CSE 430: Operating Systems

Class: 13 **Date:** 3/4

Spring 2009

Note Title

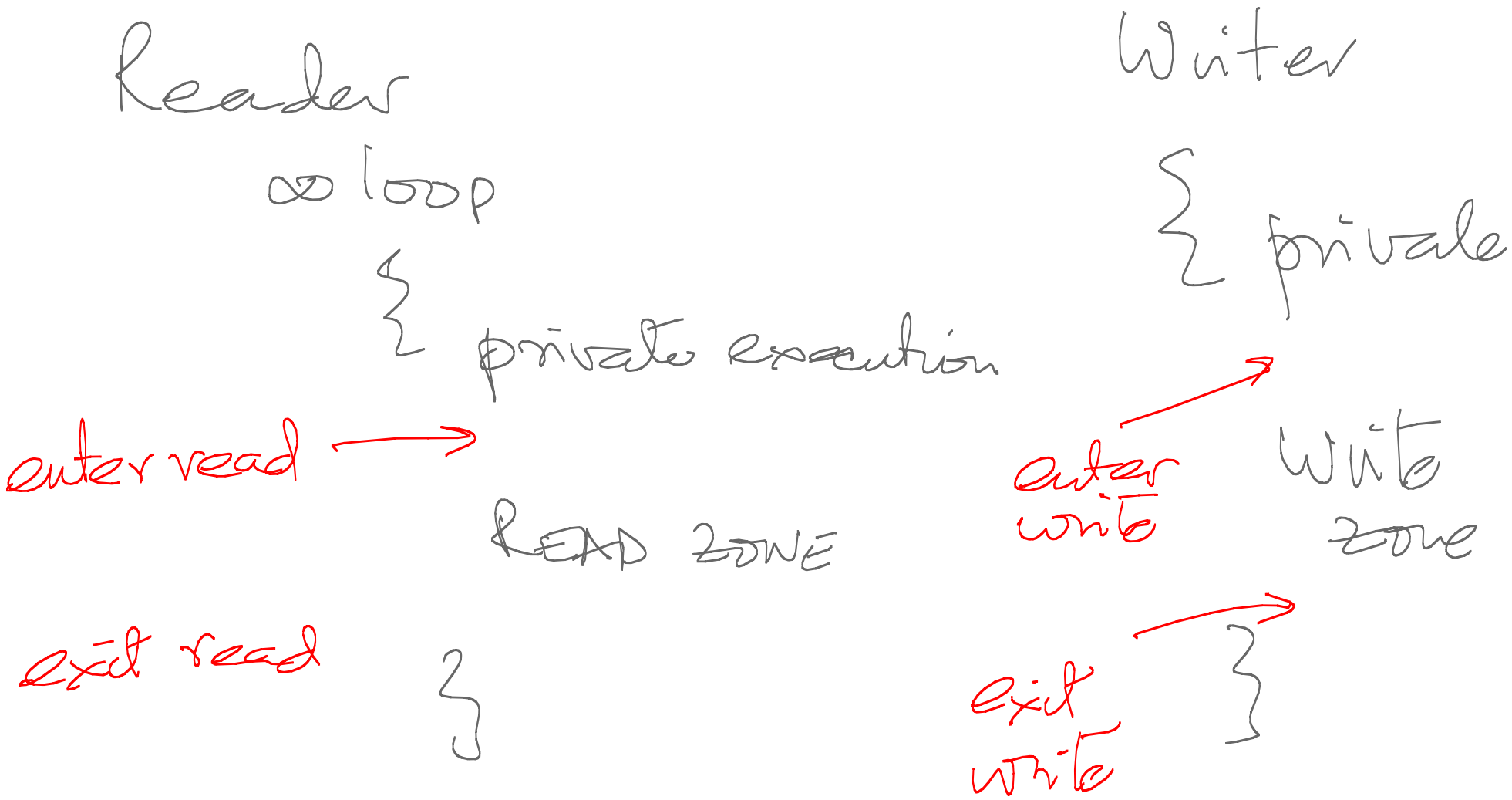
Readers & Writers

- there are N processes
- some are "readers"
- " " " "writers"
- each process: ∞loop {

  non critical

  → critical

  ------ }


Reader
∞ loop
{
private execution
enter read
READ ZONE
exit read
}
Writer
{
private
enter write
write zone
exit write
}

→ single writer OR multiple readers
→ shared read, exclusive write

1) When 1 process in write zone no other process is in their read or write zones

2) When 1 process is in its read zone, no other process is in write zone

S = 1

Read entry

P(S)

Write Entry

P(S)

Read exit

V(S)

Write Exit

V(S)

Sem → wsem = 1
mutex = 1

int rc = 0

Read entry

P(mutex)
rc++
if(rc==1) → P(wsem)
V(mutex)

Read exit

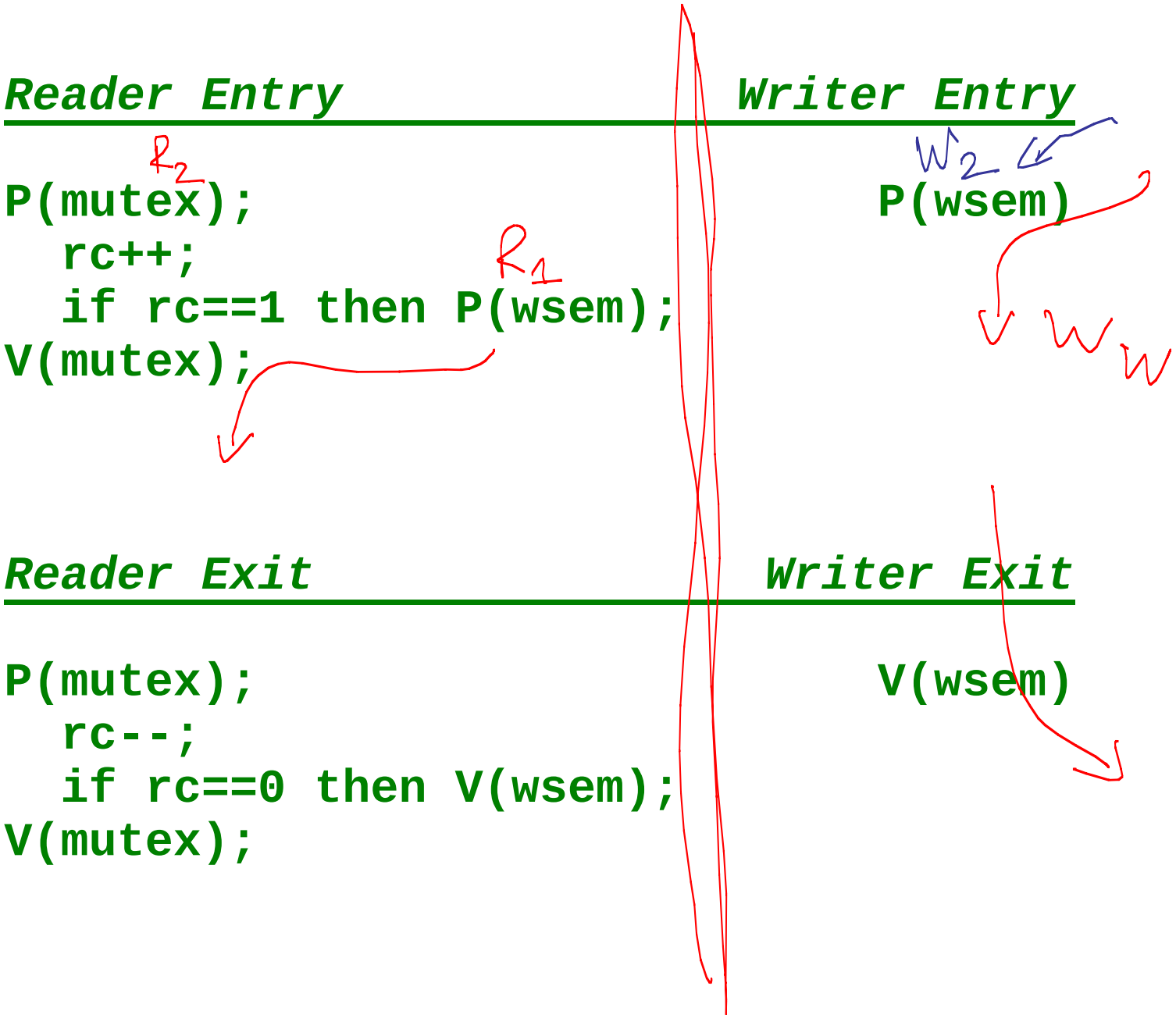
P(mutex)
rc--
if(rc==0) V(wsem)
V(mutex)

Write Entry

P(wsem)

Write Exit

V(wsem)


Reader Entry
Writer Entry
P(mutex);
rc++;
if rc==1 then P(wsem);
V(mutex);
P(wsem)
Reader Exit
Writer Exit
P(mutex);
rc--;
if rc==0 then V(wsem);
V(mutex);
V(wsem)

Reader Entry

```
P(rsem);
V(rsem)
P(rmutex);
 rc++
 if rc==1 P(wsem);
V(rmutex);
```

Reader Exit

```
P(rmutex);
 rc--;
 if rc==0 V(wsem);
V(rmutex);
```

Writer Entry

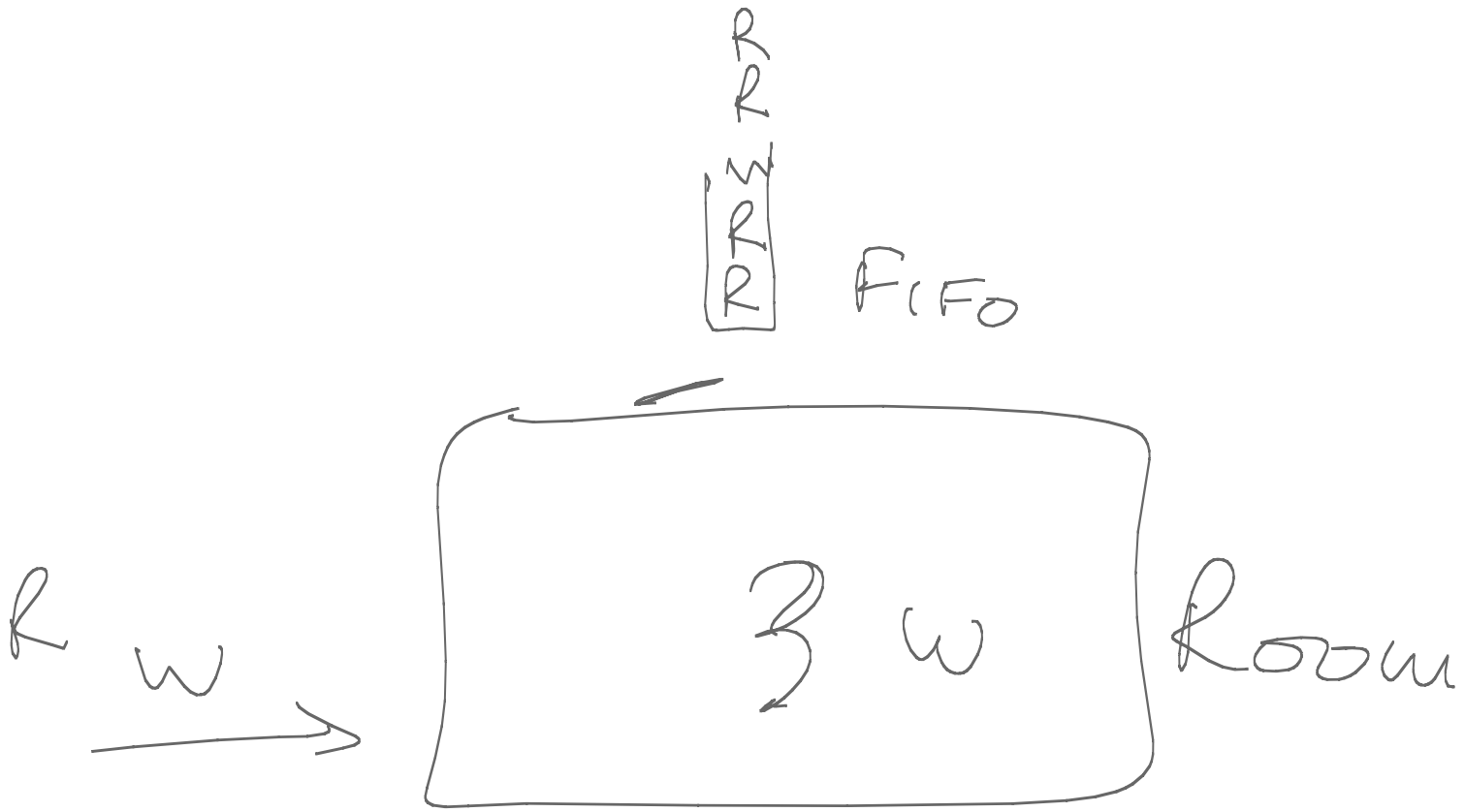
```
P(wmutex);
 wc++;
 if wc==1 P(rsem);
V(wmutex);
P(wsem);
```

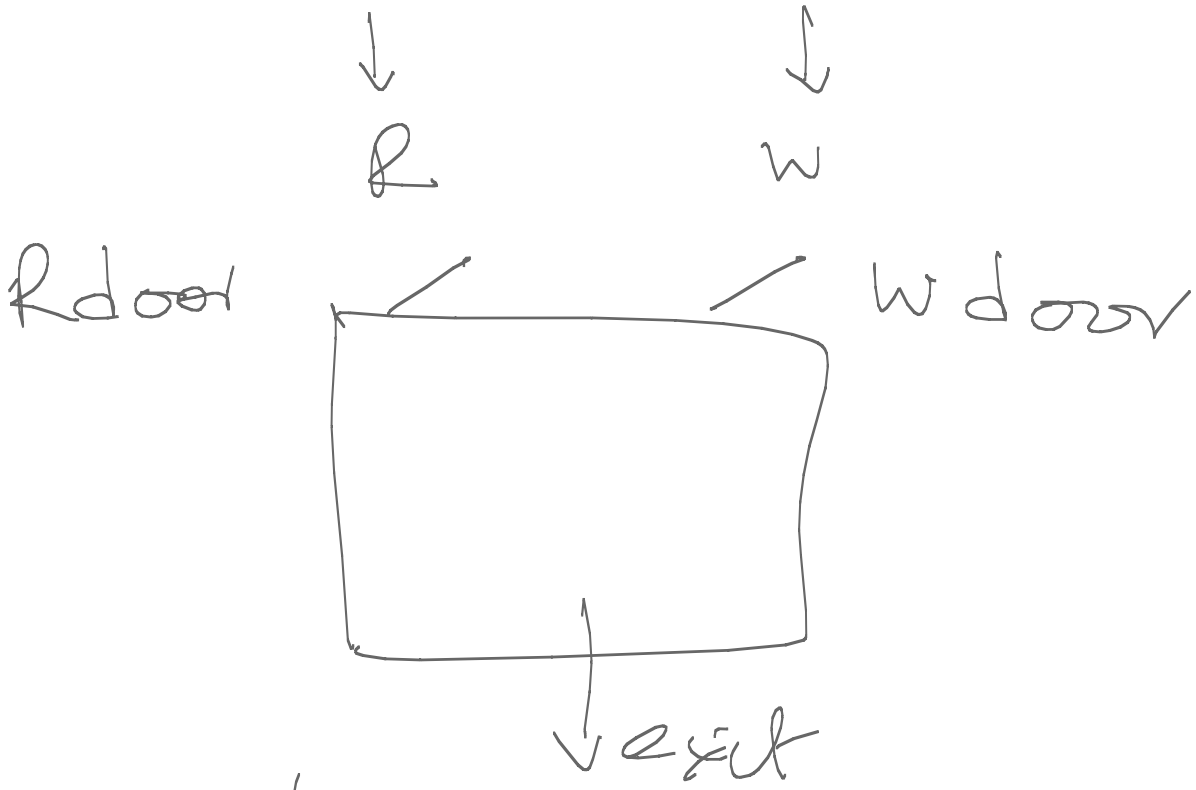
Writer Exit

```
V(wsem);
P(wmutex);
  wc--;
  if wc==0 V(rsem);
V(wmutex);
```

① Readers can enter if
no writers inside &&
no writers waiting.

② Writer can enter if
no reader & no writer


R
R
W
R
R
FIFO
R
W
3 W
Room



(1) writer waiting no reader - only
(2) writer exit → pull all waiting readers (if any)
else pull one writer (if any) else —
(3) Last reader out - pull one writer (if any)

#

rc — readers inside

wc — writers "

rwc — readers waiting

wwc — writers waiting

$= 0$

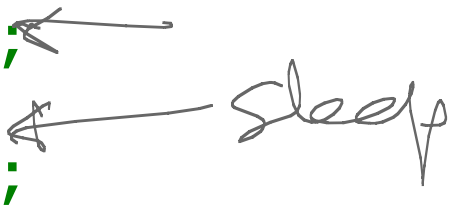
Semaphores

mutex = 0 for entry & exit mutual exclusion

rsem = 0
wsem = 0
} Qs for R & W waiting.

Reader Entry

```
P(mutex);
   if (wwc>0) or (wc>0) {
              rwc++;
              V(mutex);
              P(rsem);
              P(mutex);
              rwc--;  };
  rc++;
V(mutex);
```



Reader Exit

```
P(mutex);
  rc--;
  if (rc=0) && (wwc>0) V(wsem);
V(mutex);
```

Writer Entry

```
P(mutex);
if (rc>0)||(wc>0)||(rwc>0)||(wwc >0){
                wwc++;
                V(mutex);
                P(wsem);
                P(mutex);
                wwc--; }
 wc++;
 V(mutex);
```

Writer Exit

```
  P(mutex);
   wc-- ;
   if (rwc>0) then
      for (i=1; i<=rwc; i++)V(rsem)
   else if (wwc>0) V(wsem);
  V(mutex)
```