GORDOAN MOORE

NUMBER OF TRANSISTORS ON A CHIP WILL DOUBLE ABOUT EVERY TWO YEARS

MOORE'S LAW

MOORE'S LAW

COMPUTER **SPEED** ROUGHLY **PROPORTIONAL** TO NUMBER OF TRANSISTORS PER UNIT AREA

COMPUTER **SPEED** WILL **DOUBLE** ABOUT EVERY **TWO** YEARS

Million Instructions Per Second

PROCESSING POWER (MIPS)

INCREASED

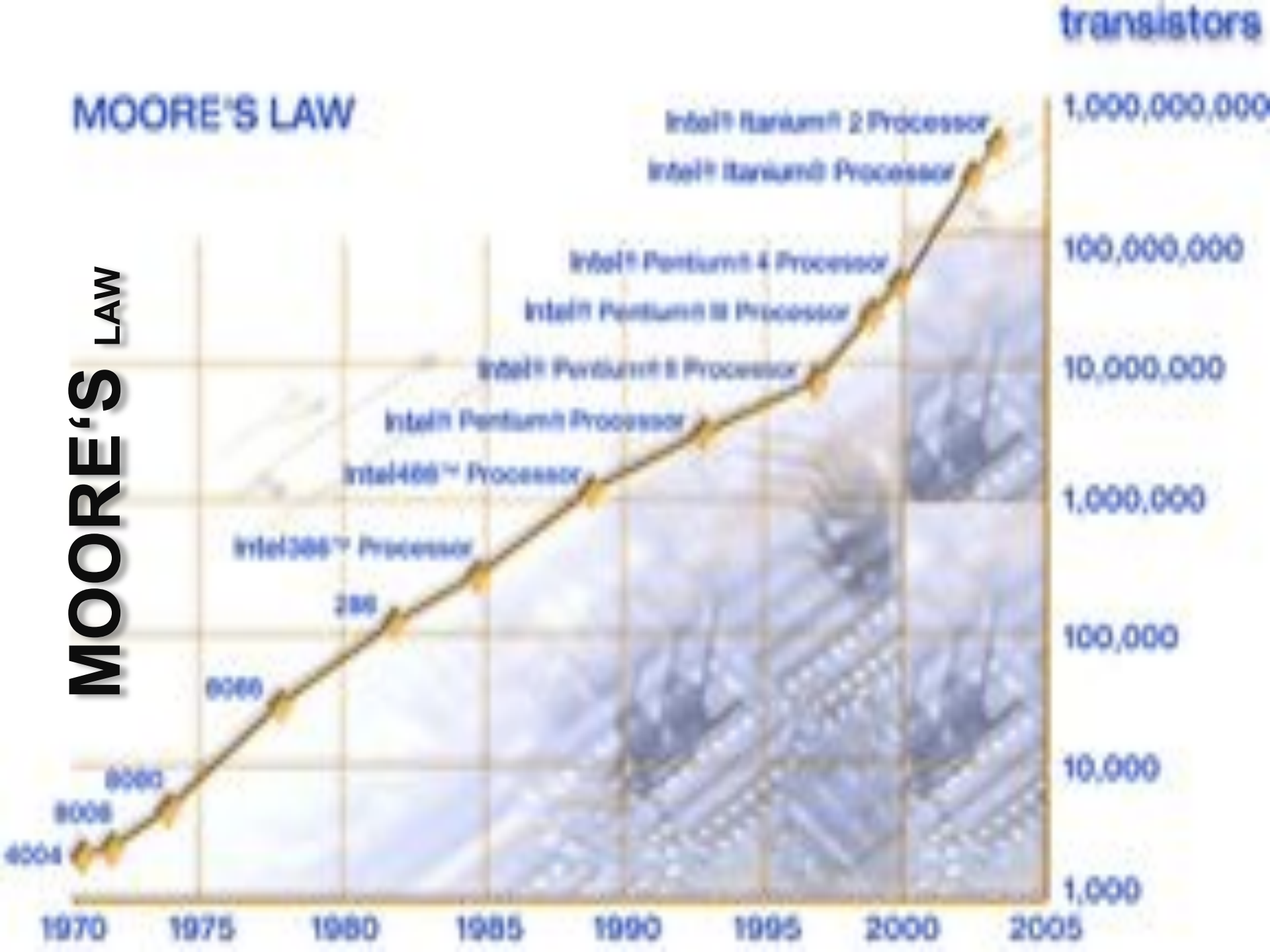
BECAUSE

TRANSISTOR

DENSITY

INCREASED

MOORE'S LAW


MOORE'S LAW
MOORE'S LAW
transistors
1,000,000,000
100,000,000
10,000,000
1,000,000
100,000
10,000
1,000
Intel® Itanium® 2 Processor
Intel® Itanium® Processor
Intel® Pentium® 4 Processor
Intel® Pentium® III Processor
Intel® Pentium® II Processor
Intel® Pentium® Processor
Intel486™ Processor
Intel386™ Processor
286
8086
8080
8008
4004
1970
1975
1980
1985
1990
1995
2000
2005

LIMITATIONS

MOORE'S LAW

* PHYSICAL LIMITS
* POWER CONSUMPTION
* HEAT DISSPIATION
* Some Others

HARDWARE SPEED IS

LIMITED

LIMITATIONS

MOORE'S LAW

* PHYSICAL LIMITS
* POWER CONSUMPTION
* HEAT DISSPIATION
* Some Others

HARDWARE SPEED IS

LIMITED

IDEA

MOORE'S LAW

SINGLE PROCESSING UNIT !

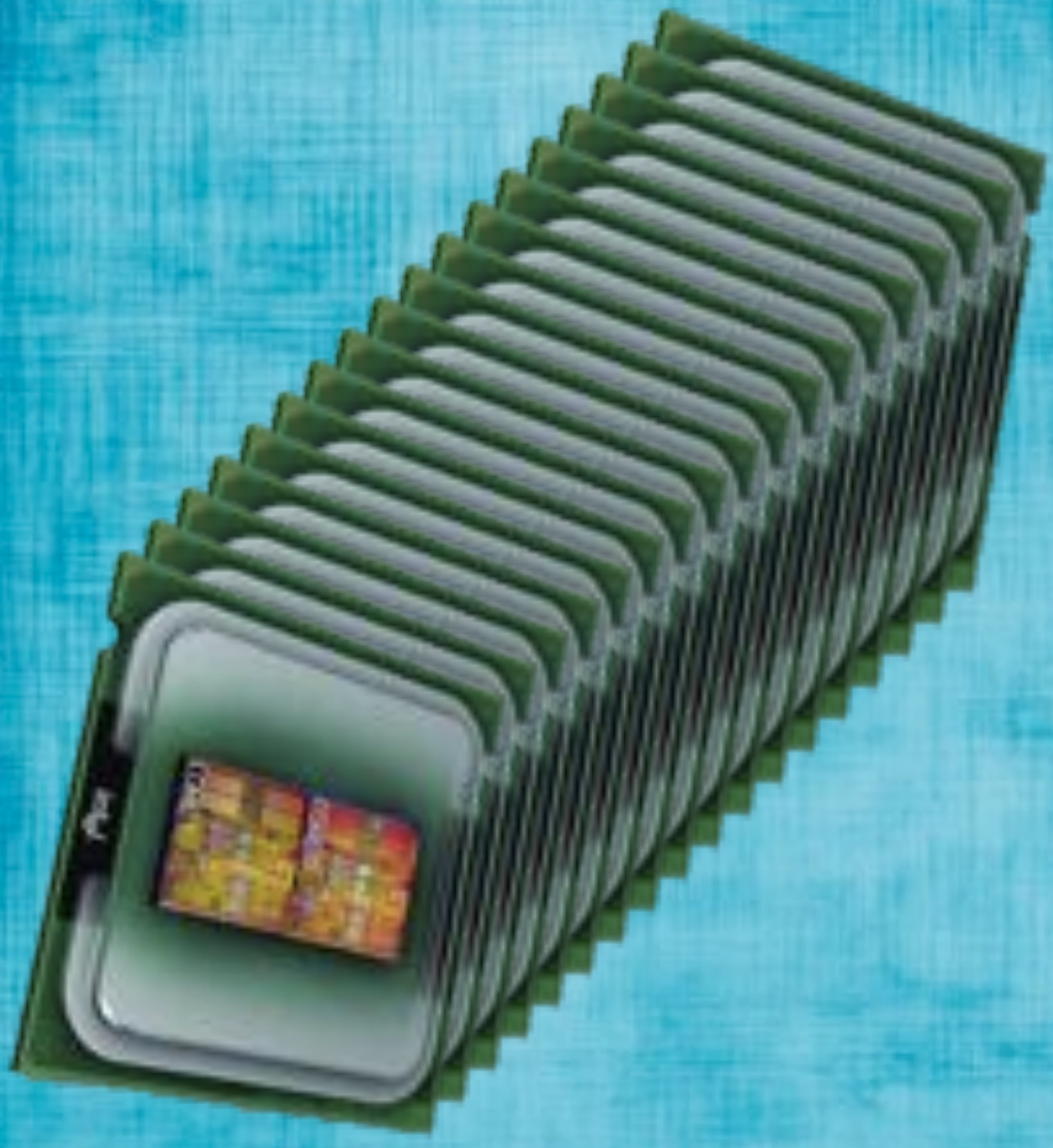
CAN WE USE

MULTIPLE

PROCESSING UNITS

MULTIPLE IS THE SPARK FOR HPC

MULTIPLE PROCESSING UNITS



MULTIPLE PROCESSING UNITS

MacBook MACHINE

Intel Core 2 Duo

2 CORES

4 Giga Byte Ram

Cost $1000

CAN SOLVE SOME PROBLEM IN

8 HOURS

MUL- SING UNITS

CRAY C90 MACHINE

8 VECTOR PROCESSORS

32 GIGA BYTE RAM

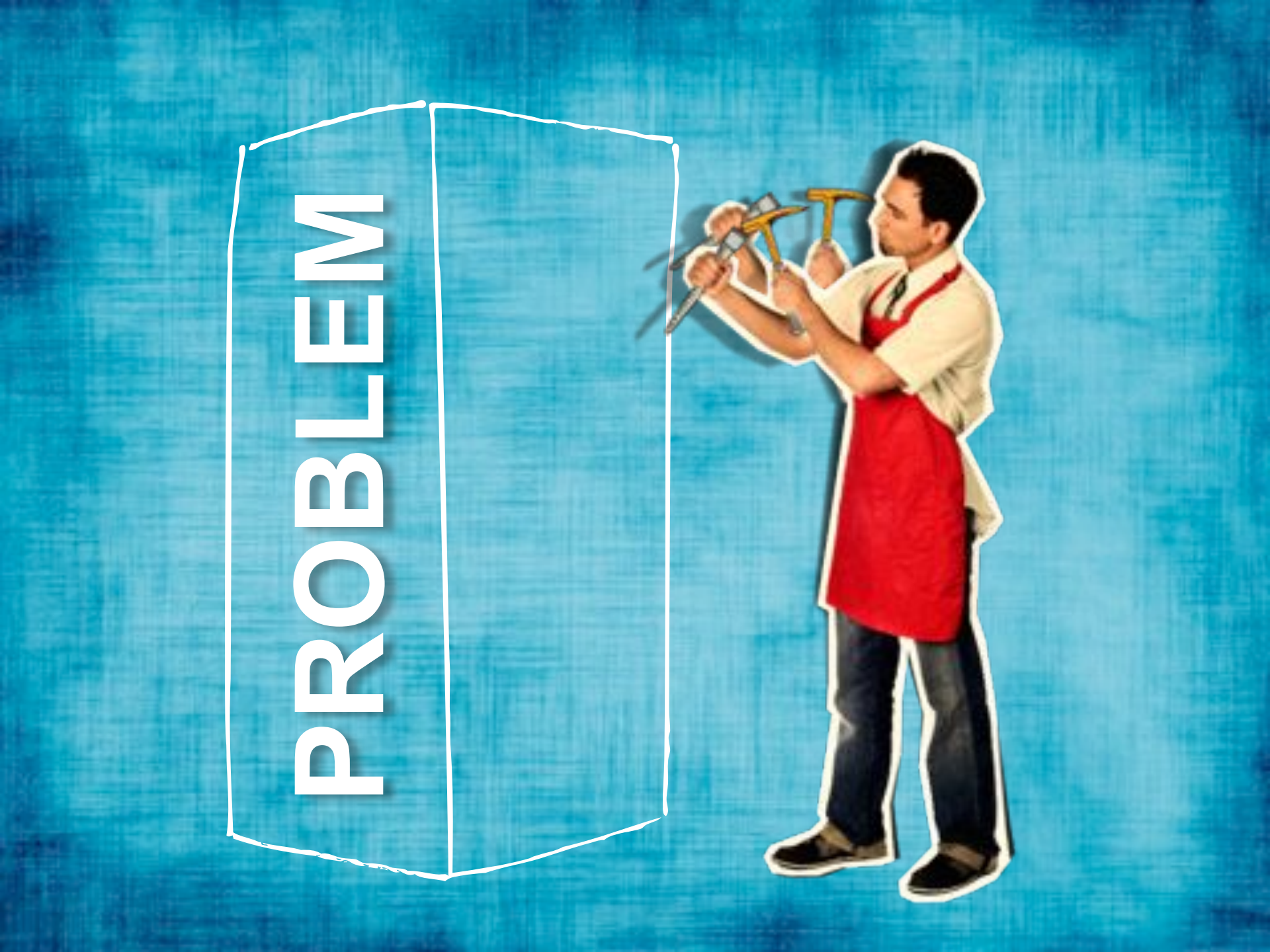
Cost **$26 MILLION**

CAN SOLVE
SAME PROBLEM IN

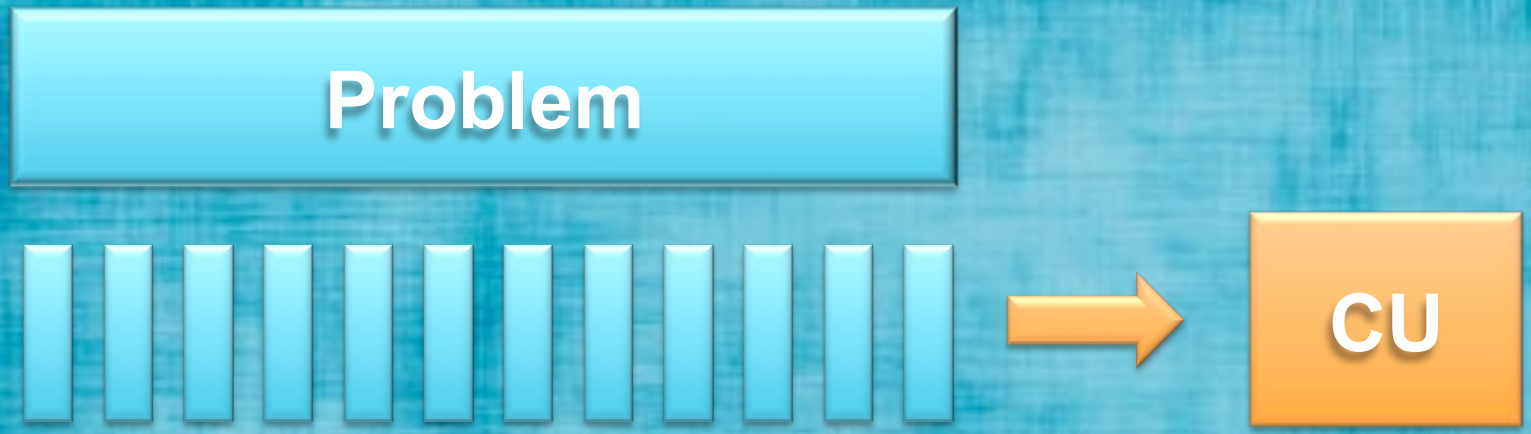
0.002 SECNODS


HAVE A LOOK AT
TOP 500

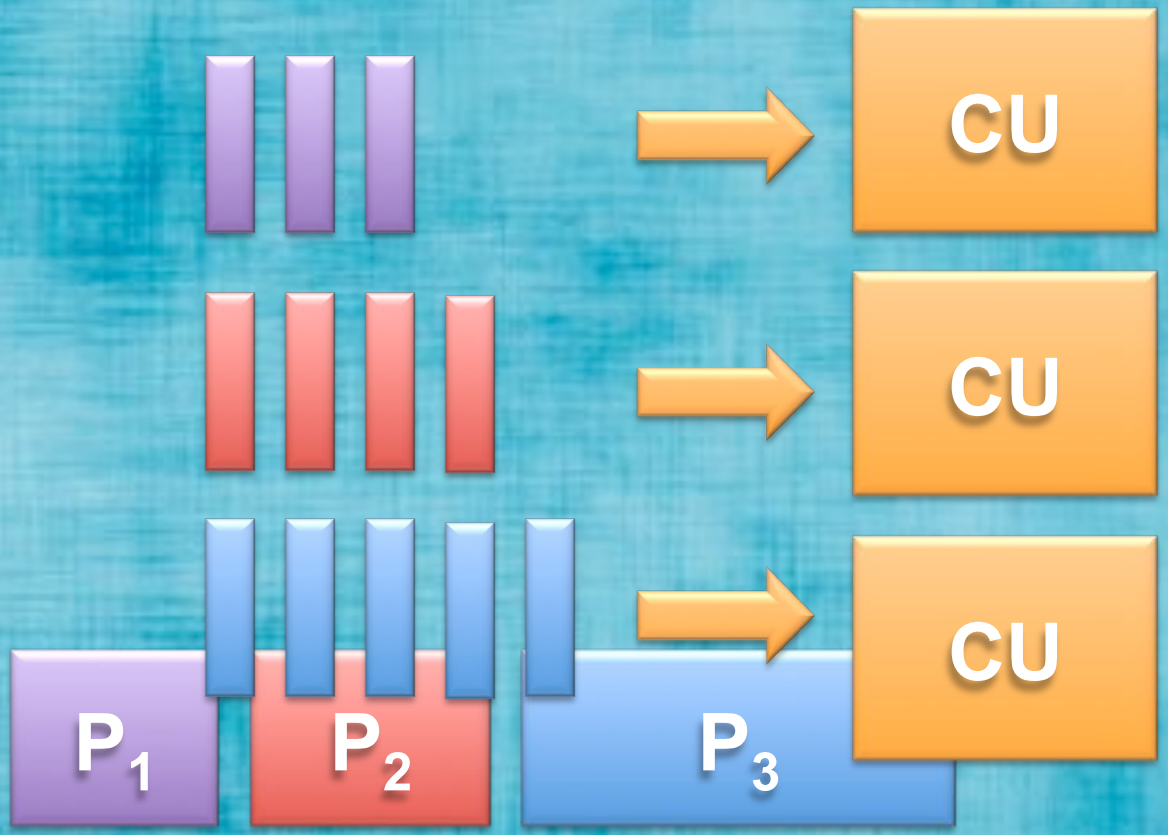
PROBLEM DECOMPOSITION


PROBLEM

GRANULARITY



P_1 P_2 P_3


CU
CU
CU
P1
P2
P3

TERMINOLOGY SO FAR

TASK

PARALLEL TASK

SERIAL EXECUTION

PARALLEL (CONCURRENT) EXECUTION

SINGLE VS. MULTICORE PROCESSORS

GRANULARITY

OBSERVED SPEEDUP