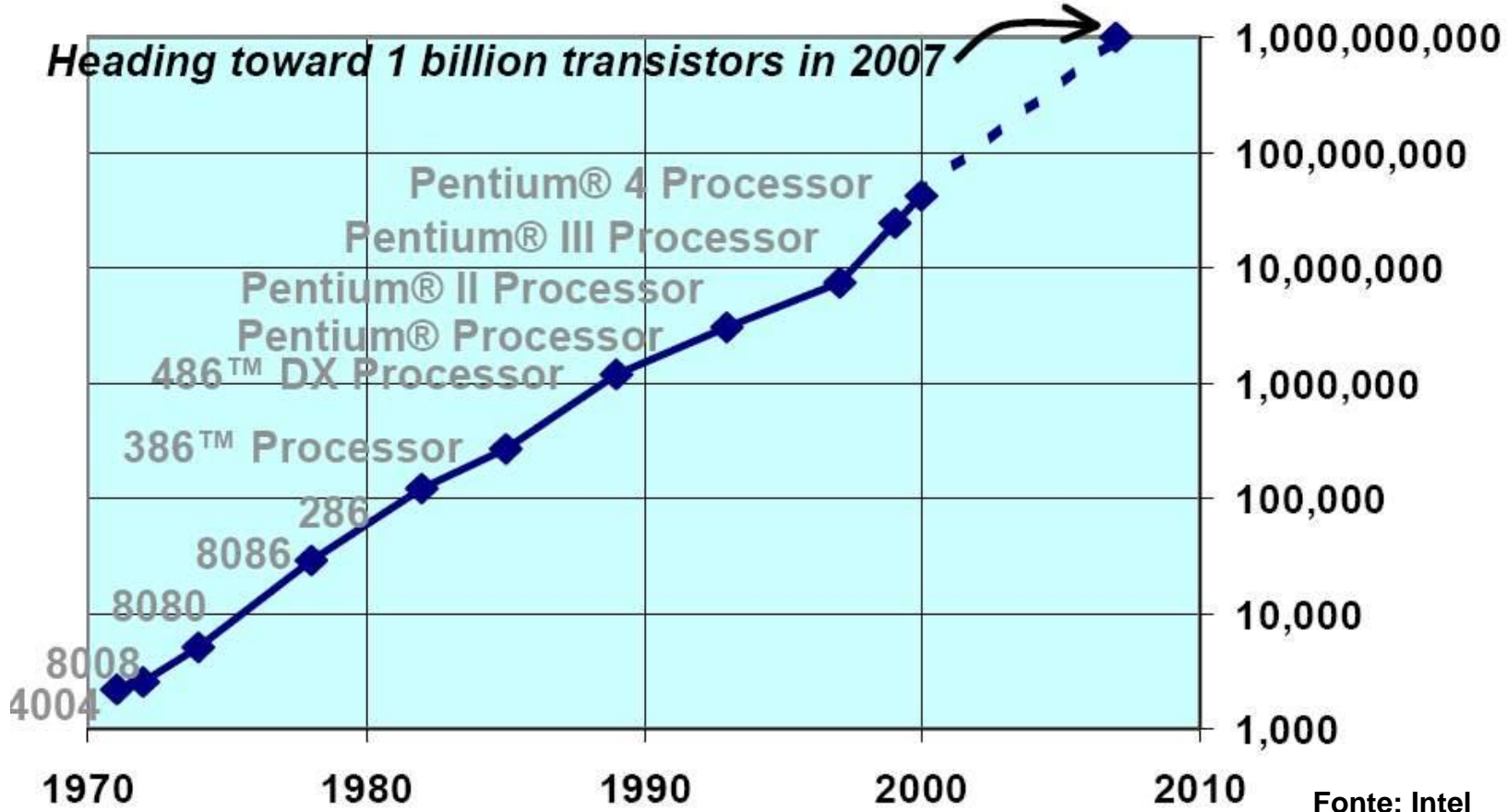
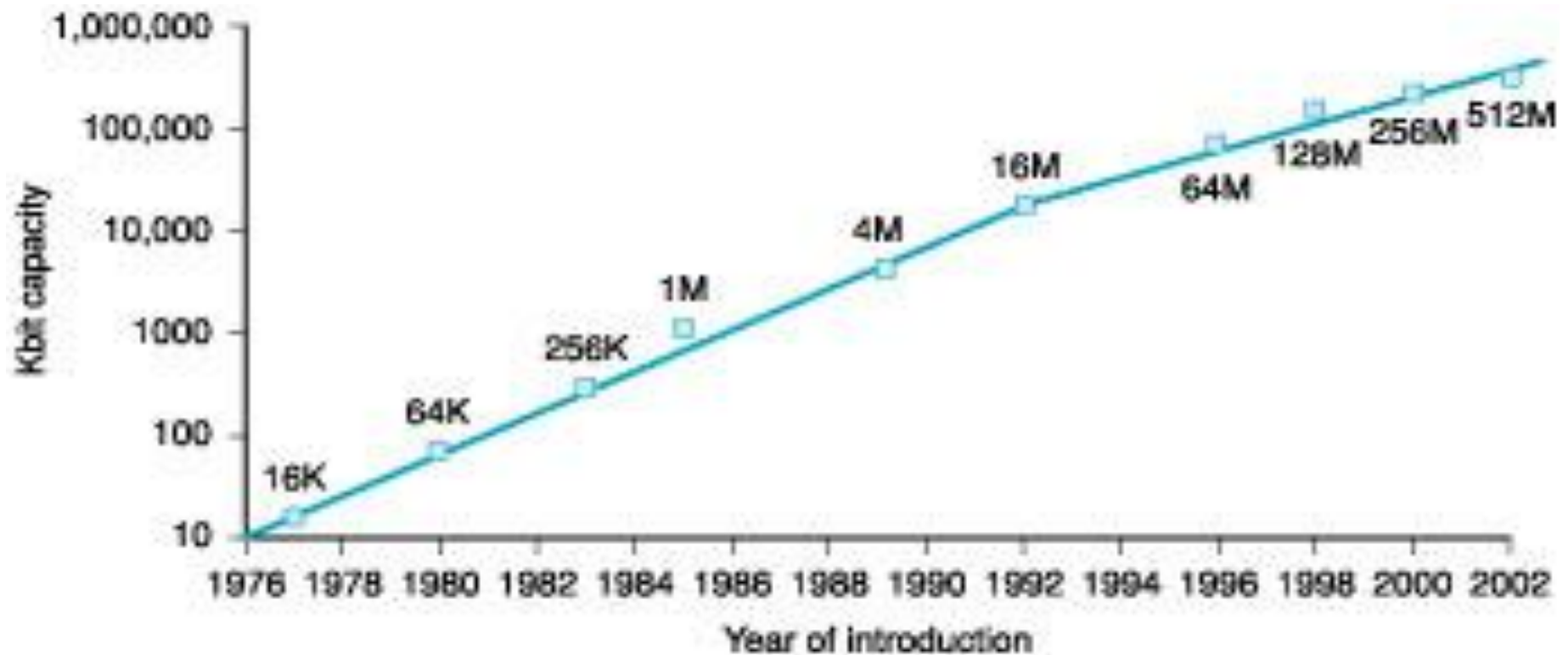

Multicore

Motivation

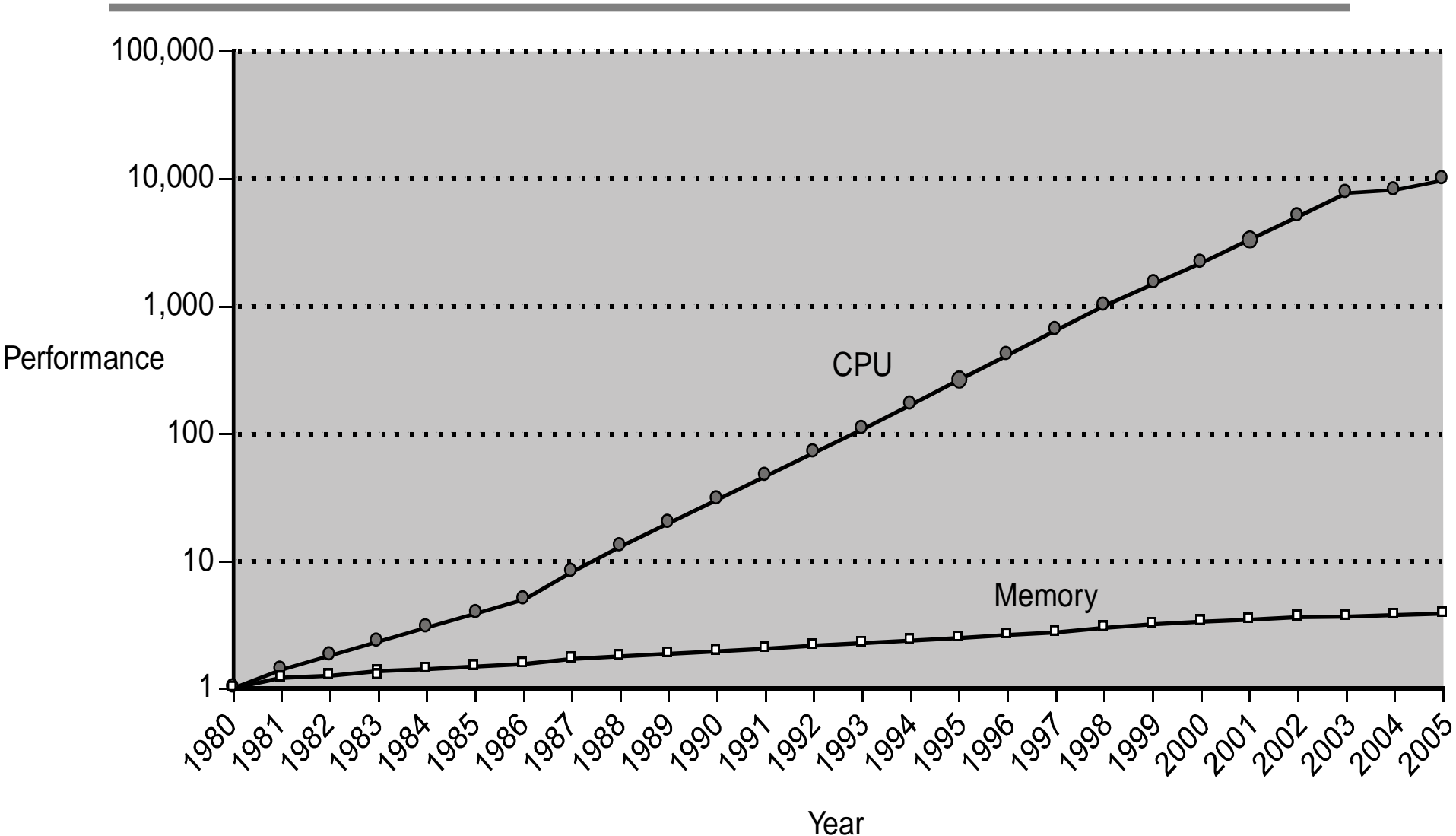
Moore's Law: the number of transistors double every 18 months



Memory capacity also increases



The Memory Wall

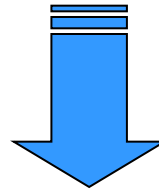


How to go parallel?

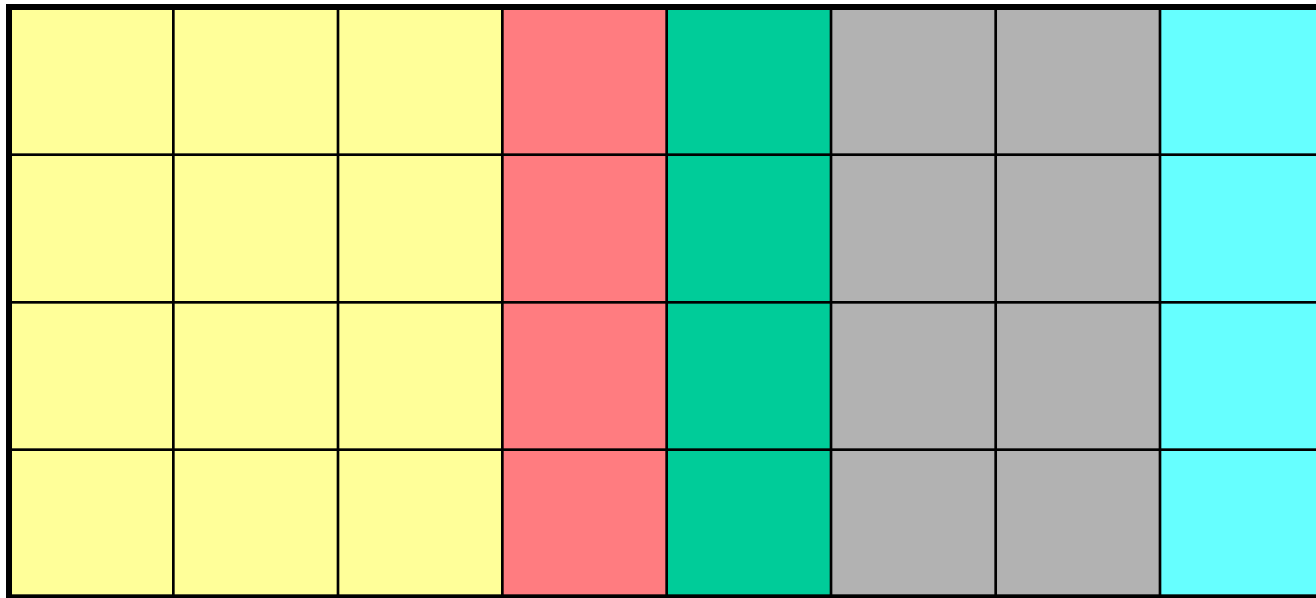
- VLIW Processors
- Superescalar Processors
 - Hyperthread
- Multi-core

Very Long Instruction Word

Instruction (8 operations)



Time
↓

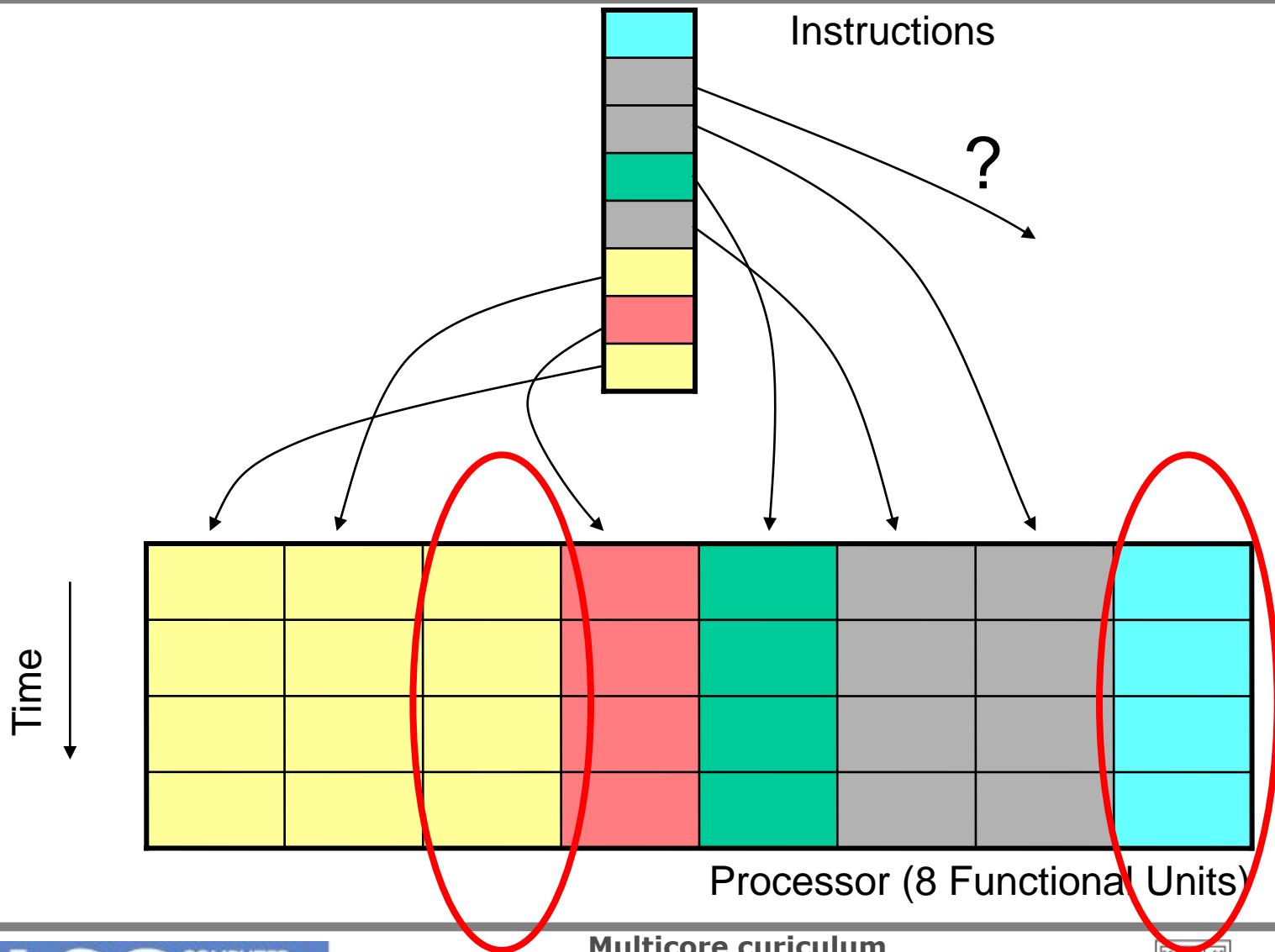


Processor (8 Functional Units)

VLIW

- Advantages
 - Easy to implement in hardware
 - Several similar tiles
 - Do not require a huge control logic
- Disadvantages
 - Difficult to generate good code

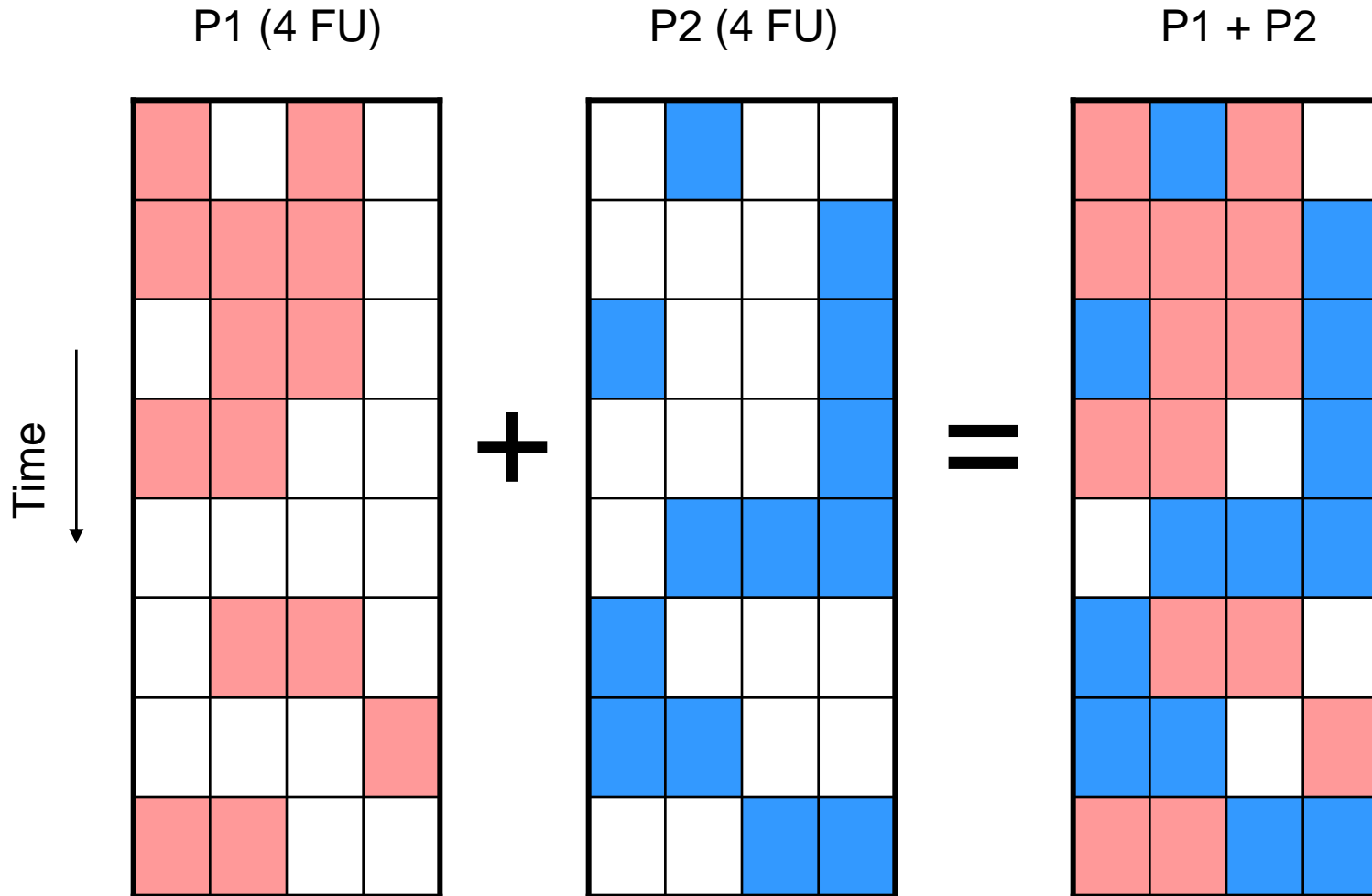
Superscalar Processor



Superscalar Processor

- Advantage
 - Transparent to the software
 - The processor is able to use dynamic information to find the parallelism
 - Speculative code execution
- Disadvantage
 - Can not always find instruction for each functional unit
 - Detecting parallelism in hardware requires a lot of area

Hyperthreading Technology



Hyperthreading Technology

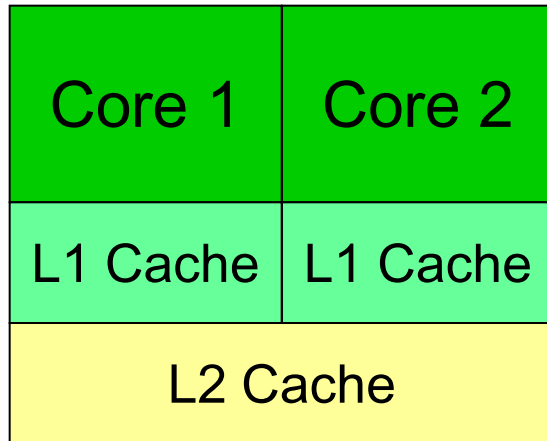
- Requirements
 - 2 Different
 - Program counter
 - Register banks
 - Status registers
 - The same
 - Functional units
 - Caches

Hyperthreading Technology

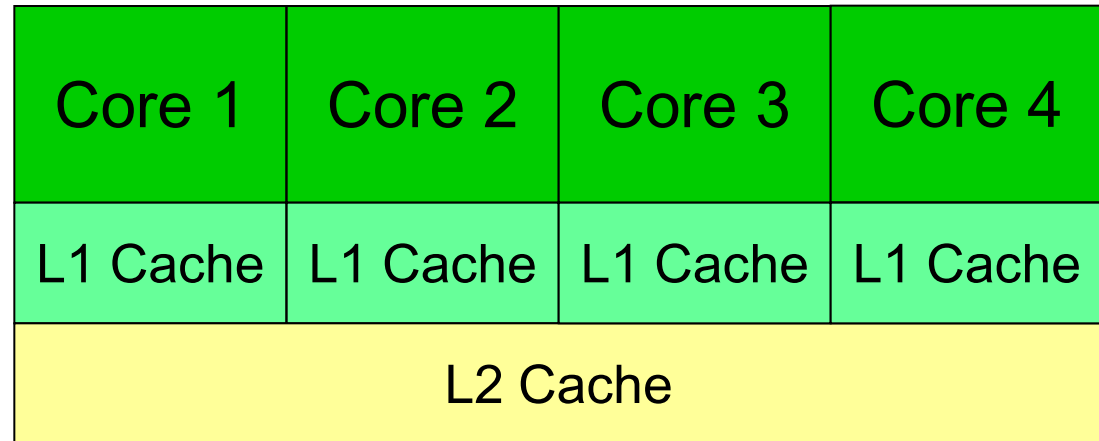
- Advantage
 - Uses the available functional units to execute a second thread
 - Capable of executing code during a stall of the other thread (cache miss, etc)
- Disadvantage
 - Threads usually need the same functional unit
 - 2 threads at the same time, but only 30% of typical speedup

Chip Multiprocessing (CMP)

2 Cores

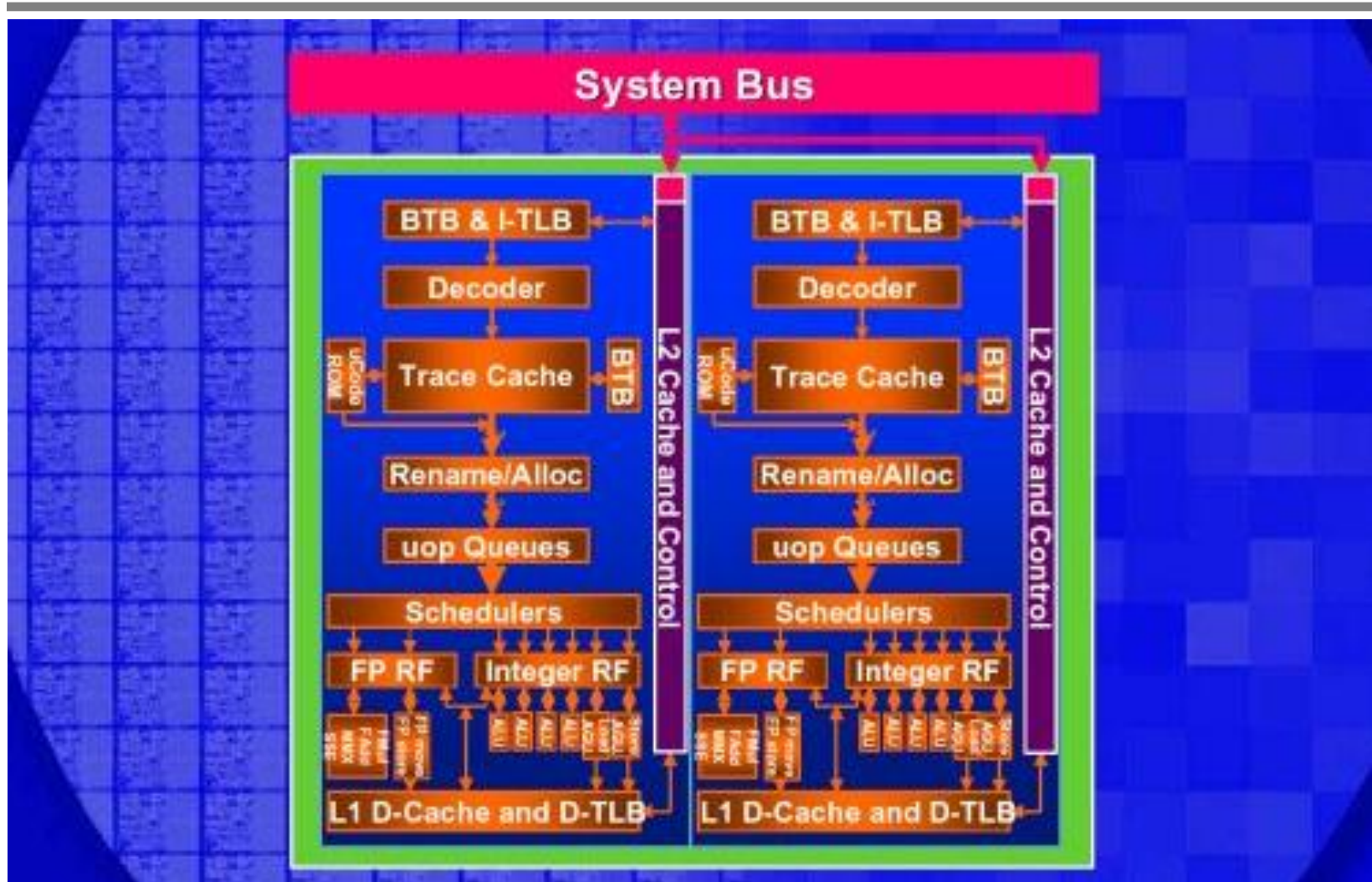


4 Cores

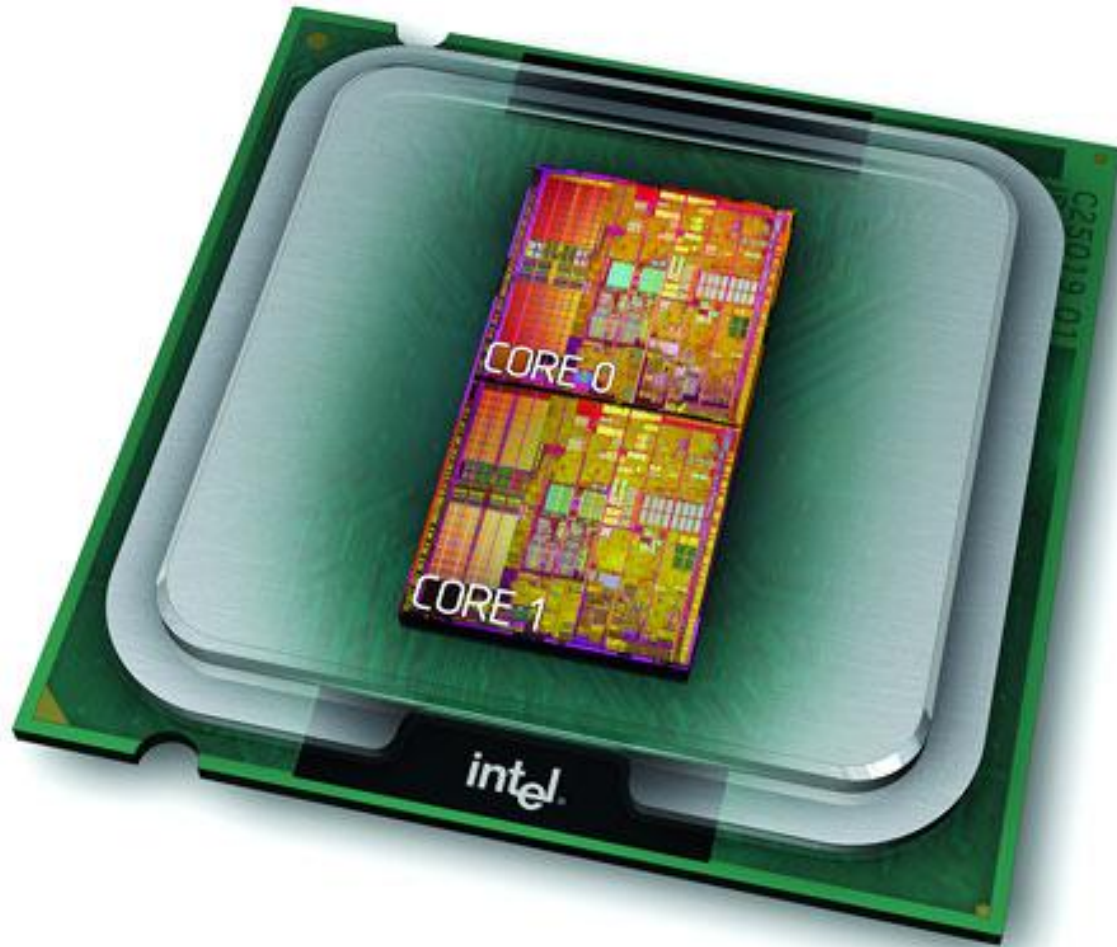


A cache L2 também pode ser dividida!

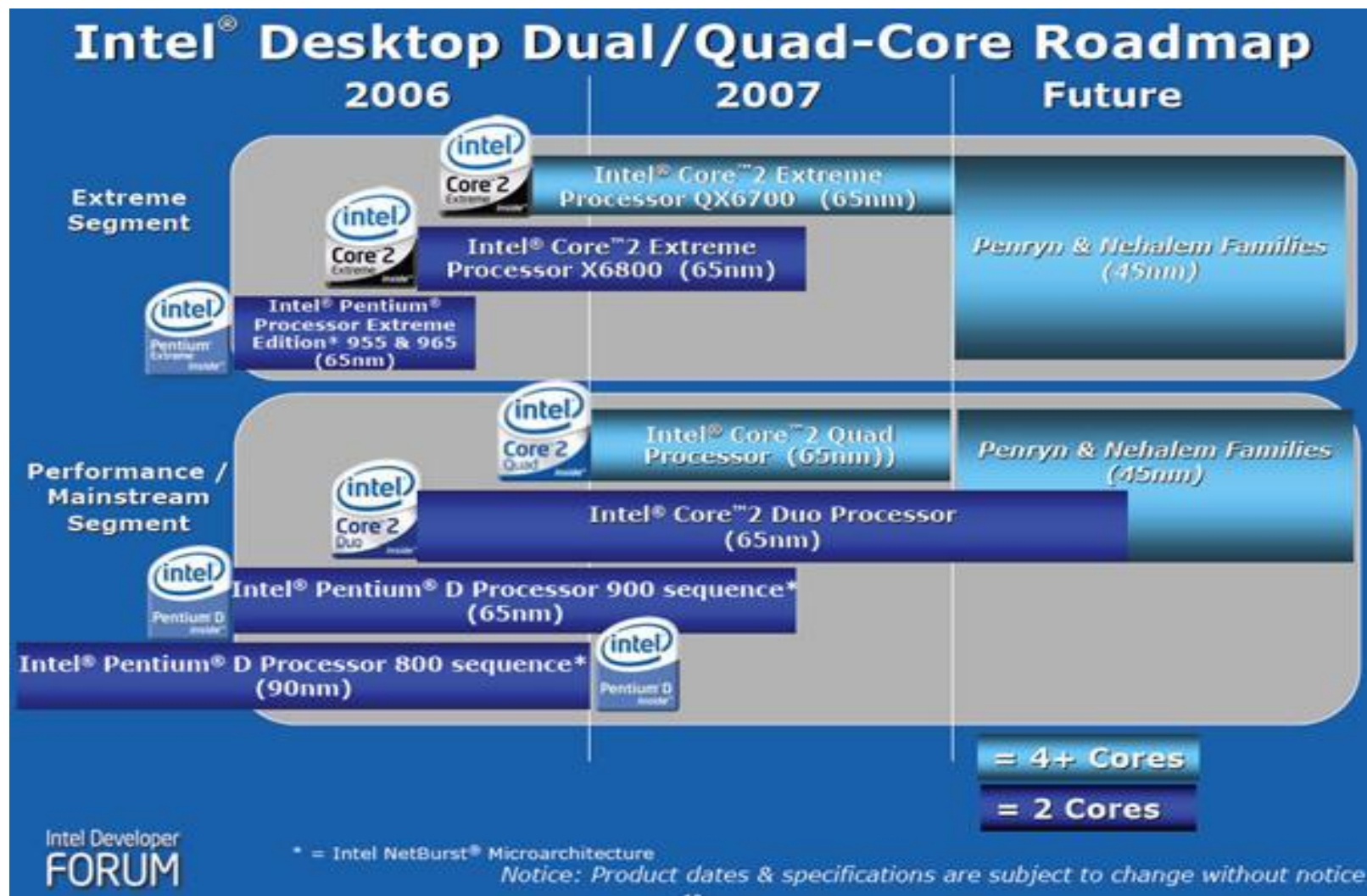
Pentium D Processor Diagram



Intel Dual Core Pentium



Intel Roadmap



AMD Dual Core

