

Announcements

- Program #2
 - On the web, due in one week

Readers/Writers Problem

- Data area shared by processors
- Some processes read data, others write data
 - Any number of readers may simultaneously read the data
 - Only one writer at a time may write
 - If a writer is writing to the file, no reader may read it
- Two of the possible approaches
 - readers have priority or writers have priority

Readers have Priority

```
Semaphore wsem = 1, x = 1;
reader()
{
  repeat
    P(x);
    readcount = readcount + 1;
    if readcount = 1 then P (wsem);
    V(x);
    READUNIT;
    P(x);
    readcount = readcount - 1;
    if readcount = 0 V(wsem);
    V(x);
  forever
};

writer()
{
  repeat
    P(wsem);
    WRITEUNIT;
    V(wsem)
  forever
}
```

Comments on Reader Priority

- semaphores $x, wsem$ are initialized to 1
- note that readers have priority - a writer can gain access to the data only if there are no readers (i.e. when readcount is zero, $signal(wsem)$ executes)
- possibility of starvation - writers may never gain access to data

Writers Have Priority

reader

```
repeat
  P(z);
  P(rsem);
  P(x);
  readcount++;
  if (readcount == 1) then
    P(wsem);

  V(x);
  V(rsem);
V(z);
readunit;
P(x);
  readcount- -;
  if readcount == 0 then
    V (wsem)

V(x)
forever
```

writer

```
repeat
  P(y);
  writecount++;
  if writecount == 1 then
    P(rsem);

  V(y);
  P(wsem);
writeunit
  V(wsem);
  P(y);
  writecount--;
  if (writecount == 0) then
    V(rsem);

  V(y);
forever;
```

Notes on readers/writers with writers getting priority

Semaphores $x, y, z, wsem, rsem$ are initialized to 1

```
P(z);  
  P(rsem);  
  P(x);  
    readcount++;  
    if (readcount==1) then  
      P(wsem);  
  V(x);  
  V(rsem);  
V(z);
```



readers queue up on semaphore z ; this way only a single reader queues on $rsem$. When a writer signals $rsem$, only a single reader is allowed through

Sample Synchronization Problem

- **Class Exercise:**
 - **CMSC 412 Midterm #1 (Spring 1998) Q#3**
 - Solution posted at:
 - <http://www.cs.umd.edu/~hollings/cs412/s10/sampleExam1b.soln.html>