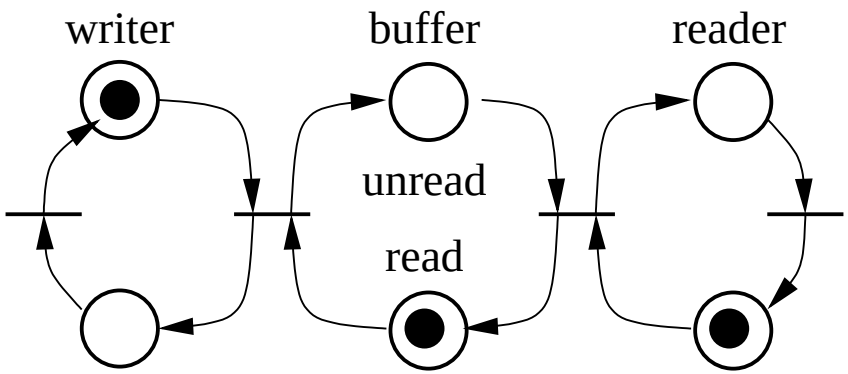
EEE8068
Real Time Computer Systems
ACM models and code examples

Dr. Bystrov

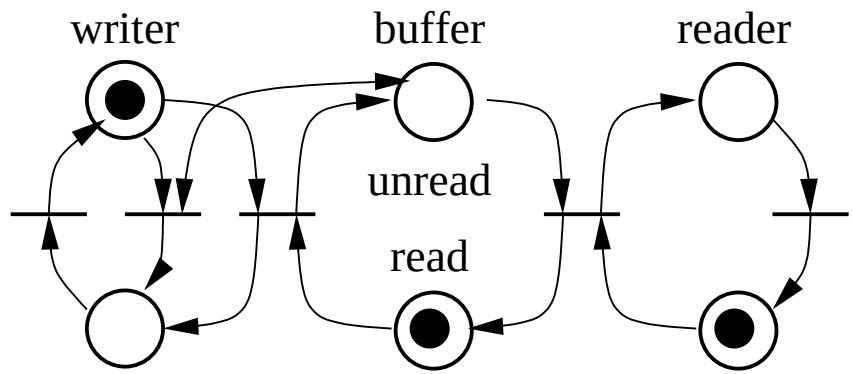
School of Electrical Electronic and Computer Engineering

University of Newcastle upon Tyne

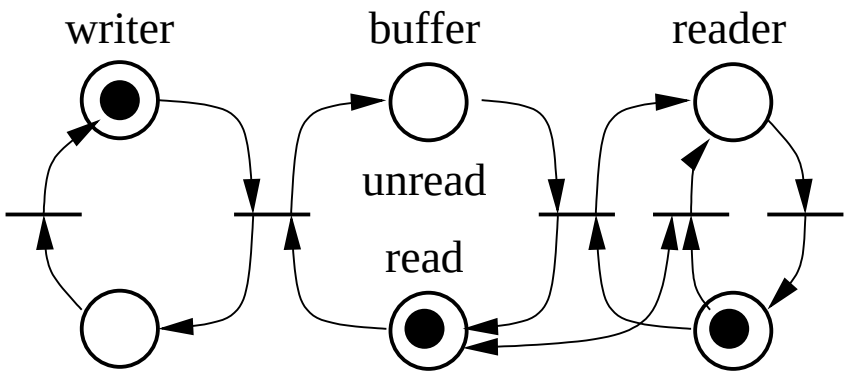
Taxonomy with Petri nets



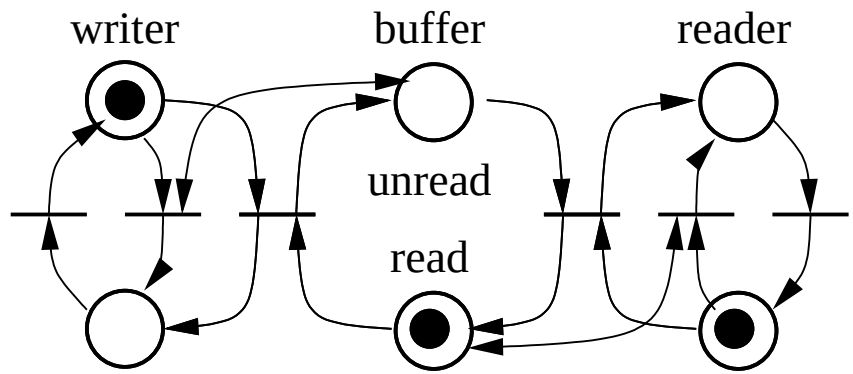
(a) FIFO



(b) Signal



(c) Message



(d) Pool

Single atomic slot in the middle.
If not atomic, then multiple slots are needed. Why?

ACM FIFO type, 1 slot

```
Process Write:
do forever
  {
   wait_until(f=0);
   write_slot();
   f:=1;
  }
```

```
Process Read:
do forever
  {
   wait_until(f=1);
   read_slot();
   f=0;
  }
```

- Waiting possible on both sides
- No overwriting, no re-reading
- What to protect with critical sections?

ACM Signal type, 3 slots

```
Process Write:
w:=1;
l:=2;
do forever
  {
   write_slot(w);
   l:=w;
   w:=¬(r,l);
  }
```

```
Process Read:
r:=2;
do forever
  {
   wait_until (l<>r)
   r:=l;
   read_slot(r);
  }
```

- Waiting possible on the reader side only
- Overwriting possible, no re-reading
- What to protect with critical sections?
- What about the 2-slot signal? Unnecessary delay possible!

ACM Signal type, 2 slots

```
Process Write:
w := 0;
do forever
  {
   write_slot(w);
   w := not r;
  }
```

```
Process Read:
r := 1;
do forever
  {
   r := not r;
   wait_until (w<>r)
   read_slot(r);
  }
```

- Waiting possible on the reader side only
- Overwriting possible, no re-reading
- What to protect with critical sections?
- What causes unnecessary delay?

ACM Pool type, 3 slots

```
Process Write:
do forever
 {
  write_slot(n);
  l:=n;
  n:=¬(l,r);
 {
```

```
Process Read:
do forever
 {
  r:=l;
  read_slot(r);
 }
```

- n, l and r are ternary variables (1, 2, 3)
- initialise n:=1, l:=2
- Waiting not allowed
- Overwriting and re-reading
- What to protect with critical sections?

What to do next?

- Motivation: try the demo, review Delay Differential Equations, construct an example of a control system that becomes unstable under increased latency
- Review the concept of ACM
- Review ACM taxonomy and Petri net models for a single atomic slot
- Read the original papers on ACM; they are on Blackboard
- Review the pseudo code discussed in this lecture