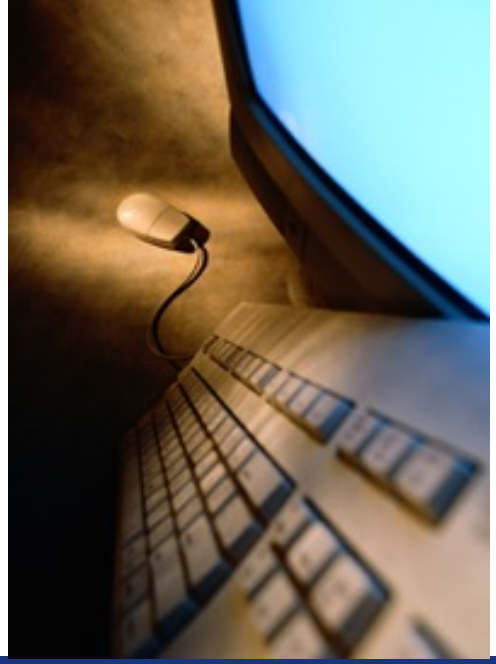
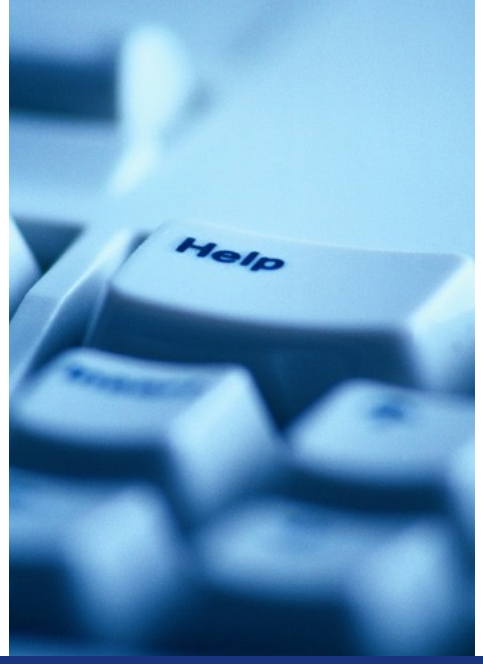
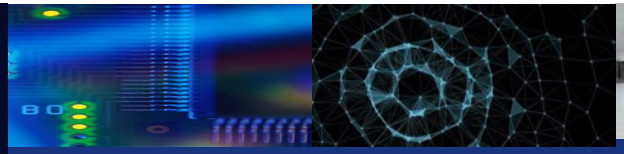



操作系统原理

Operating Systems Principles

陈鹏飞
计算机学院



作业-4

1、什么是用户级线程和内核级线程？两者之间的区别是什么？在什么情况下一种类型比另一种更有优势？

2、以下哪个程序状态在多线程的进程中是跨线程共享的？

a.寄存器值
b.堆内存
c.全局变量
d.堆栈内存

3、考虑以下代码回答相关问题

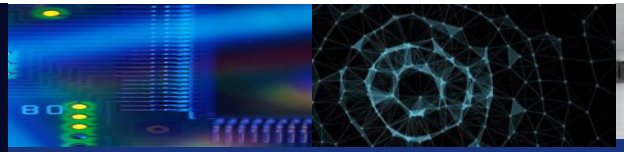
```
pid_t pid;

pid = fork();
if (pid == 0) { /* child process */
   fork();
   thread_create( . . .);
}
fork();
```

a.创建了多少个进程?
b.创建了多少个线程?

作业-4

4、 考虑以下程序，给出Line C和Line P的输出。

```
#include <pthread.h>
#include <stdio.h>

int value = 0;
void *runner(void *param); /* the thread */

int main(int argc, char *argv[])
{
pid_t pid;
pthread_t tid;
pthread_attr_t attr;

   pid = fork();

   if (pid == 0) { /* child process */
      pthread_attr_init(&attr);
      pthread_create(&tid,&attr,runner,NULL);
      pthread_join(tid,NULL);
      printf("CHILD: value = %d",value); /* LINE C */
   }
   else if (pid > 0) { /* parent process */
      wait(NULL);
      printf("PARENT: value = %d",value); /* LINE P */
   }
}

void *runner(void *param) {
   value = 5;
   pthread_exit(0);
}
```



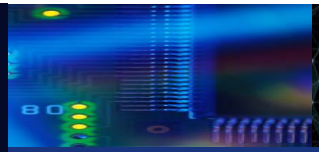
作业-4

5、考虑一个多核系统和一个使用多对多线程模型编写的多线程程序。让程序中用户级线程的数量大于系统中处理核心的数量。讨论以下场景对性能的影响。

a.分配给程序的内核线程数小于处理器核心数。

b.分配给程序的内核线程数等于处理器核心数。

c.分配给程序的内核线程数大于处理器核心数，但小于用户级线程数。



作业-4

选做

Write a multithreaded program that calculates various statistical values for a list of numbers. This program will be passed a series of numbers on the command line and will then create three separate worker threads. One thread will determine the average of the numbers, the second will determine the maximum value, and the third will determine the minimum value. For example, suppose your program is passed the integers

90 81 78 95 79 72 85

The program will report

```
The average value is 82
The minimum value is 72
The maximum value is 95
```

The variables representing the average, minimum, and maximum values will be stored globally. The worker threads will set these values, and the parent thread will output the values once the workers have exited. (We could obviously expand this program by creating additional threads that determine other statistical values, such as median and standard deviation.)