100 int main(int argc, char* argv[]){
101     int fd;
102
103     struct sigaction report;
104     report.sa_handler = sig_report;
105     report.sa_flags = 0;
106     if((sigemptyset(&report.sa_mask))== -1) perr("sigemptyset","report","");
107     if((sigaddset(&report.sa_mask, SIGINT))== -1) perr("sigaddset","SIGINT","to report");
108     if((sigaddset(&report.sa_mask, SIGPIPE))== -1) perr("sigaddset","SIGPIPE","to
report");
109     if((sigaction(SIGINT,&report,0))== -1) perr("sigaction","SIGINT","");
110     if((sigaction(SIGPIPE,&report,0))== -1) perr("sigaction","SIGPIPE","");
111
112     if(argc<3){
113         fprintf(stderr, "Error: need more argument\n");
114         exit(1);
115     }
116     else{
117         for(n;n<argc;n++){//for each infile
118             if((fd=open(argv[n],O_RDONLY))== -1) perr("open", argv[n], "for reading");
119

```

```
120     int pipe_fg[2];
121     int pipe_gm[2];
122     if(pipe(pipe_fg)==-1) perr("pipe","pipe_fg","");
123     if(pipe(pipe_gm)==-1) perr("pipe","pipe_gm","");
124
125     switch(m=fork()){
126         case -1:
127             perr("fork","m","");
128             break;
129         case 0://child more
130             if(close(fd)==-1)
131                 perr("close", argv[n], "");
132             more(pipe_fg, pipe_gm);
133             exit(EXIT_SUCCESS);
134             break;
135     }
136     switch(g=fork()){
137         case -1:
138             perr("fork","g","");
139             break;
140         case 0://child grep
141             if(close(fd)==-1)
142                 perr("close", argv[n], "");
143             grep(pipe_fg, pipe_gm, argv[1]);
144             exit(EXIT_SUCCESS);
145             break;
146     }
147     //parent
148     kitty(fd,argv[n],pipe_fg,pipe_gm,report);
149 }
150 }
151 return 0;
152 }
```

<Test Case #1 - long file, short file, long file / SIGINT(Control-C)>

```
bash-4.2$ ./catgm ";" bible.txt catgrepmore.c bible.txt
```

the history of the Creation of the world; but also an account of its
the deep; and the spirit of God moved over the waters.
1:4. And God saw the light that it was good; and he divided the light
1:5. And he called the light Day, and the darkness Night; and there was
1:8. And God called the firmament, Heaven; and the evening and morning
1:9. God also said; Let the waters that are under the heaven, be
1:10. And God called the dry land, Earth; and the gathering together of
1:16. And God made two great lights: a greater light to rule the day;
body, but in the soul; which is a spiritual substance, endued with
controvertists would have it, but a blessing, rendering them fruitful;
upon the earth; and there was not a man to till the earth.
flesh; she shall be called woman, because she was taken out of man.
hath commanded us that we should not eat; and that we should not touch
were opened to any more perfect knowledge of good; but only to the
shame of their being naked; which they minded not before; because being
3:10. And he said: I heard thy voice in paradise; and I was afraid,
She shall crush... Ipsa, the woman; so divers of the fathers read this
4:1. And Adam knew Eve his wife; who conceived and brought forth Cain,
him fear his own brothers and nephews; of whom, by this time, there might
be a good number upon the earth; which had now endured near 130 years;
writ supposes this mark to have been a trembling of the body; or a
His wife... She was a daughter of Adam, and Cain's own sister; God
Lamech in hunting slew Cain, mistaking him for a wild beast; and that

Number of files: 1

Number of bytes: 2686976

```
jmp_buf report_jb;
int byte=0;
int n=2;
pid_t g, m, p;
    fprintf(stderr, "Error: Failed to %s [%s] %s: %s\n", op, file, para, str
error(errno));
    exit(errno);
return 0;
int r, w, jmp;
char buf[MAXSIZE];
int s = 0;
if((close(pipe_gm[1]))==-1) perr("close","pipe_gm[1]","");
if((close(pipe_gm[0]))==-1) perr("close","pipe_gm[0]","");
```

```

if((close(pipe_fg[0]))==-1) perr("close","pipe_fg[0]", "");
    perr("sigprocmask","report","for SIG_UNBLOCK");
    break;
if(r<0) perr("read",filename,"for reading");
w=write(pipe_fg[1],buf,r);
if(w<0) perr("write",filename,"for writing");
    int pw=0;
    perr("write",filename,"into pipe");
    w = w+pw;
    byte = byte+w;

```

Number of files: 2

Number of bytes: 2692036

the history of the Creation of the world; but also an account of its
the deep; and the spirit of God moved over the waters.

1:4. And God saw the light that it was good; and he divided the light

1:5. And he called the light Day, and the darkness Night; and there was

1:8. And God called the firmament, Heaven; and the evening and morning

1:9. God also said; Let the waters that are under the heaven, be

1:10. And God called the dry land, Earth; and the gathering together of

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body, but in the soul; which is a spiritual substance, endued with
controvertists would have it, but a blessing, rendering them fruitful;
upon the earth; and there was not a man to till the earth.

flesh; she shall be called woman, because she was taken out of man.

hath commanded us that we should not eat; and that we should not touch

were opened to any more perfect knowledge of good; but only to the

shame of their being naked; which they minded not before; because being

3:10. And he said: I heard thy voice in paradise; and I was afraid,

She shall crush... Ipsa, the woman; so divers of the fathers read this

4:1. And Adam knew Eve his wife; who conceived and brought forth Cain,

him fear his own brothers and nephews; of whom, by this time, there might

be a good number upon the earth; which had now endured near 130 years;

writ supposes this mark to have been a trembling of the body; or a

His wife... She was a daughter of Adam, and Cain's own sister; God

Lamech in hunting slew Cain, mistaking him for a wild beast; and that

Number of files: 3

Number of bytes: 5379012

<Test Case #2 - long file, short file, long file / q key>

```

bash-4.2$ ./catgm ";" bible.txt catgrepmore.c bible.txt
the history of the Creation of the world; but also an account of its
the deep; and the spirit of God moved over the waters.
1:4. And God saw the light that it was good; and he divided the light
1:5. And he called the light Day, and the darkness Night; and there was
1:8. And God called the firmament, Heaven; and the evening and morning
1:9. God also said; Let the waters that are under the heaven, be
1:10. And God called the dry land, Earth; and the gathering together of
1:16. And God made two great lights: a greater light to rule the day;
body, but in the soul; which is a spiritual substance, endued with
controvertists would have it, but a blessing, rendering them fruitful;
upon the earth; and there was not a man to till the earth.
flesh; she shall be called woman, because she was taken out of man.
hath commanded us that we should not eat; and that we should not touch
were opened to any more perfect knowledge of good; but only to the
shame of their being naked; which they minded not before; because being
3:10. And he said: I heard thy voice in paradise; and I was afraid,
She shall crush... Ipsa, the woman; so divers of the fathers read this
4:1. And Adam knew Eve his wife; who conceived and brought forth Cain,
him fear his own brothers and nephews; of whom, by this time, there might
be a good number upon the earth; which had now endured near 130 years;
writ supposes this mark to have been a trembling of the body; or a
His wife... She was a daughter of Adam, and Cain's own sister; God
Lamech in hunting slew Cain, mistaking him for a wild beast; and that
jmp_buf report_jb;
int byte=0;
int n=2;
pid_t g, m, p;
    fprintf(stderr, "Error: Failed to %s [%s] %s: %s\n", op, file, para, str
error(errno));
    exit(errno);
return 0;
int r, w, jmp;
char buf[MAXSIZE];
int s = 0;
if((close(pipe_gm[1]))==-1) perr("close","pipe_gm[1]","");
if((close(pipe_gm[0]))==-1) perr("close","pipe_gm[0]","");
if((close(pipe_fg[0]))==-1) perr("close","pipe_fg[0]","");
    perr("sigprocmask","report","for SIG_UNBLOCK");
    break;
if(r<0) perr("read",filename,"for reading");

```

```

w=write(pipe_fg[1],buf,r);
if(w<0) perr("write",filename,"for writing");
int pw=0;
perr("write",filename,"into pipe");
w = w+pw;
byte = byte+w;

```

the history of the Creation of the world; but also an account of its
the deep; and the spirit of God moved over the waters.

1:4. And God saw the light that it was good; and he divided the light

1:5. And he called the light Day, and the darkness Night; and there was

1:8. And God called the firmament, Heaven; and the evening and morning

1:9. God also said; Let the waters that are under the heaven, be

1:10. And God called the dry land, Earth; and the gathering together of

1:16. And God made two great lights: a greater light to rule the day;

body, but in the soul; which is a spiritual substance, endued with

controvertists would have it, but a blessing, rendering them fruitful;

upon the earth; and there was not a man to till the earth.

flesh; she shall be called woman, because she was taken out of man.

hath commanded us that we should not eat; and that we should not touch

were opened to any more perfect knowledge of good; but only to the

shame of their being naked; which they minded not before; because being

3:10. And he said: I heard thy voice in paradise; and I was afraid,

She shall crush... Ipsa, the woman; so divers of the fathers read this

4:1. And Adam knew Eve his wife; who conceived and brought forth Cain,

him fear his own brothers and nephews; of whom, by this time, there might

be a good number upon the earth; which had now endured near 130 years;

writ supposes this mark to have been a trembling of the body; or a

His wife... She was a daughter of Adam, and Cain's own sister; God

Lamech in hunting slew Cain, mistaking him for a wild beast; and that

<Test Case #3 - short file, long file, short file / SIGINT(Control-C)>

```

bash-4.2$ ./catgm ";" catgrepmore.c bible.txt catgrepmore.c
jmp_buf report_jb;
int byte=0;
int n=2;
pid_t g, m, p;
    fprintf(stderr, "Error: Failed to %s [%s] %s: %s\n", op, file, para, str
error(errno));
    exit(errno);
return 0;
int r, w, jmp;
char buf[MAXSIZE];
int s = 0;
if((close(pipe_gm[1]))== -1) perr("close", "pipe_gm[1]", "");
if((close(pipe_gm[0]))== -1) perr("close", "pipe_gm[0]", "");
if((close(pipe_fg[0]))== -1) perr("close", "pipe_fg[0]", "");
    perr("sigprocmask", "report", "for SIG_UNBLOCK");
    break;
if(r<0) perr("read", filename, "for reading");
w=write(pipe_fg[1], buf, r);
if(w<0) perr("write", filename, "for writing");
    int pw=0;
        perr("write", filename, "into pipe");
        w = w+pw;
    byte = byte+w;

```

Number of files: 1

Number of bytes: 5060

the history of the Creation of the world; but also an account of its
the deep; and the spirit of God moved over the waters.

1:4. And God saw the light that it was good; and he divided the light

1:5. And he called the light Day, and the darkness Night; and there was

1:8. And God called the firmament, Heaven; and the evening and morning

1:9. God also said; Let the waters that are under the heaven, be

1:10. And God called the dry land, Earth; and the gathering together of

1:16. And God made two great lights: a greater light to rule the day;

body, but in the soul; which is a spiritual substance, endued with
controvertists would have it, but a blessing, rendering them fruitful;
upon the earth; and there was not a man to till the earth.

flesh; she shall be called woman, because she was taken out of man.

hath commanded us that we should not eat; and that we should not touch

were opened to any more perfect knowledge of good; but only to the shame of their being naked; which they minded not before; because being
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 be a good number upon the earth; which had now endured near 130 years;
 writ supposes this mark to have been a trembling of the body; or a
 His wife... She was a daughter of Adam, and Cain's own sister; God
 Lamech in hunting slew Cain, mistaking him for a wild beast; and that
 --More--

Number of files: 2

Number of bytes: 2692036

```

jmp_buf report_jb;
int byte=0;
int n=2;
pid_t g, m, p;
    fprintf(stderr, "Error: Failed to %s [%s] %s: %s\n", op, file, para, str
error(errno));
    exit(errno);
return 0;
int r, w, jmp;
char buf[MAXSIZE];
int s = 0;
if((close(pipe_gm[1]))==-1) perr("close","pipe_gm[1]","");
if((close(pipe_gm[0]))==-1) perr("close","pipe_gm[0]","");
if((close(pipe_fg[0]))==-1) perr("close","pipe_fg[0]","");
    perr("sigprocmask","report","for SIG_UNBLOCK");
    break;
if(r<0) perr("read",filename,"for reading");
w=write(pipe_fg[1],buf,r);
if(w<0) perr("write",filename,"for writing");
    int pw=0;
    perr("write",filename,"into pipe");
    w = w+pw;
    byte = byte+w;

```

--More--

Number of files: 3

Number of bytes: 2697096

<Test Case #4 - short file, long file, short file / q key>

```

bash-4.2$ ./catgm ";" catgrepmore.c bible.txt catgrepmore.c
jmp_buf report_jb;
int byte=0;
int n=2;
pid_t g, m, p;
    fprintf(stderr, "Error: Failed to %s [%s] %s: %s\n", op, file, para, str
error(errno));
    exit(errno);
    return 0;
    int r, w, jmp;
    char buf[MAXSIZE];
    int s = 0;
    if((close(pipe_gm[1]))==-1) perr("close","pipe_gm[1]","");
    if((close(pipe_gm[0]))==-1) perr("close","pipe_gm[0]","");
    if((close(pipe_fg[0]))==-1) perr("close","pipe_fg[0]","");
        perr("sigprocmask","report","for SIG_UNBLOCK");
        break;
    if(r<0) perr("read",filename,"for reading");
    w=write(pipe_fg[1],buf,r);
    if(w<0) perr("write",filename,"for writing");
        int pw=0;
        perr("write",filename,"into pipe");
        w = w+pw;
        byte = byte+w;

```

the history of the Creation of the world; but also an account of its
the deep; and the spirit of God moved over the waters.

1:4. And God saw the light that it was good; and he divided the light

1:5. And he called the light Day, and the darkness Night; and there was

1:8. And God called the firmament, Heaven; and the evening and morning

1:9. God also said; Let the waters that are under the heaven, be

1:10. And God called the dry land, Earth; and the gathering together of

1:16. And God made two great lights: a greater light to rule the day;

body, but in the soul; which is a spiritual substance, endued with

controvertists would have it, but a blessing, rendering them fruitful;

upon the earth; and there was not a man to till the earth.

flesh; she shall be called woman, because she was taken out of man.

hath commanded us that we should not eat; and that we should not touch

were opened to any more perfect knowledge of good; but only to the

shame of their being naked; which they minded not before; because being

3:10. And he said; I heard thy voice in paradise; and I was afraid,

She shall crush... Ipsa, the woman; so divers of the fathers read this

4:1. And Adam knew Eve his wife; who conceived and brought forth Cain, him fear his own brothers and nephews; of whom, by this time, there might be a good number upon the earth; which had now endured near 130 years; writ supposes this mark to have been a trembling of the body; or a His wife... She was a daughter of Adam, and Cain's own sister; God Lamech in hunting slew Cain, mistaking him for a wild beast; and that

```

jmp_buf report_jb;
int byte=0;
int n=2;
pid_t g, m, p;
    fprintf(stderr, "Error: Failed to %s [%s] %s: %s\n", op, file, para, str
error(errno));
    exit(errno);
return 0;
int r, w, jmp;
char buf[MAXSIZE];
int s = 0;
if((close(pipe_gm[1]))==-1) perr("close","pipe_gm[1]","");
if((close(pipe_gm[0]))==-1) perr("close","pipe_gm[0]","");
if((close(pipe_fg[0]))==-1) perr("close","pipe_fg[0]","");
    perr("sigprocmask","report","for SIG_UNBLOCK");
    break;
if(r<0) perr("read",filename,"for reading");
w=write(pipe_fg[1],buf,r);
if(w<0) perr("write",filename,"for writing");
    int pw=0;
        perr("write",filename,"into pipe");
    w = w+pw;
byte = byte+w;

```