

Task 1:

Inside struct proc in proc.h added:

```
int sched_count;  
int run_ticks;
```

Task 2:

Inside allocproc() in proc.c added:

```
p->sched_count = 0;  
p->run_ticks = 0;
```

Task 3:

Inside scheduler():

```
p->sched_count++;
```

Task 4:

Inside case T_IRQ0 + IRQ_TIMER in trap.c:

```
if(myproc() && myproc() -> state == RUNNING) {  
    myproc() -> run_ticks++;  
}
```

Task 5:

In syscall.h:

```
#define SYS_getstats 25
```

In syscall.c:

```
extern int sys_getstats(void);  
[SYS_getstats] sys_getstats,
```

Task 6:

In sysproc.c:

```
int  
sys_getstats(void)  
{  
    int *user_stats_ptr;  
  
    if(argptr(0, (void*)&user_stats_ptr, 2*sizeof(int)) < 0)  
        return -1;  
    struct proc *p = myproc();  
    int kernel_stats[2];  
    kernel_stats[0] = p->sched_count;
```

```

kernel_stats[1] = p->run_ticks;

if(copyout(p->pgdir, (uint)user_stats_ptr, (char*)kernel_stats, sizeof(kernel_stats)) < 0)
return -1;
return 0;
}

```

Task 7:

In user.h:

```

struct procstats {
    int sched_count;
    int run_ticks;
};
int getstats(int *stats_array);

```

Task 8:

In usys.S:

```

SYSCALL(getstats)

```

Task 9:

Added statstest.c:

```

#include "types.h"
#include "stat.h"
#include "user.h"

int main(void) {
    int stats[2];
    int i;
    for(i = 0; i < 2; i++) {
        if(getstats(stats) == 0) {
            printf(1, "Scheduled %d times, ran for %d ticks\n", stats[0], stats[1]);
        }
        else {
            printf(2, "getstats failed\n");
        }
        sleep(10);
    }
    exit();
}

```

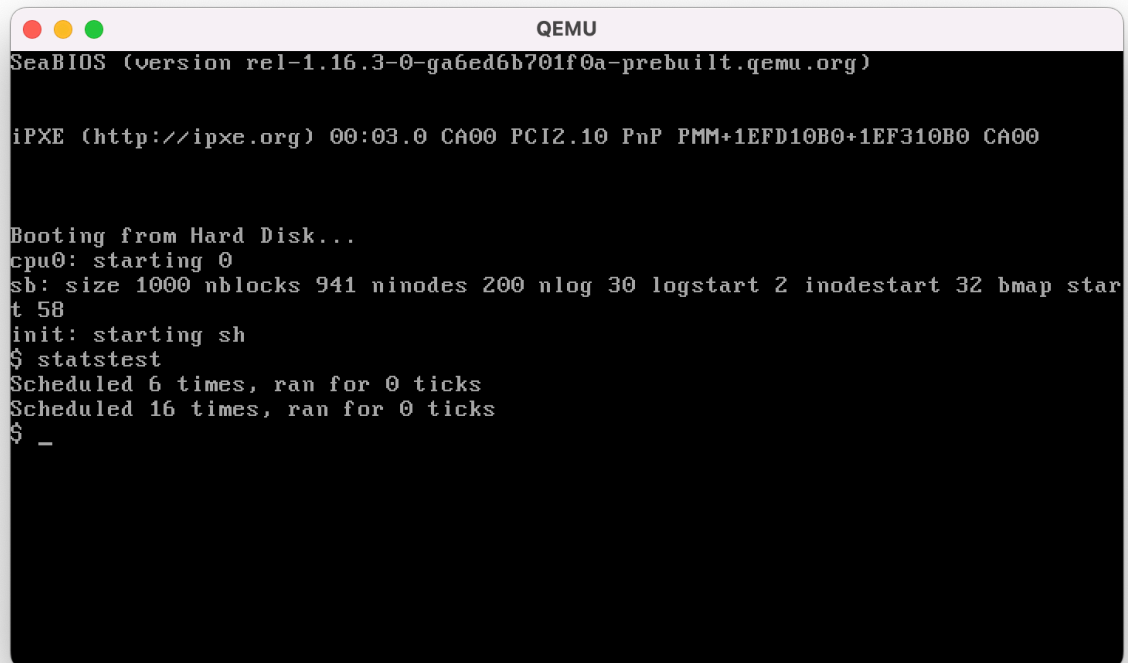
Task 10:

In Makefile:

```

_statstest\

```

A screenshot of a QEMU terminal window. The window has a title bar with three colored buttons (red, yellow, green) on the left and the text "QEMU" in the center. The terminal content shows the SeaBIOS boot process. It starts with "SeaBIOS (version rel-1.16.3-0-ga6ed6b701f0a-prebuilt.qemu.org)". Then it displays ACPI table information: "iPXE (http://ipxe.org) 00:03.0 CA00 PCI2.10 PnP PMM+1EFD10B0+1EF310B0 CA00". This is followed by "Booting from Hard Disk...". Then "cpu0: starting 0". Then "sb: size 1000 nblocks 941 ninodes 200 nlog 30 logstart 2 inodestart 32 bmap start 58". Then "init: starting sh". Then "\$ statstest". Then "Scheduled 6 times, ran for 0 ticks". Then "Scheduled 16 times, ran for 0 ticks". Finally, it shows "\$ _" on a new line.

```
SeaBIOS (version rel-1.16.3-0-ga6ed6b701f0a-prebuilt.qemu.org)

iPXE (http://ipxe.org) 00:03.0 CA00 PCI2.10 PnP PMM+1EFD10B0+1EF310B0 CA00

Booting from Hard Disk...
cpu0: starting 0
sb: size 1000 nblocks 941 ninodes 200 nlog 30 logstart 2 inodestart 32 bmap start 58
init: starting sh
$ statstest
Scheduled 6 times, ran for 0 ticks
Scheduled 16 times, ran for 0 ticks
$ _
```

Screenshot of the QEMU terminal