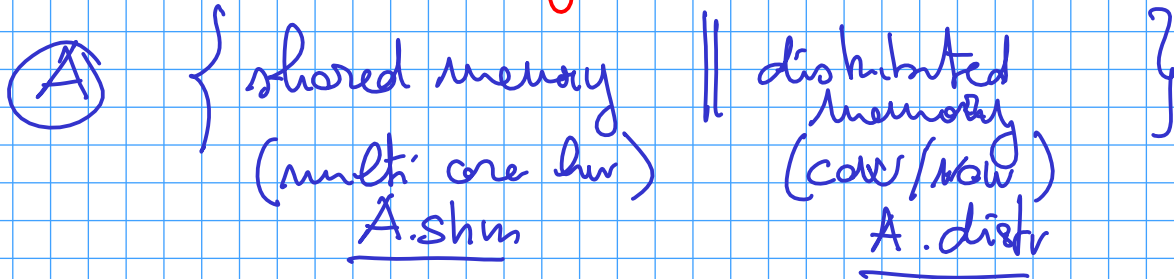


Posix mechanism for parallel programming

- (A) Forcing parallel activities (control flows)
- (B) Mechanism for synchronizing & communicating

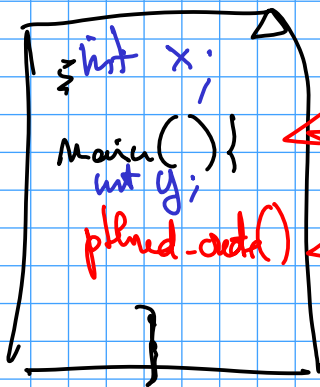


A.shm

independent control flows → threads

control flows during the memory space of the thread creator

→ pthread



main thread

establishes a new thread

inheriting the addr. space

may access x;

y not accessible

ca is in the private stack of the thread

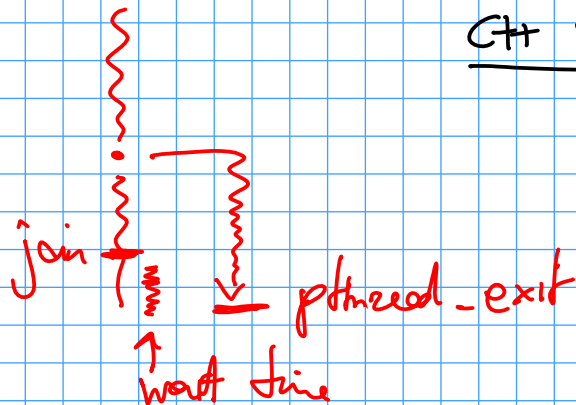
pthread_t tid;

pthread_create(&tid, NULL, f, NULL);

...

pthread_join(tid, &retval);

C++ threads



Communications are through SH MEM

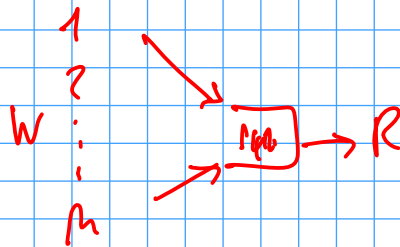
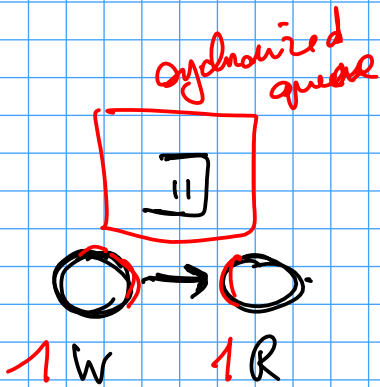
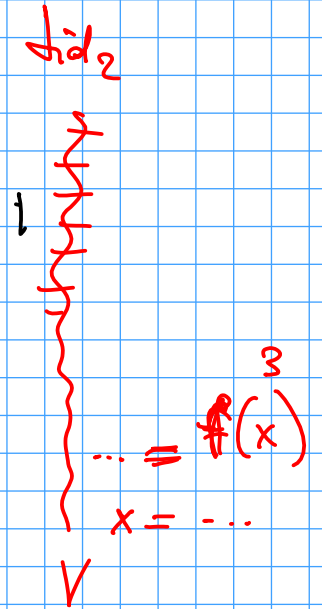
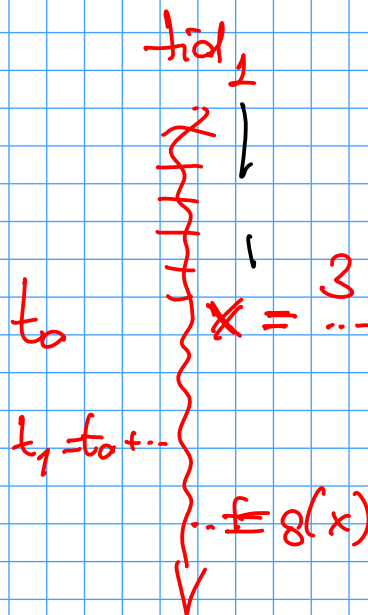
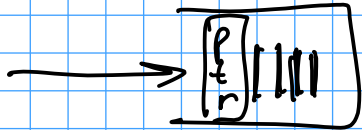
Synchronization

↳ locks / spinlocks

(EXCH
TEST and SET)

↳ mutexes

↳ semaphores / condition variables



A. distr

unit of concurrency / parallelis
is the process

Single machine

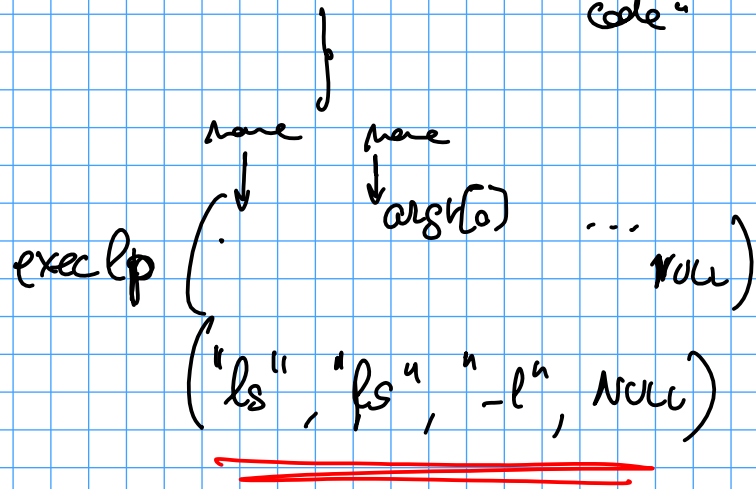
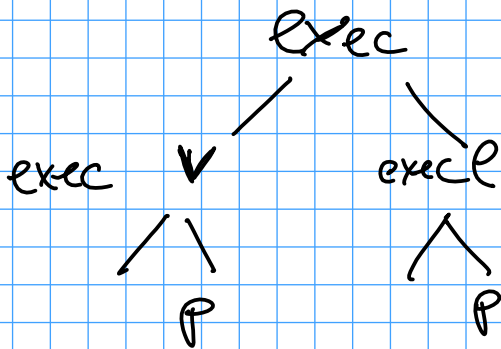
networked machine

fork creates the process } duplicates the current process
exec differentiates the code

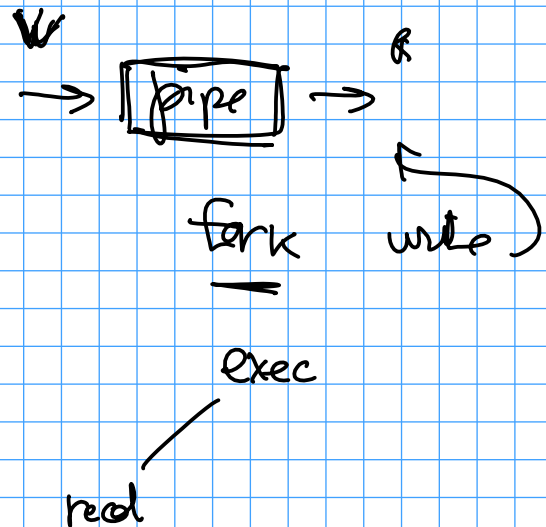
ssh + fork & exec

```
pid (new) }  
pid (old) } pid = fork();  
           } printf("ciao\n");
```

```
pid = fork();  
switch (pid) {  
case 0: "son process code"  
break;  
default: "father code"
```

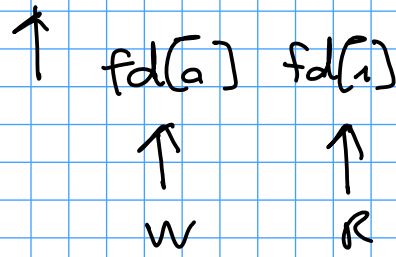


```
char* argv[4];  
strcpy(argv[0], "ls");  
       argv[1], "-l";  
argv[2] = NULL;  
execvp(argv[0], argv);
```



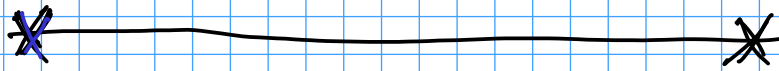
int pipe (&fd)

FIFO buffer



```

write(fd[0], buff, len); read(fd[1], buff, MAX)
  
```



SysV IPC

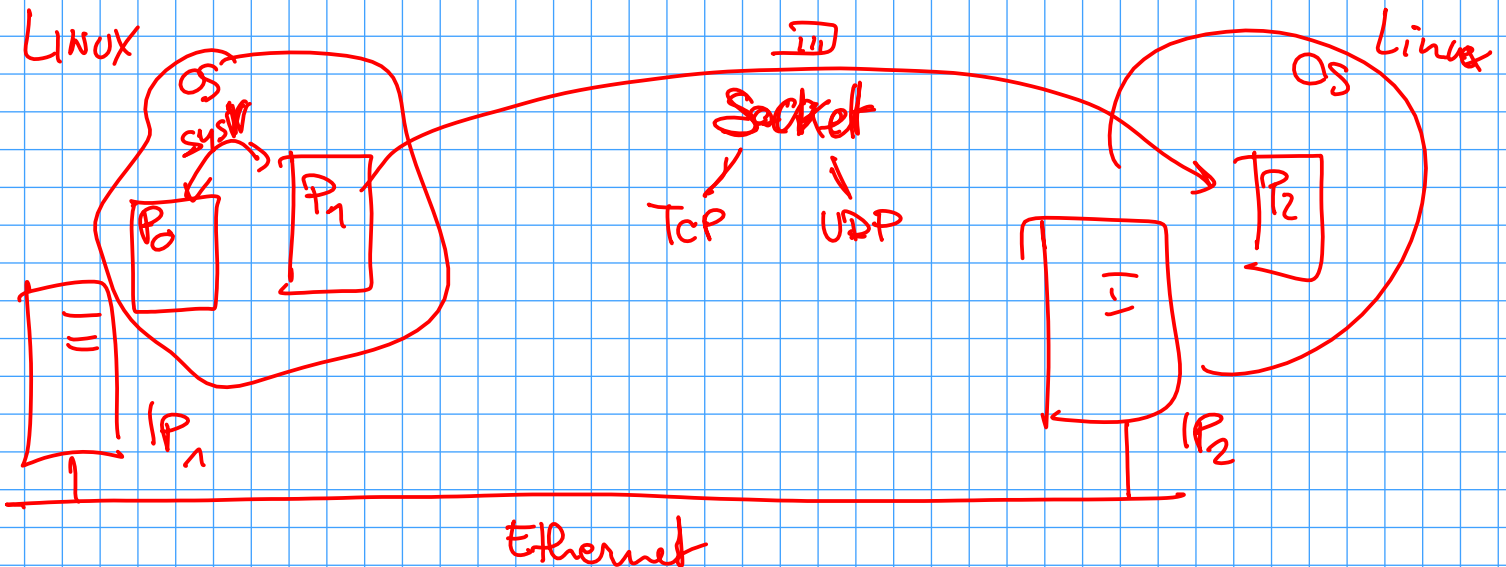
create the mechanism
(permissions, message)

- msg queues
- shm memory
- semaphores

use it

- msg queues: send, receive
- shm: attach/detach, post/wait
- sem: sem

destroy / release



Server side

Client side

socket(, ,)

socket()

AF_UNIX

AF_INET

PF_UNIX

PF_INET

bind() IPno
portno

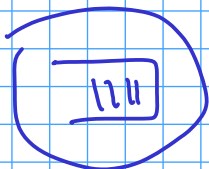
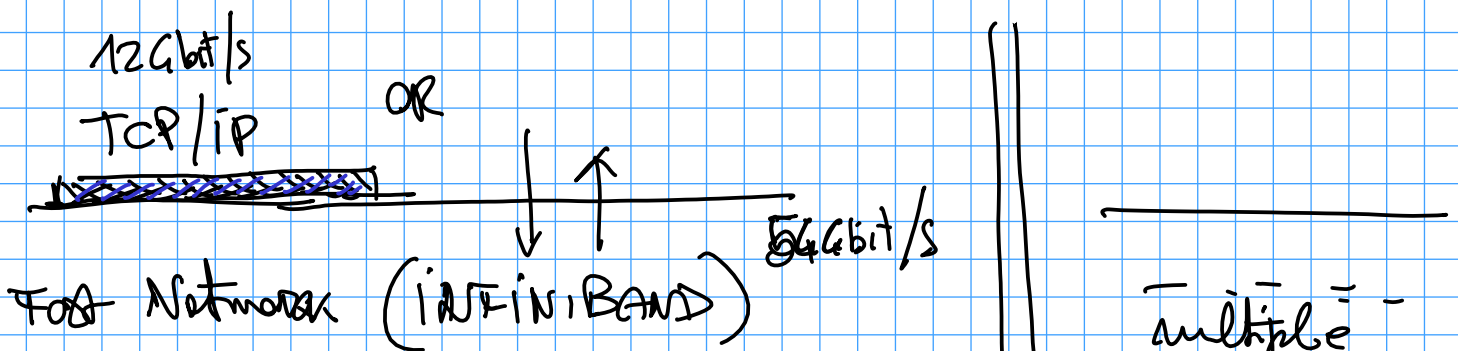
binds the socket to an address

listen() tells how many requests I can have

s = accept() accept connection

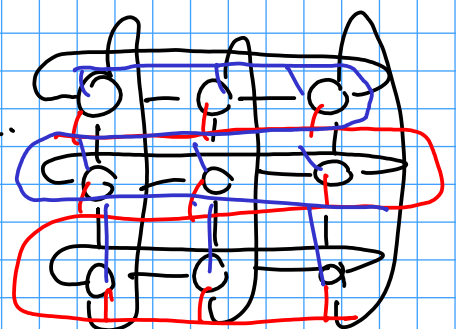
s = connect()

read(s, ...) ← write(s', ...)
write(s, ...) → read(s', ...)



SPSC Queue
MPSC MPMC

point to point communc.



bus for collectives
bus barriers