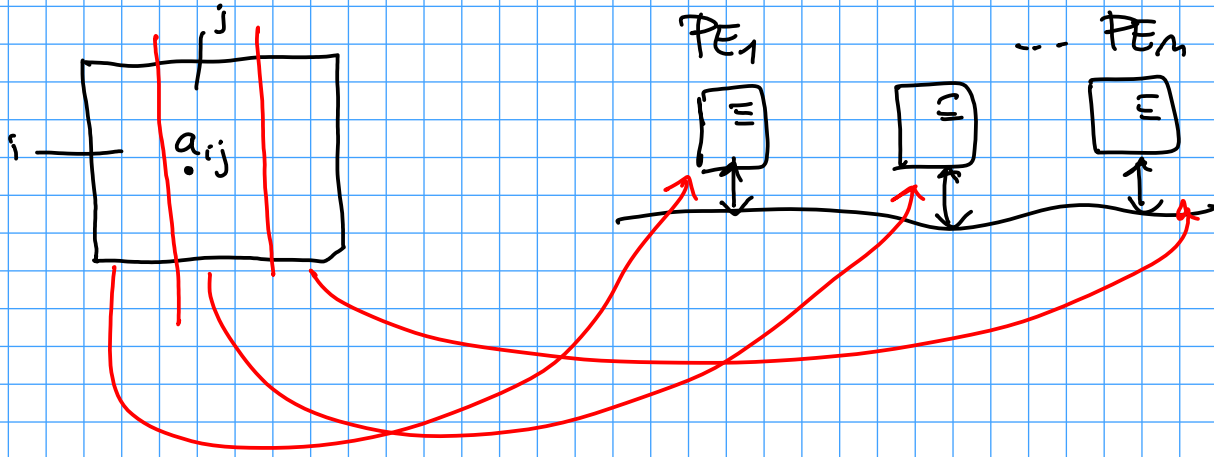


## Distributed Array

## Support Structure Design Space

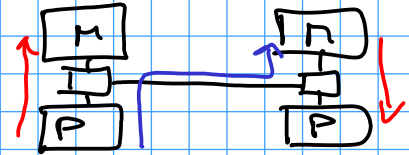
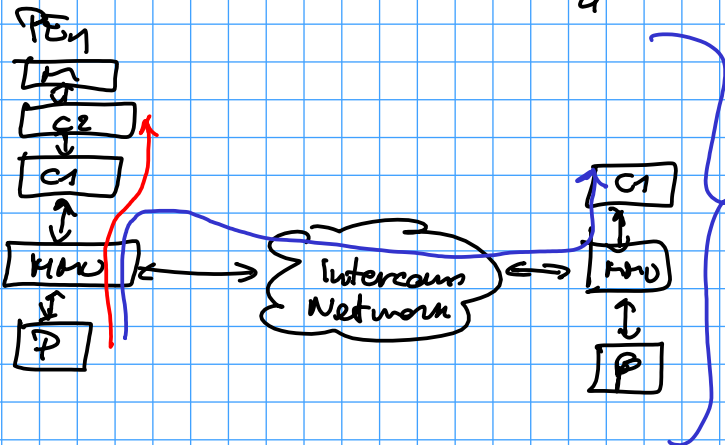
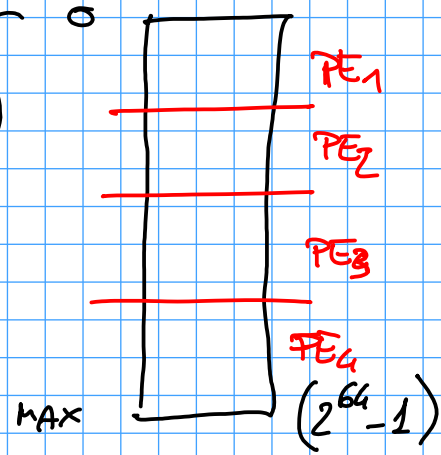
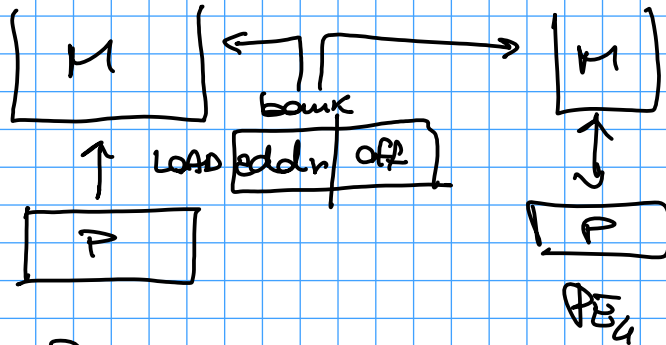


- ① Partitioning (how to split)
- ② Mapping (where the partitions should be allocated)

Driving force  $\Rightarrow$  locality

# PGAS

## Partitioned Global Address Space



SA extensions for deep learning

## EPIPHANY (Adaptiva)

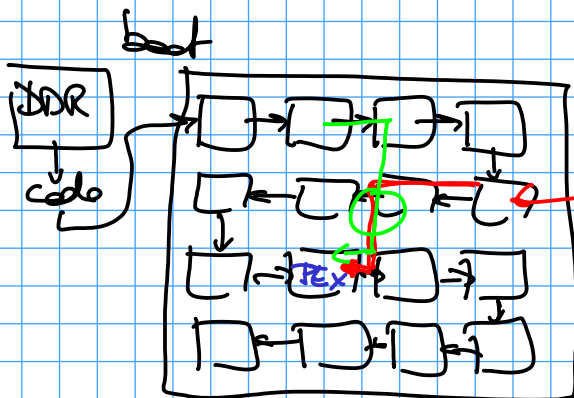
↳ 16 to 64 cores



## EPIV 1024

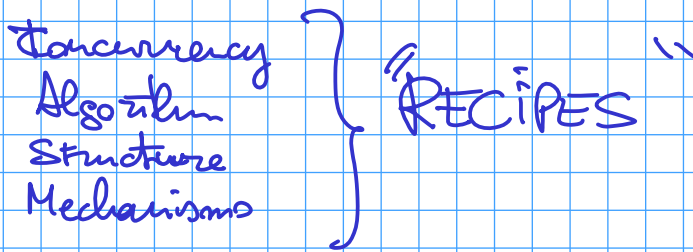


- PGAS 64k bytes x chip
- RISC 64 bits
- YESH on chip networks
- 2k power islands on chip
- (5-10 W)

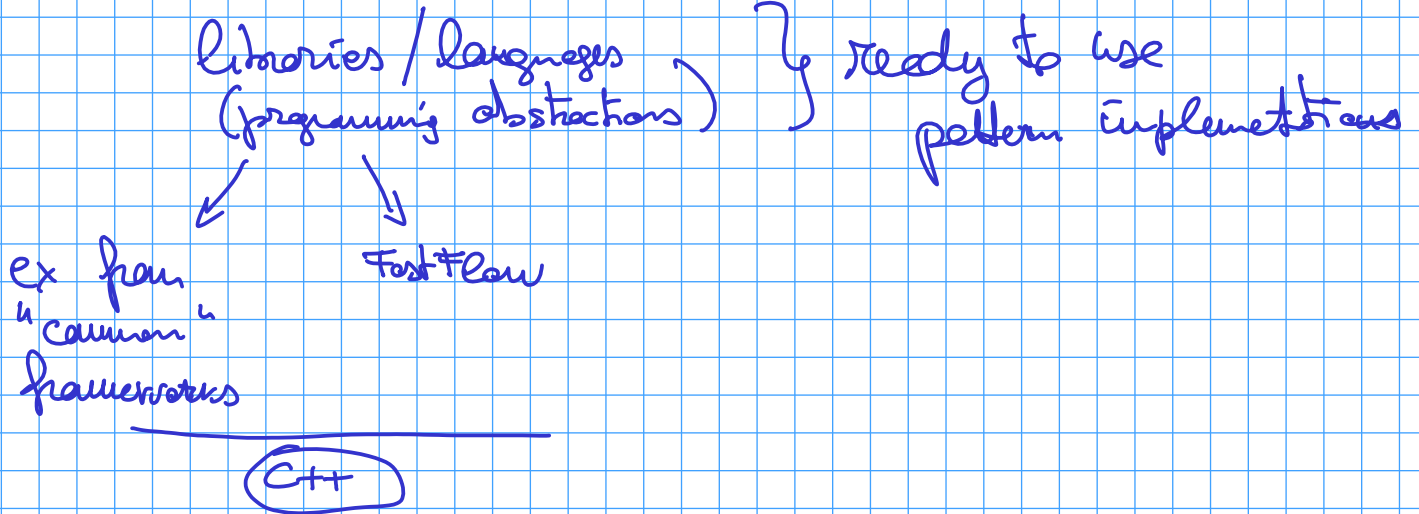


LOAD (non local PGAS address)  
PE X

# Design Patterns



## Algorithmic Skeletons



Cilk(plus) → Intel → OpenSource (plus)



spawn  
wait  
parallel for concept

forks a concurrent activity to evaluate an expr  
wait for termination of all spawned activities in a function

↳ implements independent iteration loop in parallel (D&C approach)

spawn + wait

fork/join model

for(i=0; i<N; i++) { B }



for(i=0; i<N/2; i++)    for(i=N/2; i<N; i++)



SYNTAX

-cilk\_spawn

-cilk\_sync

-cilk\_for

--cilkopts\_set\_params ( , );

"nworkers", "6"

GNU

-fcilkplus

INTEL

icc

only if you use the --cilkopts xxx routines

#include <cilk/cilk.h>

" <cilk/cilk-api.h>

spawn  
wait  
perform