

Tshlab

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Outline

- Analyze
- Fix Bug
- Update
- To-do List

Analyze

Work

- Accomplish a tiny shell
 - `eval()`
 - signal handler
- To become more familiar with process control and signaling

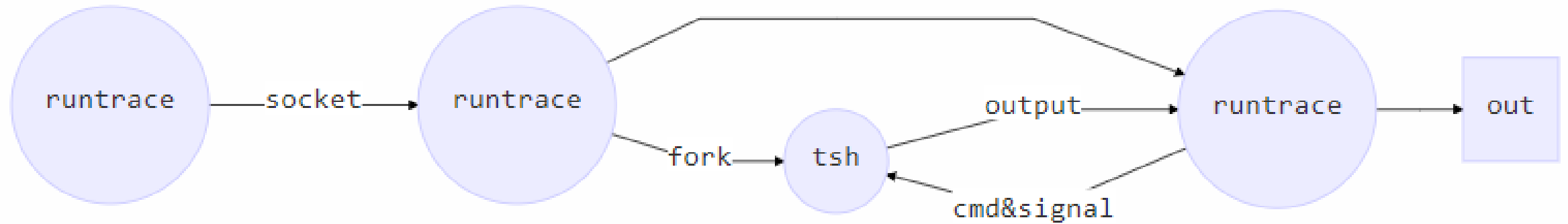
File hierarchy

tshlab/src/	Main source codes, some of which will be copied to handout and sent to students
tshlab/writeup/	Writeup of Lab sent to students
tshlab/patches/	Patches added by PKU // to fix bugs ?
tshlab/test/	Test
tshlab/test-autograder/	Test
tshlab/online-solutions/	Online solutions // may be used for cheat checker ?
tshlab/handin/	Directory of handins from students
tshlab/handout/	Directory sent to student
tshlab-rubric.txt	Other code rules
tshlab/Makefiles and other config files for autolab	

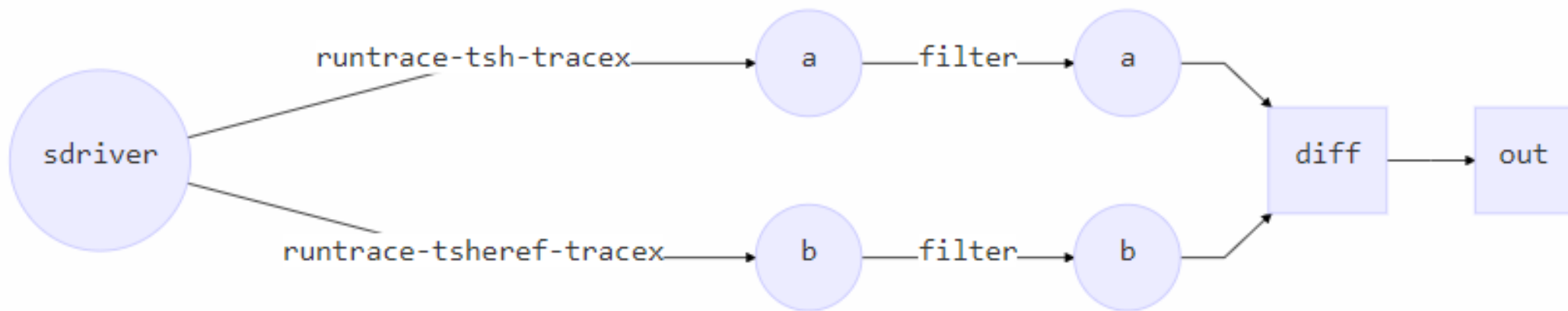
Main part – tshlab/src

- Driver program & traces to test tsh
 - sdriver.c
 - runtrace.c
 - trace*.txt
 - fork.c myspin.c myxx.c ... helper routines

Runtrace



Sdriver



Bugs

File descriptor

- 重定向时，打开文件得到新的描述符 – `builtin_cmd()`
- 返回给`eval()`函数，使用后在`eval()`中关闭
- Bug: 只有非`builtin_cmd`时才修改`fd`

File descriptor

tshlab/src/tsh.c

```
11 (tok->outfile);  
    out_fd = open(tok->outfile, O_WRONLY | O_CREAT | O_TRUNC, 0644);  
    if(out_fd == -1) {  
        (void) fprintf(stderr, "Error: %s Couldn't open file\n",  
                        tok->outfile);  
        return 1;  
    }  
}
```

```
switch (tok->builtins) {  
case BUILTIN_QUIT:  
    fflush(stdout);  
    fflush(stderr);  
    exit(0);  
case BUILTIN_JOBS:  
    listjobs(job_list, out_fd);  
    return 1;  
case BUILTIN_FG:  
case BUILTIN_BG:  
    do_bgfg(tok->argv, out_fd);  
    return 1;  
default:  
    /* not a builtin command */  
    (*input_fd) = in_fd;  
    (*output_fd) = out_fd;  
    return 0;  
}
```

```
return 0; /* not a builtin command */
```

```
501 501 11 (tok->outfile);  
502 502     out_fd = open(tok->outfile, O_WRONLY | O_CREAT | O_TRUNC, 0644);  
503 503     if(out_fd == -1) {  
504 504         (void) fprintf(stderr, "Error: %s Couldn't open file\n",  
505 505             tok->outfile);  
506 506         return 1;  
507 507     }  
508 508 }  
509 509  
510 510 (*input_fd) = in_fd;  
511 511 (*output_fd) = out_fd;  
512 512  
513 513 switch (tok->builtins) {  
514 514 case BUILTIN_QUIT:  
515 515     fflush(stdout);  
516 516     fflush(stderr);  
517 517     exit(0);  
518 518 case BUILTIN_JOBS:  
519 519     listjobs(job_list, out_fd);  
520 520     return 1;  
521 521 case BUILTIN_FG:  
522 522 case BUILTIN_BG:  
523 523     do_bgfg(tok->argv, out_fd);  
524 524     return 1;  
525 525 default:  
526 526     /* not a builtin command */  
527 527     return 0;  
528 528 }  
529 529
```

Gcc error

- 缓冲区太小
- `sprintf(buf, "%s\n", cmdline);`
- `char buf[MAXLINE + 1];`

```
lzzz@DESKTOP-5DIRHK6:/mnt/c/Users/Joe/OneDrive - pku.edu.cn/Grade_3/OSP/OSP/Project/tshlab-handout$ make
/usr/bin/gcc -Wall -g -Werror -Wl,--wrap,fork -o tsh tsh.c fork.c
tsh.c: In function 'listjobs' :
tsh.c:713:31: error: 'sprintf' may write a terminating nul past the end of the destination [-Werror=format-overflow=]
    sprintf(buf, "%s\n", job_list[i].cmdline);
                        ^
tsh.c:713:13: note: 'sprintf' output between 2 and 1025 bytes into a destination of size 1024
    sprintf(buf, "%s\n", job_list[i].cmdline);
    ^~~~~~
cc1: all warnings being treated as errors
Makefile:19: recipe for target 'tsh' failed
make: *** [tsh] Error 1
```

“Too many jobs”

- 当job数目大于MAXJOBS时
- addjob失败, 后续操作导致 segmentation fault
- 直接返回

```
tshlab/src/tsh.c MODIFIED  
...  
326 326      signals handlers can run again. Notice that the global job  
327 327      list is protected because the signals for the three  
328 328      handlers that manipulate it are blocked. */  
329 -      addjob(job_list, pipe_counts + 1, pids, status, cmdline);  
330 -  
329 +      if (!addjob(job_list, pipe_counts + 1, pids, status, cmdline)) {  
330 +          return;  
331 +      }  
331 332      char buf[MAXLINE];  
332 333      struct job_t *j = getjobpid(job_list, pids[0]);  
333 334      if (!bg) {  
...  
...
```

pkill

- trace10.txt: /usr/bin/pkill myspin1
- kill所有用户的myspin1进程, operation not permitted
- -u 参数指定用户 \$USER
- /usr/bin/pkill -u \$USER myspin1
- 需要实现环境变量

pkill

tshlab/src/trace10.txt MODIFIED

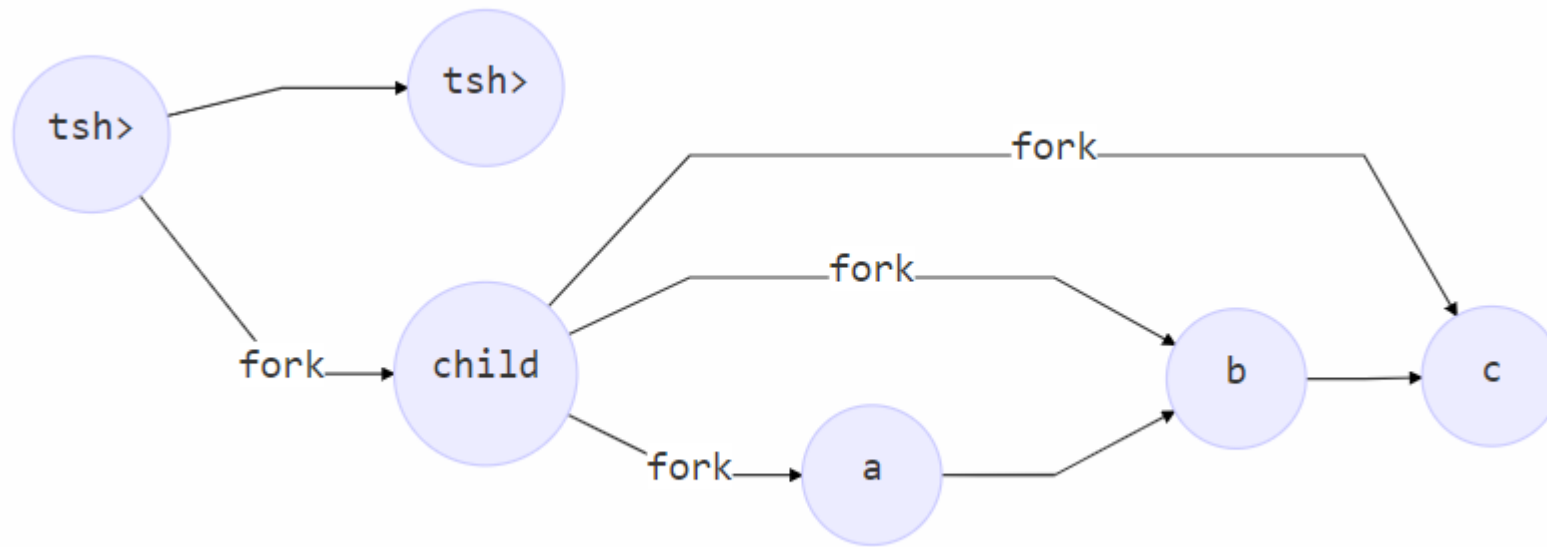
...

8	8	
9	9	WAIT
10	10	
11		-/bin/echo -e tsh\076 /usr/bin/pkill myspin1
	11	+/bin/echo -e tsh\076 /usr/bin/pkill -u \$USER myspin1
12	12	NEXT
13		-/usr/bin/pkill myspin1
	13	+/usr/bin/pkill -u \$USER myspin1
14	14	NEXT
15	15	
16	16	SIGNAL

...

Updates

Pipes

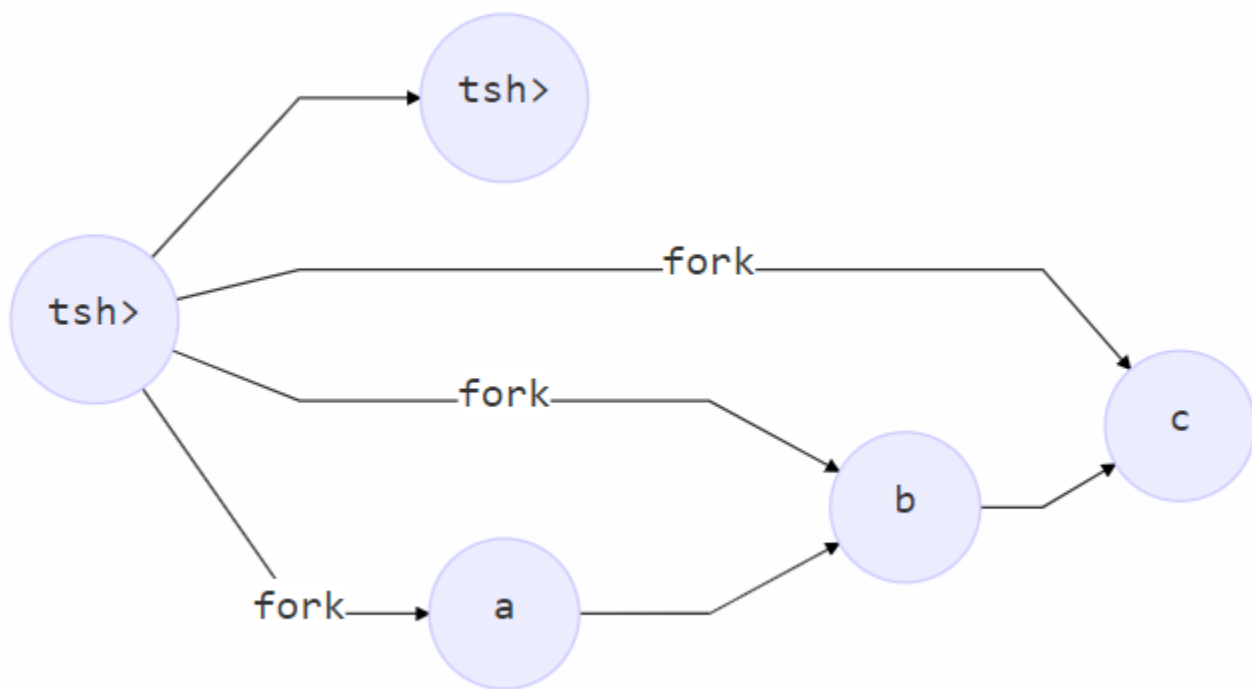


Pipes -- problem

- 子进程由child产生
- Tsh无法收到SIGCHLD
- 不能跟踪

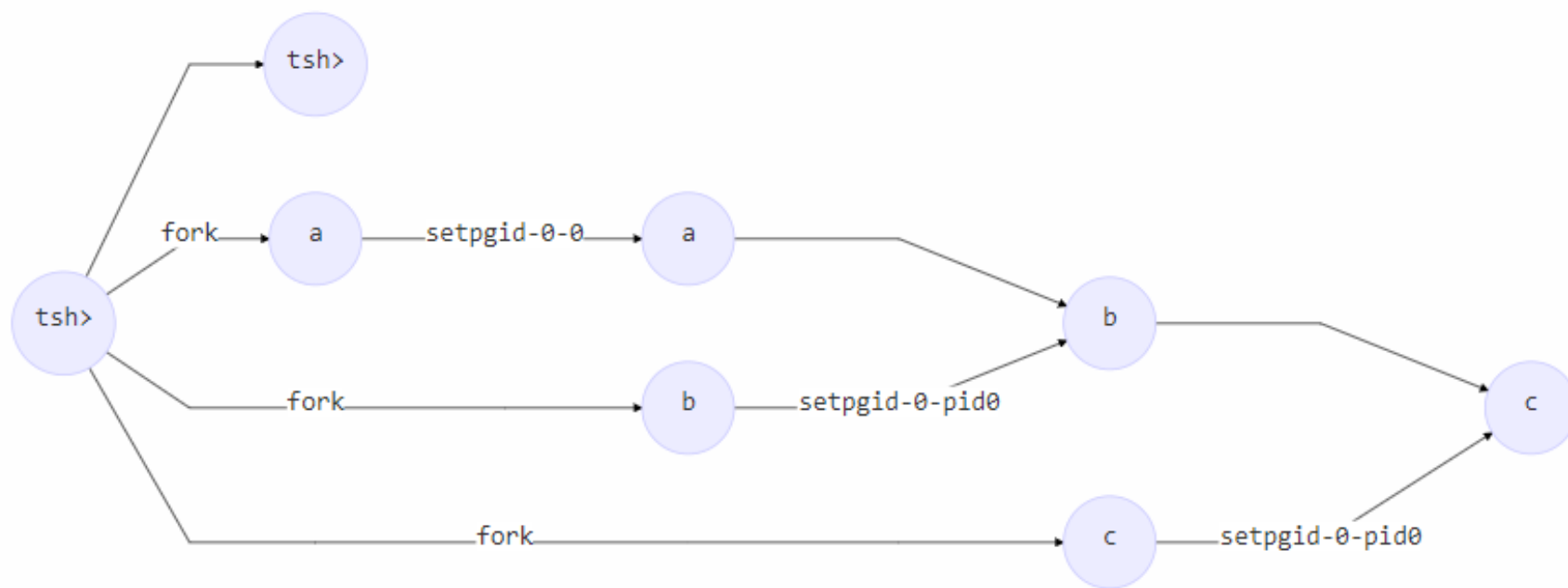
Pipes

- 所有的子进程都应该由Tsh创建
- 且a,b,c在不同于tsh的同一进程组



Pipes

- 所有的子进程都应该由Tsh创建
- 且a,b,c在不同于tsh的同一进程组



Pipes

- Race – b,c调用setpgid必须在a之后
- Add SIGUSR1 to synchronize

```
    }  
    Signal(SIGTTIN, SIG_DFL);  
    Signal(SIGTTOU, SIG_DFL);  
-    if (i == 0)  
+    if (i == 0) {  
        setpgid(0, 0);  
+        /* send a SIGUSR1 to parent */  
+        kill(getppid(), SIGUSR1);  
+    }  
    else {  
        setpgid(0, childgid);  
    }
```

```
    }  
-    if (i == 0)  
+    if (i == 0) {  
        childgid = pid;  
  
+        /* wait for setpgid */  
+        while (!sigusr1_flag)  
+            sigsuspend(&mask_all);  
+    }  
    if (i > 0) {  
        close(pipes[i - 1][0]);  
        close(pipes[i - 1][1]);  
    }
```

Job struct

- 修改Job结构和相关的处理

```
61 struct job_t {           /* The job struct */
62 -   pid_t pid;             /* job PID */
63     int jid;               /* job ID [1, 2, ...] */
64     int state;             /* UNDEF, BG, FG, or ST */
65     char cmdline[MAXLINE]; /* command line */
66 };
67 struct job_t job_list[MAXJOBS]; /* The job list */
```

```
61 struct job_t {           /* The job struct */
62 +   int pgid;              /* The number of processes in a job */
63 +   int procnum;           /* job ID [1, 2, ...] */
64     int jid;               /* UNDEF, BG, FG, or ST */
65     int state;             /* job PID */
66 +   pid_t pids[MAXPIPES + 1];
67     char cmdline[MAXLINE]; /* command line */
68 };
69 struct job_t job_list[MAXJOBS]; /* The job list */
```

Sdriver

- Sdriver比对输出，忽略(PID)
- 更改之后 – (PID, PID, PID…)
- 修改sdriver的正则表达式忽略括号中的内容

```
* These transformations allow us to do diffs on the outputs of
* different runs of different shells.
*/
#define PERLPROG "while(<>){chomp; s/\\s+//g; s/\\(\\d+\\)/\\(PID\\)/g; print \"$_\\n\"}"
#define PERLPROG "while(<>){chomp; s/\\s+//g; s/\\(\\.\\*\\)/[PIDS]/g; print \"$_\\n\"}"

/*****
* Global variables
```

Traces

- 用\0174代替 |

SIGINT

NEXT

```
-/bin/echo -e tsh\076 /bin/sh -c \047/bin/ps h | /bin/fgrep -v grep | /bin/fgrep mysplit\047
```

```
+ /bin/echo -e tsh\076 /bin/sh -c \047/bin/ps h \0174 /bin/fgrep -v grep \0174 /bin/fgrep mysplit\047
```

NEXT

```
/bin/sh -c '/bin/ps h | /bin/fgrep -v grep | /bin/fgrep mysplit'
```

NEXT

Traces

- trace25.txt – Pipe – use commands with a pipe to xargs

```
+#  
+# trace25.txt - Pipe - use commands with a pipe to xargs  
+#  
+  
+/bin/echo -e tsh\076 /bin/ls \0174 /usr/bin/xargs echo  
+NEXT  
+/bin/ls | /usr/bin/xargs echo  
+NEXT  
+  
+quit
```

Traces

- trace26.txt - Pipe - children fork by tsh

```
+#  
+# trace26.txt - Pipe - children fork by tsh  
+#  
+  
+/bin/echo -e tsh\076 ./mysplit 10 \0174 ./mysplit 10 \046  
+NEXT  
+./mysplit 10 | ./mysplit 10  
+WAIT  
+WAIT  
+SIGINT  
+NEXT  
+  
+quit
```

Traces

- trace27.txt - Pipe - background jobs with pipe

```
+#  
+# trace27.txt - Pipe - background jobs with pipe  
+#  
+  
+/bin/echo -e tsh\076 ./myspin1 10 \0174 ./myspin1 10 \046  
+NEXT  
+./myspin1 10 | ./myspin1 10 &  
+  
+NEXT  
+  
+quit
```

Traces

- trace28.txt - Pipe - use commands with multiple pipes

```
+#
+# trace28.txt - Pipe - use commands with multiple pipes
+#
+
+/bin/echo -e tsh\076 ./mysplit 10
+NEXT
+./mysplit 10
+WAIT
+
+
+SIGTSTP
+NEXT
+
+/bin/echo -e tsh\076 /bin/ps h \0174 /bin/fgrep -v grep \0174 /bin/fgrep mysplit \0174 /usr/bin/expand \0174 /usr/bin/colrm 1 15 \0174 /usr/bin/colrm
+NEXT
+/bin/ps h | /bin/fgrep -v grep | /bin/fgrep mysplit | /usr/bin/expand | /usr/bin/colrm 1 15 | /usr/bin/colrm 2 11
+NEXT
+
+quit
```

Writeup

- Update writeup

	Author	Commit	Message
•	? Lzzz	b24eb1e	modify writeup -- SoB Li Zhuo <lizhmq@pku.edu.cn>
•	? Lzzz	cfeea76	add comment by Cheng Sheng <1600012909@pku.edu.cn>
•	? Lzzz	ff33525	modify config.h, tsh head -- SoB Li Zhuo <lizhmq@pku.edu.cn>
•	? Lzzz	1c98b8e	add environment -- implemented by Cheng Sheng <1600012909@pku.edu.cn>
•	? Lzzz	75c92dd	modify PERLPROG to ignore anything between "()" -- SoB Li Zhuo <lizhmq@pku.edu.cn>
•	? Lzzz	36f6982	fix fgpid bug, add fgpgid in job struct -- SoB Li Zhuo <lizhmq@pku.edu.cn>
•	? Lzzz	bc6fc85	fix race bug -- add SIGUSR1 to synchronize -- SoB Li Zhuo <lizhmq@pku.edu.cn>
•	? Lzzz	302b7e9	fix "loop initial declaration" bug, robust code fix -- SoB Li Zhuo <lizhmq@pku.edu.cn>
•	? Lzzz	7a11f67	fix pkill bug -- should implement ENV \$USER -- SoB Li Zhuo <lizhmq@pku.edu.cn>
•	? Lzzz	0f39e50	add traces to test pipes -- SoB Li Zhuo <lizhmq@pku.edu.cn>
•	? Lzzz	0530e85	fix "too many jobs" segmentation fault bug -- SoB Li Zhuo <lizhmq@pku.edu.cn>
•	? Lzzz	da5722d	fix code to more robust -- SoB Li Zhuo <lizhmq@pku.edu.cn>
•	? Lzzz	6898cc3	fully implement pipes & add helper functions -- SoB Li Zhuo <lizhmq@pku.edu.cn>
•	? Lzzz	6f7d300	implement pipes -- SoB Li Zhuo <lizhmq@pku.edu.cn>
•	? Lzzz	192e465	fix traces: substitute with \0174 -- SoB Li Zhuo <lizhmq@pku.edu.cn>
•	? Lzzz	21679d5	fix bug: tsh.c -- SoB Li Zhuo <lizhmq@pku.edu.cn>
•	? Lzzz	164313b	rewrite tsh.c and then add deal_pipe
•	? Lzzz	2484bcf	fix bug: builtin_cmd may not close file descriptors -- SoB Li Zhuo <lizhmq@pku.edu.cn>
•	? Lzzz	294f118	init

To-do List

Builtin-cmd & pipes

- Current tsh doesn't support this for simplicity.

Multi-processes control

- Tsh wait for all processes in a job to terminate.
- Send signals to all processes in a job.
- Job的多个进程处于不同状态时, job的状态如何定义

Background job read/write

- Raise SIGTTIN & SIGTTOUT

Evaluation

- Evaluate by output

Thanks