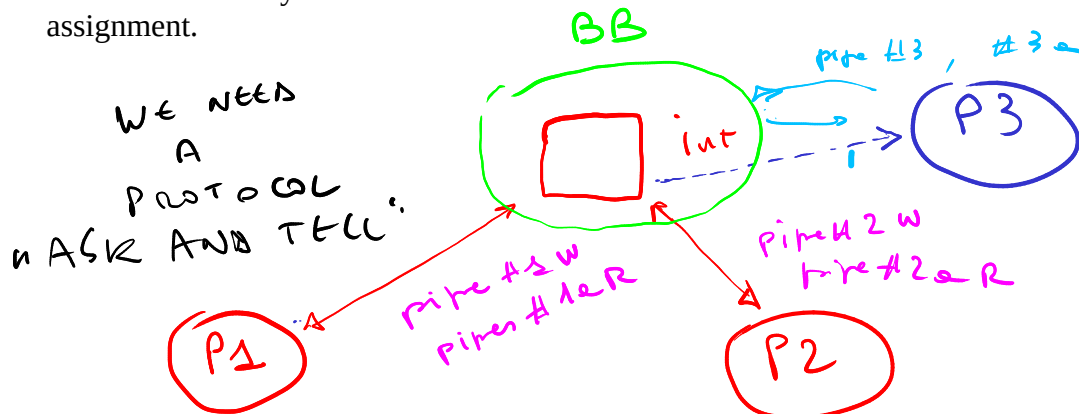# A BLACKBOARD SERVER USING MESSAGES

A BB is a shared memory. When SM is not available, it can be emulated by different solutions:
- a central server connected through messages to which clients ask for a service (read, write)
- a remote procedure call (RPC) method

Although these solutions may seem complex, they have benefits. The client/server model, in particular, prevents races in accessing shared memory, hence avoiding semaphores.
The RPC model will be described and implemented at the end of the course.

In this homework you will learn how to build the first solution. This skill is necessary for the first assignment.

WE NEED
A
PROTOCOL
"ASK AND TELL"

BB

pipe #3, #3a

P3

int

pipe #2 W
pipe #2a R

pipe #1 W
pipe #1a R

P1

P2

Master
|
generate 6 pipes
|
fork() exec BB // shared memory
fork() exec P1
|
fork() exec P3
|
wait

Suppose you:
func() exec P3
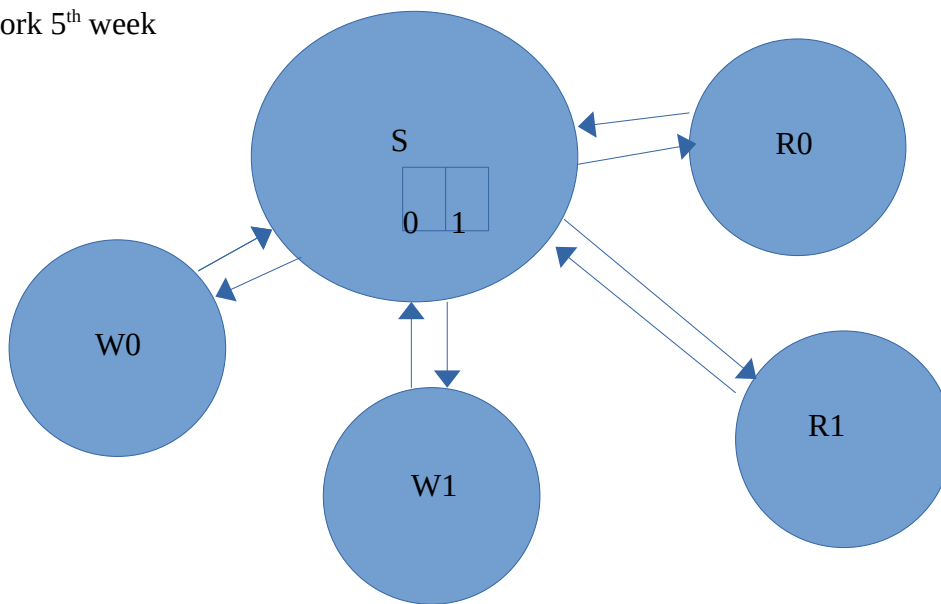func() exec P2
|
- - - -
- - - B3

PROTOCOL:
CHARS ex: 'W' 'R'

STATES OF PROCESSES:

BB: wait received command

answered read ok to receive
a status

{ wait - rec (w) —
— sent ok — update updated status

cannot be interrupted

Homework 5th week

W0 generates random integers, asks to write in cell 0
W1 generates random integers, asks to write in cell 1
R0 asks reading cell 0 if its value has changed and writes into a logfile F0
R1 asks reading cell 1 if its value has changed and writes into a logfile F1

S is server connected through couples of unnamed pipes. One pipe is for asking, the other one for answering.

The code of S can be schematized as follow:

loop forever
        select all incoming pipes
        accept one of the queries *under condition**
        answer

conditions for W0, W1
if cell[0]==cell[1]==0 accept both
if cell[0]<=cell[1] accept W0
if cell[1]<=cell[0] accept W1

conditions for R0, R1
if cell[0] has changed accept R0
if cell[1] has changed accept R1

Hints:
  • you can read random numbers from */dev/random* (see slides)
  • test separately the W and R processes
  • use ascii characters instead of integer
  • try different timeout values, including a zero value
  • count how many numbers have been stored in S by W0 and W1 and compare with the logfiles lengths
  • try to estimate the speed (when timeout is zero in particular).

BB code:

loop{

select one
   of the incoming
      pipes
choose one
   (boring on
      condition)
answer, update
      the state
3

ATOMIC

ATOMIC ≐ CRITICAL SECTION
   ≐ MUTUAL EXCLUSION TO HAVE "ATOMICITY"