

15-410

“...What could possibly go wrong...”

Paradise Lost
Sep. 22, 2006

Dave Eckhardt

Bruce Maggs

Outline

When to use `if()` vs. `while()`

Consider the lowly worker thread

```
/* note: not a thrgrp_*() worker thread */  
void  
worker(void *ignored)  
{  
    workitem *work;  
    while (work = find_work())  
        perform(work);  
    thr_exit((void *) 0);  
}
```

What's Wrong With This Picture?

```
workitem *  
find_work(void)  
{  
    workitem *w;  
    mutex_lock(&m);  
    if (going_out_of_business)  
        w = (workitem *) 0;  
    else  
        w = (workitem *) dequeue(q);  
    mutex_unlock(&m);  
    return (w);  
}
```

Better?

```
mutex_lock(&m);
if (going_out_of_business)
    w = (workitem *) 0;
else {
    if (!(w = (workitem *) dequeue(q)))
        cond_wait(&new_work, &m);
    w = (workitem *) dequeue(queue);
}
mutex_unlock(&m);
return (w);
```

What We Hope For

<i>find_work()</i>	<i>queue_work()</i>
mutex_lock(&m);	
if (!..dequeue(..))	
cond_wait(&new, &m);	
	mutex_lock(&m);
	enqueue(. . .)
	cond_signal(&new);
	mutex_unlock(&m);
w = dequeue(..);	
mutex_unlock(&m);	

What Went Wrong?

What went wrong?

What Went Wrong?

What went wrong?

- Nothing!

What Went Wrong?

What went wrong?

- Nothing!

But what if there is *another* thread?

Not Exactly What We Hope For

<i>find_work()</i>	<i>queue_work()</i>	<i>find_work()</i>
lock(&m);		
if (!..deq(..))		
cwait(&new, &m);		
	lock(&m);	
	enqueue(...)	
	csignal(&new);	
	unlock(&m);	
		lock(&m);
		if (!..deq(..))
		unlock(&m);
w = deq(..)...		return(w);
return (0);		

Have We Seen This Before?

What went wrong?

- Protected world state wasn't ready for us
- We went to sleep
- Somebody prepared the world for us to run
- We ran
 - We *assumed* nobody else had run
 - We *assumed* the world state was still ready for us

To “if()” Or Not To “if()”?

```
mutex_lock(&m);
if (going_out_of_business)
    w = (workitem *) 0;
else {
    while (!(w = (workitem *) dequeue(q)))
        cond_wait(&new_work, &m);
}
mutex_unlock(&m);
return (w);
/* XXX still wrong! - rewrite after class */
```

Summary

if() vs. while()

- If somebody can revoke your happiness, you'd better check