# 操作系统 Operating Systems

# L10 用户级线程

## User Threads

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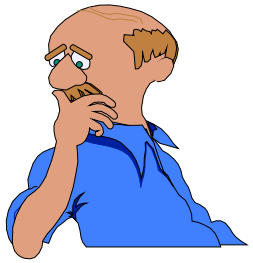
# 多进程是操作系统的基本图像



PID:1

mov … | mov [100], ax | write ax

Stack
Heap
Data
Code

100: 1

mov [100], ax

ffff 映射表

0000

PCB1

PID=1
阻塞
寄存器映像
……

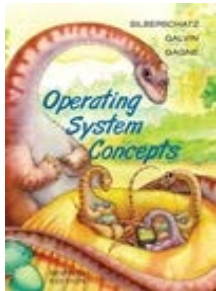
1 ax
1 bx
PC

得到ax=1，启动磁盘写，正在等待完成…

PID:2

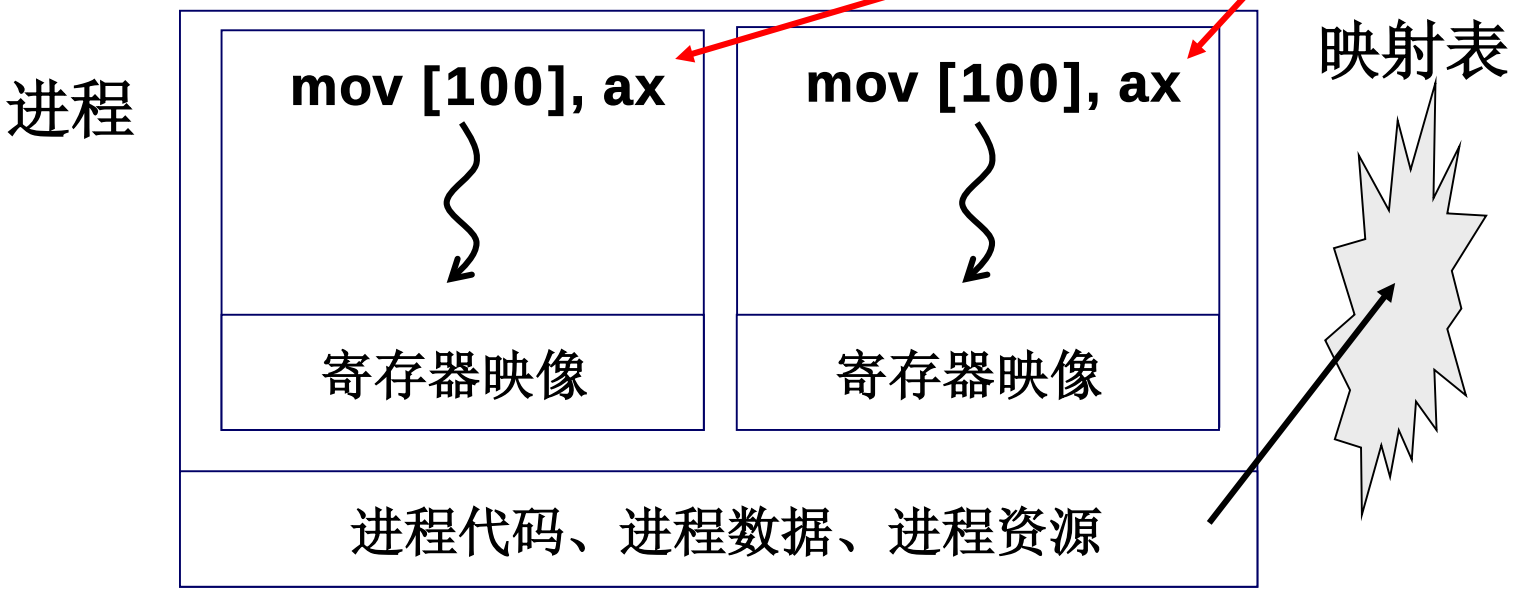
代码 | 栈 | PCB | 现场 | 映射表

PID:3

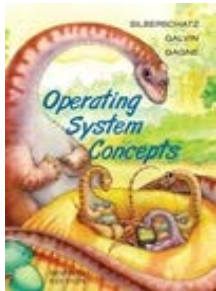


# 是否可以资源不动而切换指令序列?

- 进程 = 资源 + 指令执行序列
  - 将资源和指令执行分开
  - 一个资源 + 多个指令执行序列

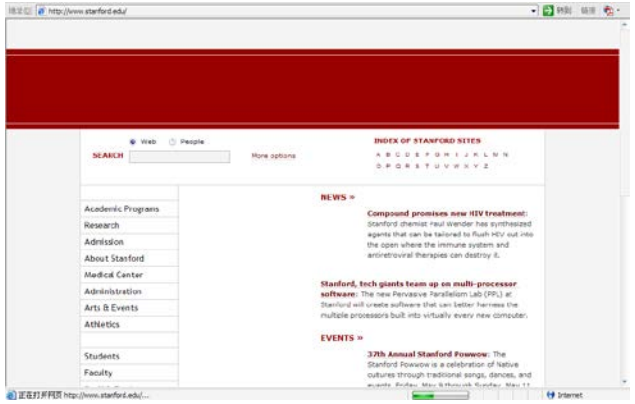



- 线程: 保留了并发的优点，避免了进程切换代价
- 实质就是映射表不变而PC指针变

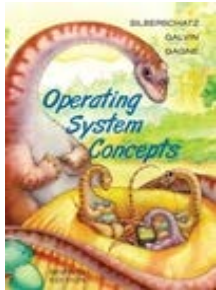


# 多个执行序列+一个地址空间是否实用?

- 一个网页浏览器
  - 一个线程用来从服务器接收数据
  - 一个线程用来显示文本
  - 一个线程用来处理图片(如解压缩)
  - 一个线程用来显示图片



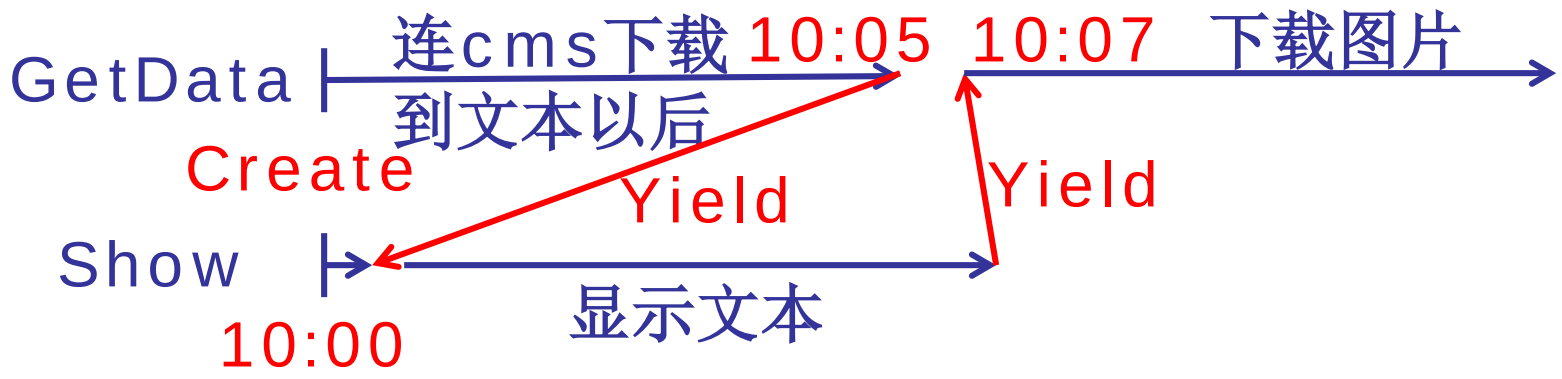

- 这些线程要共享资源吗?
  - 接收数据放在100处，显示时要读..
  - 所有的文本、图片都显示在一个屏幕上

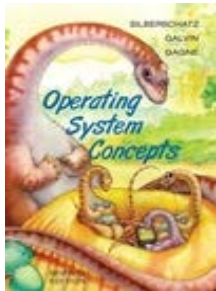


# 开始实现这个浏览器...

```
void WebExplorer()
{  char URL[] = “http://cms.hit.edu.cn”;
   char buffer[1000];
   pthread_create(..., GetData, URL, buffer);
   pthread_create(..., Show, buffer); }

void GetData(char *URL, char *p){...};
void Show(char *p){...};
```

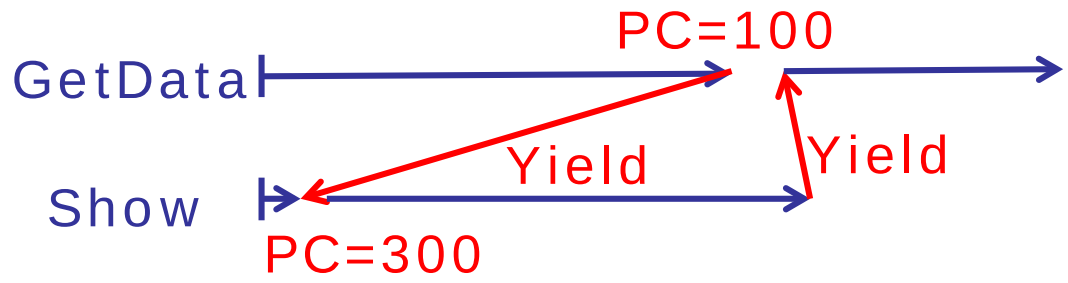


# Create? Yield?

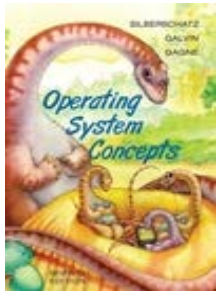
样子弄明白了，剩下的就是写程序实现这个样子了…

- 核心是Yield…
  - 能切换了就知道切换时需要是个什么样子
  - Create就是要制造出第一次切换时应该的样子
- 仔细看Yield，就是100跳到300

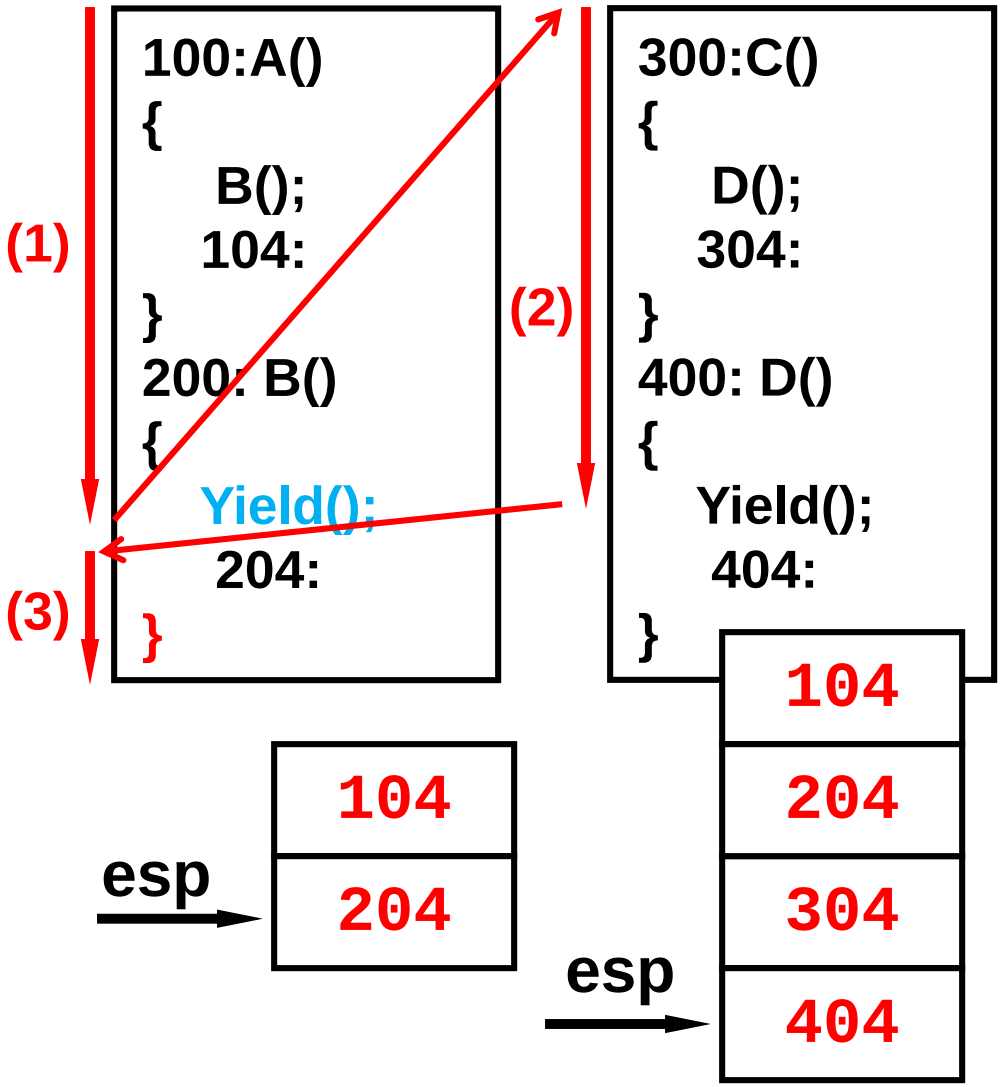



```
100:A()
{
    B();
   104:
}
200: B()
{
   Yield();
    204:
}
```

```
300:C()
{
    D();
   304:
}
400: D()
{
   Yield();
    404:
}
```



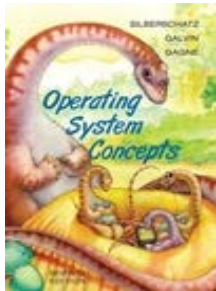
# 两个执行序列与一个栈...



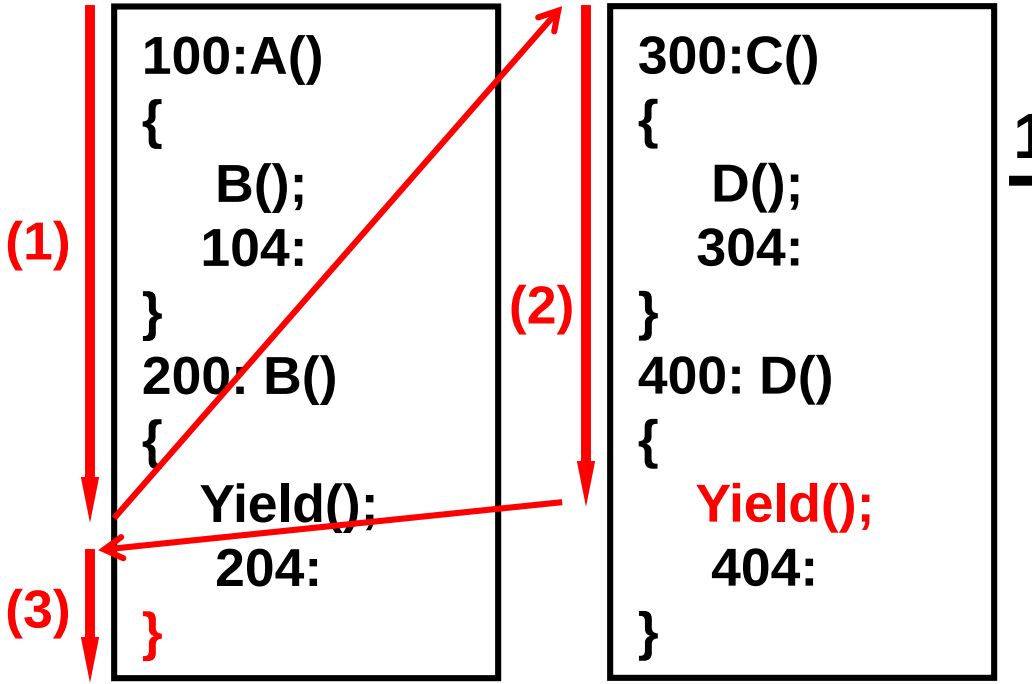

```
void Yield()          void Yield()
{                     {
    找到300;              找到 ?;
    jmp 300;              jmp ?;
}                     }
```

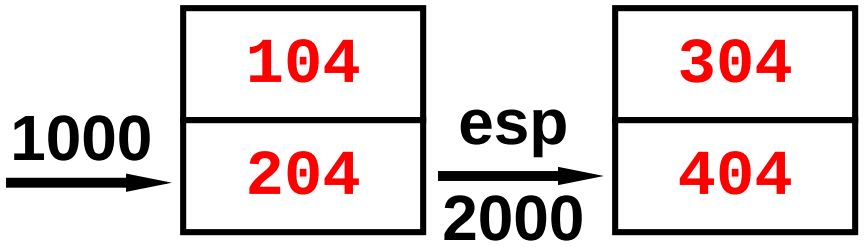
- *(3)再往下执行会怎么样?*
- 问题怎么解决?

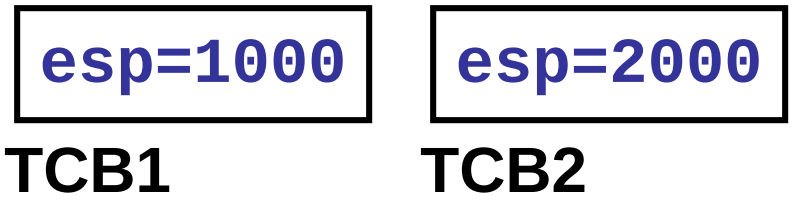
  为什么?



# 从一个栈到两个栈...



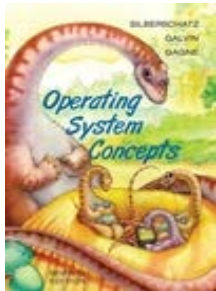



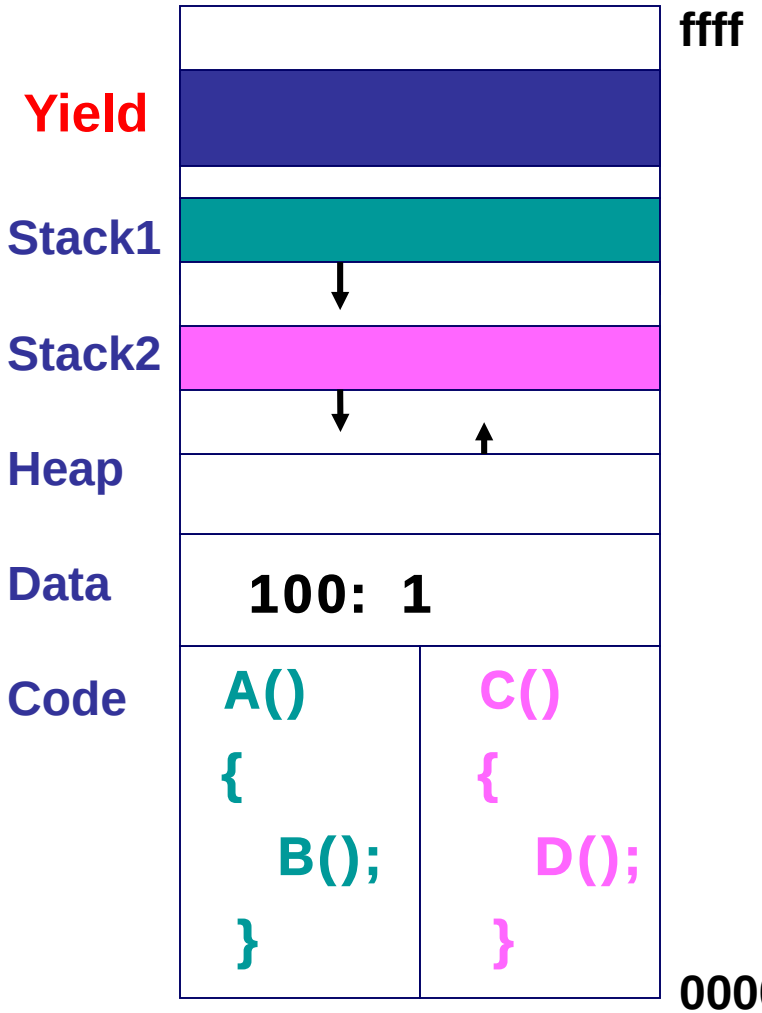

- *(3)再往下执行会怎么样?*
- *204是调用Yield()才压栈的...*

- Yield切换要先切换栈，然后...

```
void Yield(){
    TCB1.esp=esp;
    esp=TCB2.esp;
    jmp 204; 应该去掉
}
```

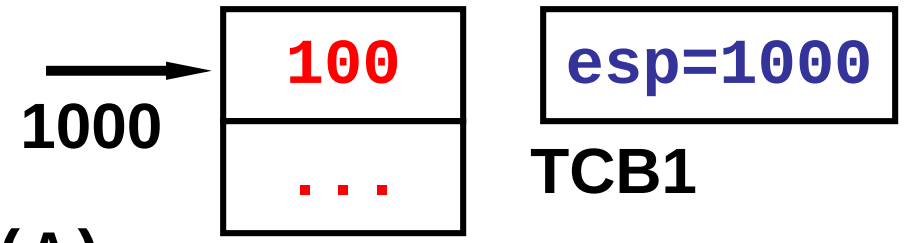


# 两个线程的样子：两个TCB、两个栈、切换的PC在栈中

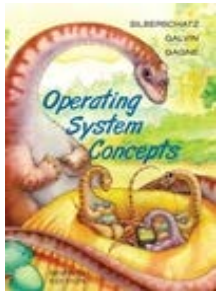



两个执行序列

- ThreadCreate的核心就是用程序做出这三样东西




```
void ThreadCreate(A)
{
    TCB *tcb=malloc();
    *stack=malloc();
    *stack = A;//100
    tcb.esp=stack;
}
```



# 将所有的东西组合在一起.....

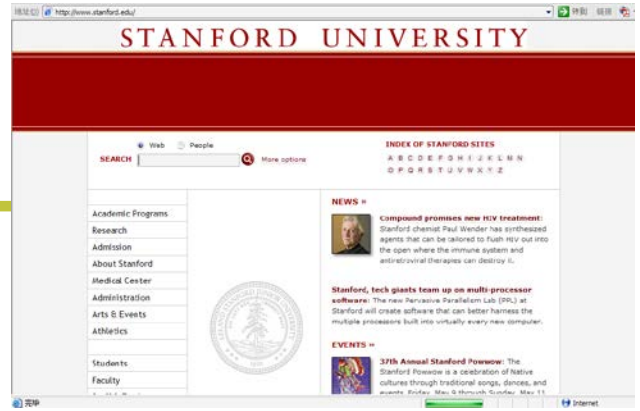
```
void WebExplorer()//main()
{ ThreadCreate(GetData,URL, buffer);...
  while(1)Yield(); }
```

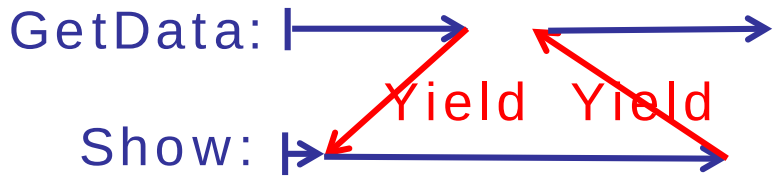
```
void GetData(char *URL, char *p){
  连接URL;下载; Yield();...}
```

```
void ThreadCreate(func,arg1){
 申请栈;申请TCB;func等入栈;关联TCB与栈;...}
```

```
void Yield(){压入现场;esp放在当前TCB
  中;Next();从下个TCB取出esp;弹栈切换线程;}
```

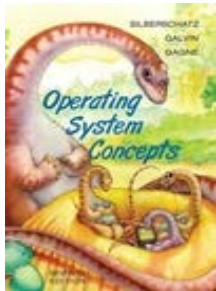
调度函数，对系统影响很大，如可优先调度show!



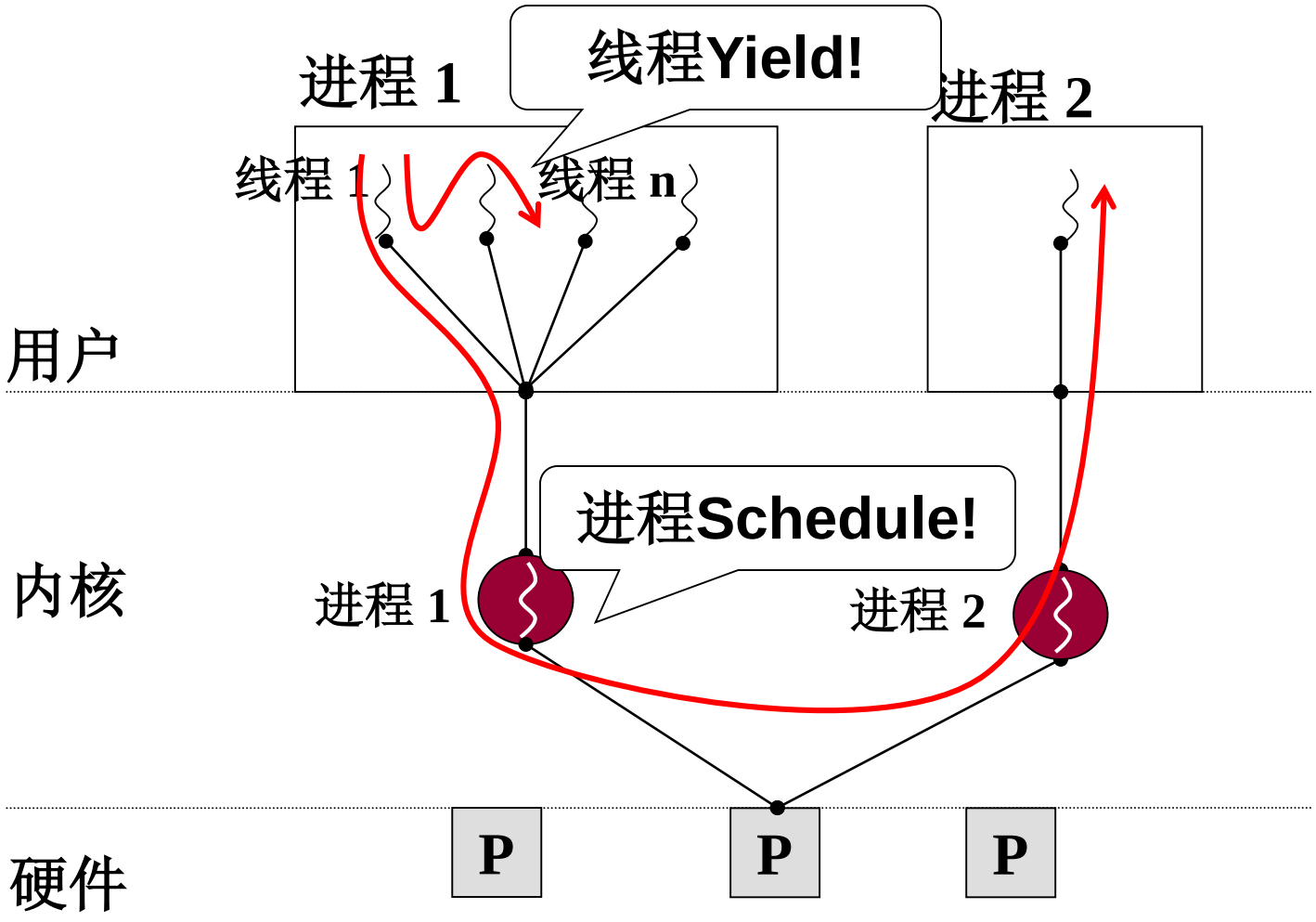

- GetData下载到文本时会调用Yield()...

- gcc -o explorer get.c yield.c … 或 gcc get.c.. -lthread



# 为什么说是用户级线程——Yield是用户程序

- 如果进程的某个线程进入内核并阻塞，则…

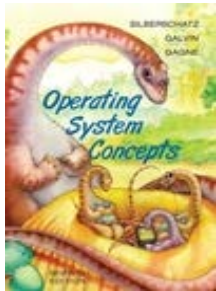



**GetData**

```
连接URL发起请求;
等待网卡IO...
进程阻塞
```

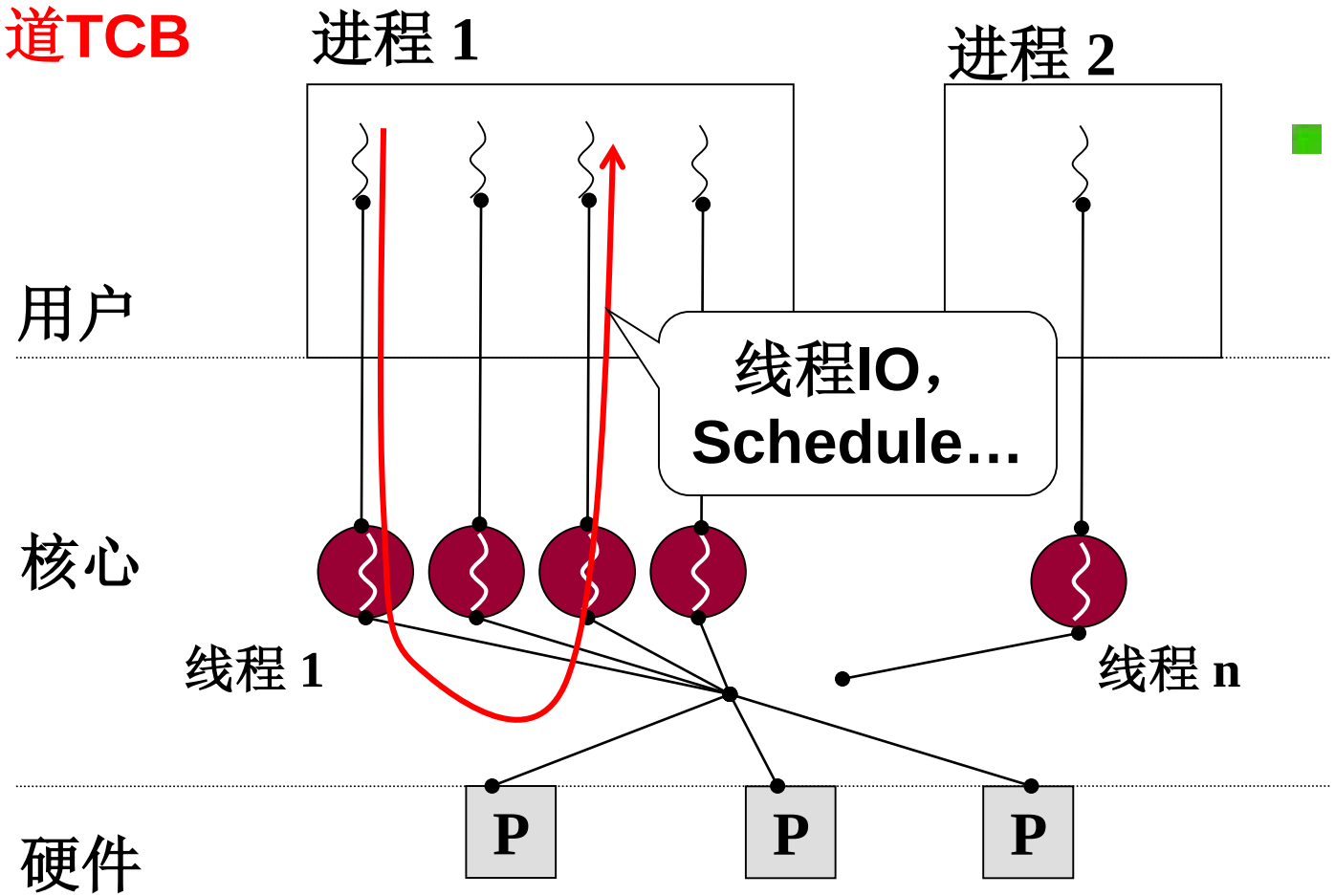
**Show**

```
显示文本和链接;
...;
```



# 核心级线程　*核心级线程和用户级线程区别，哪个快？*

- ThreadCreate是系统调用，会进入内核，内核知道TCB




- gcc -o explorer explorer.c yield.c …
- 内核级线程gcc -o explorer explorer.c…；ThreadCreate是系统调用；Yield()用户不可见，调度点由系统决定