

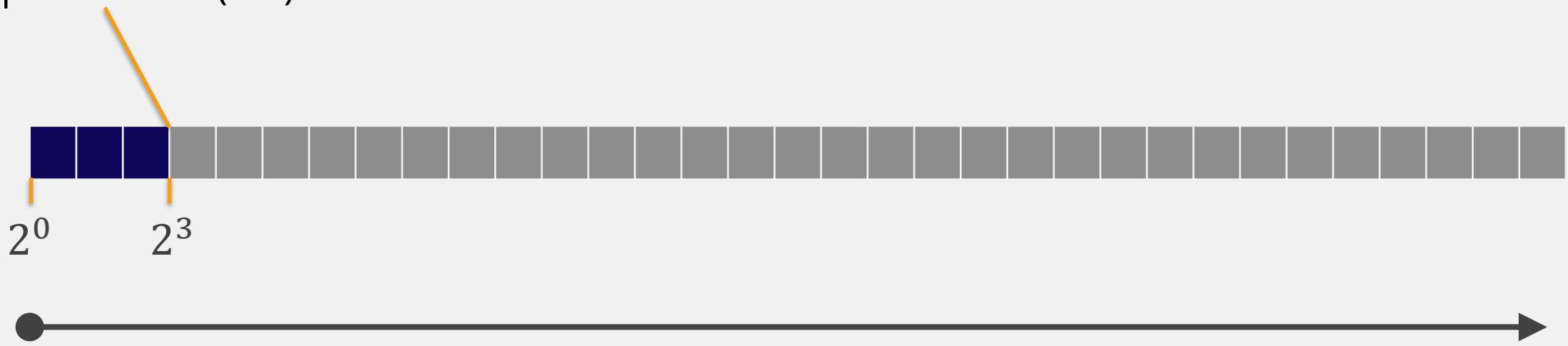


UNIVERSITÉ
DE GENÈVE

MEMORY: SIZE COMPARISON INDIVIDUAL READING

MEMORY: SIZE COMPARISON

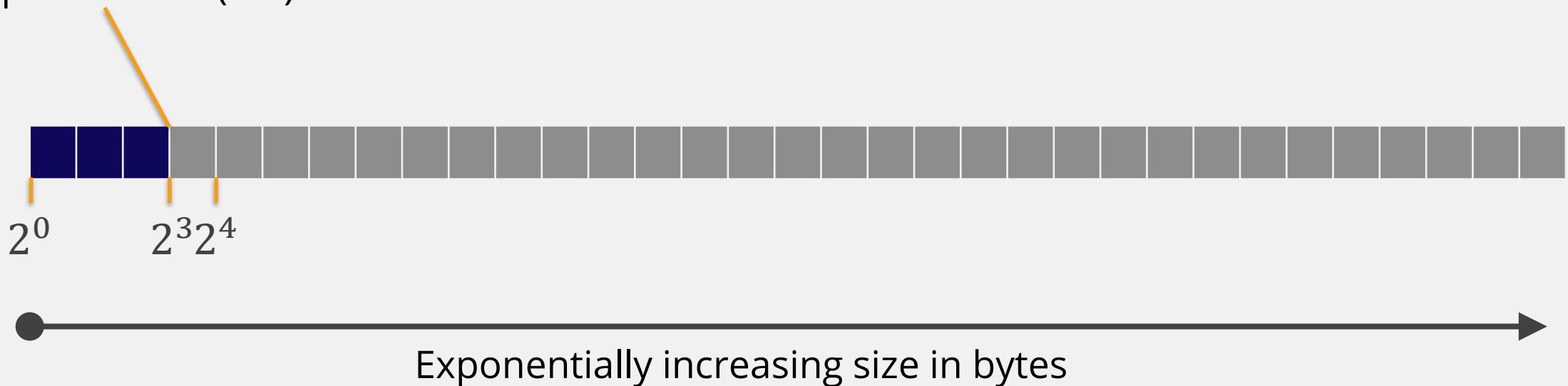
Type `double` (8 B)



It is useful to keep in mind the relative size of objects presented in this course.
Let's start with a 64-bit variable, like a double-precision float.
We represent it in blue, using three cells, because its size is $8 = 2^3$ bytes.

MEMORY: SIZE COMPARISON

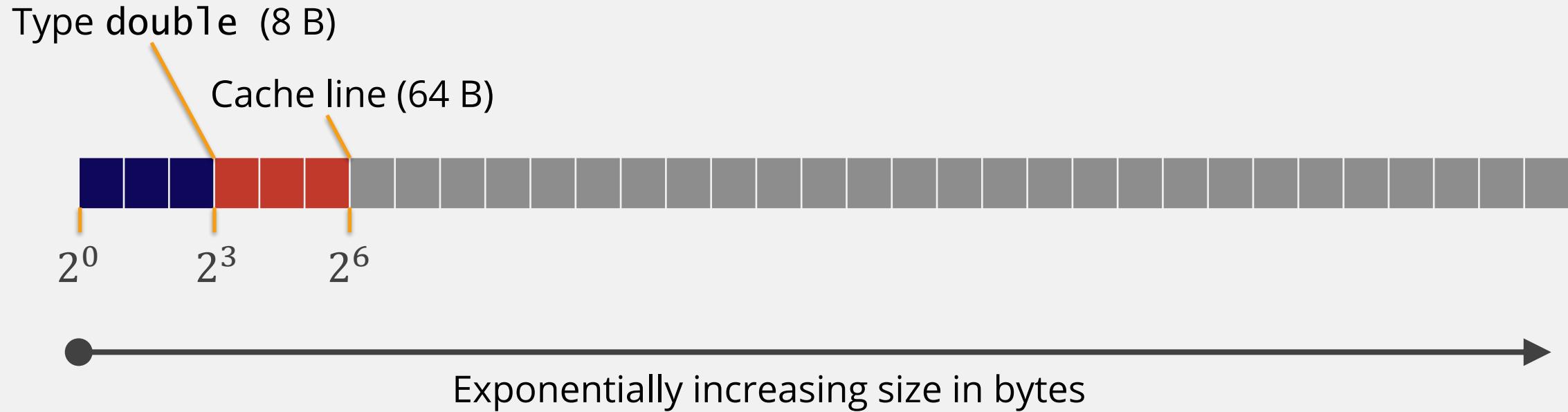
Type `double` (8 B)



From left to right, size expands exponentially.

If we add one cell, the size grows from $2^3 = 8$ bytes to $2^4 = 16$ bytes.

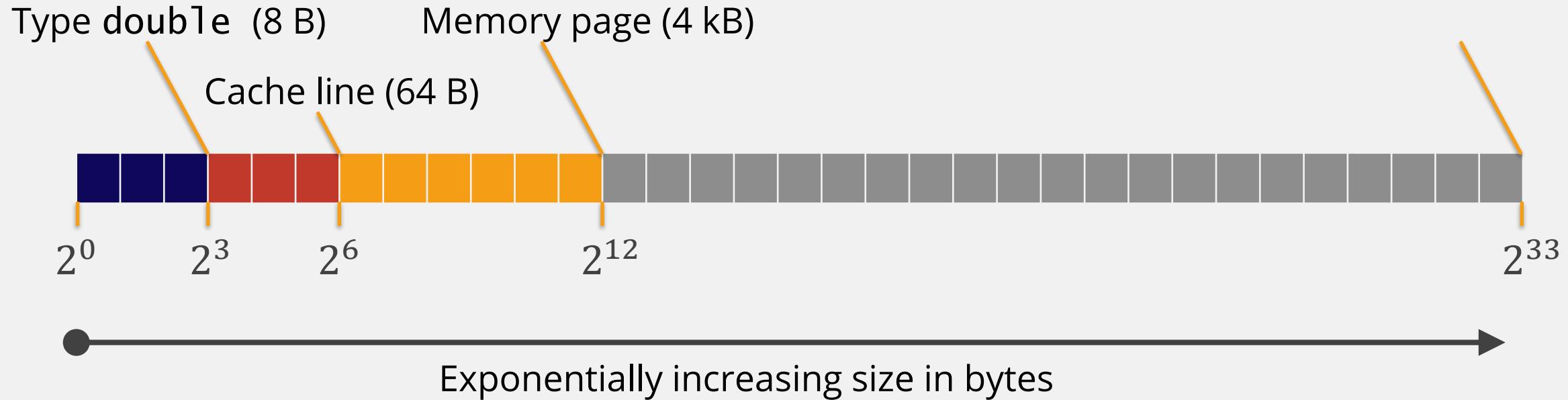
MEMORY: SIZE COMPARISON



Our next milestone is a cache line, with a typical size of $2^6 = 64$ bytes.

A cache line can store 8 doubles, or 16 floats.

MEMORY: SIZE COMPARISON

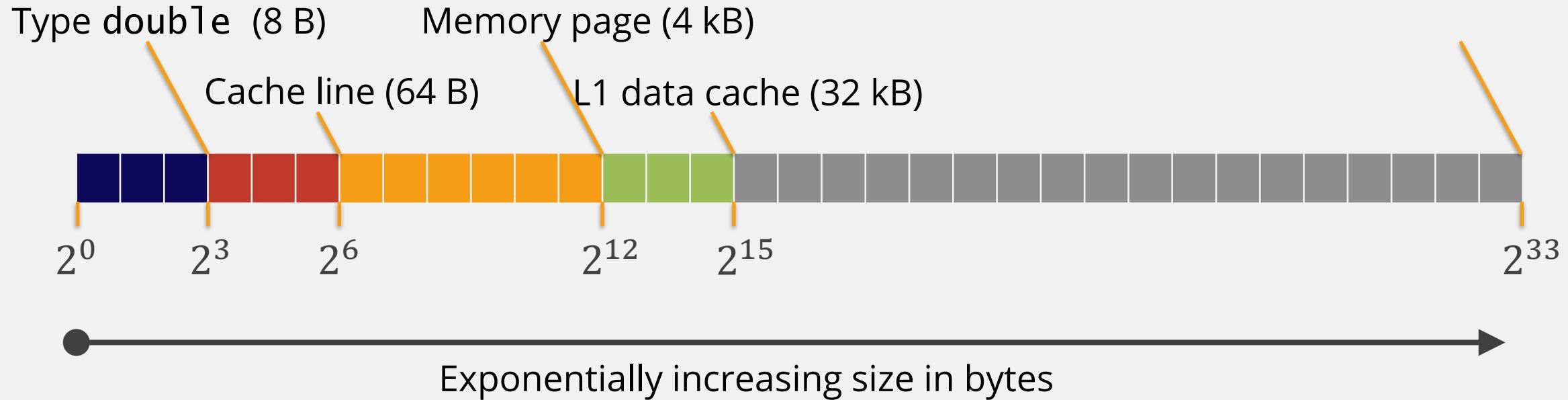


Virtual memory works with memory pages.

One memory page hold 2^{12} bytes = 4 kB.

A memory page holds 64 cache lines, or 512 double-precision floats.

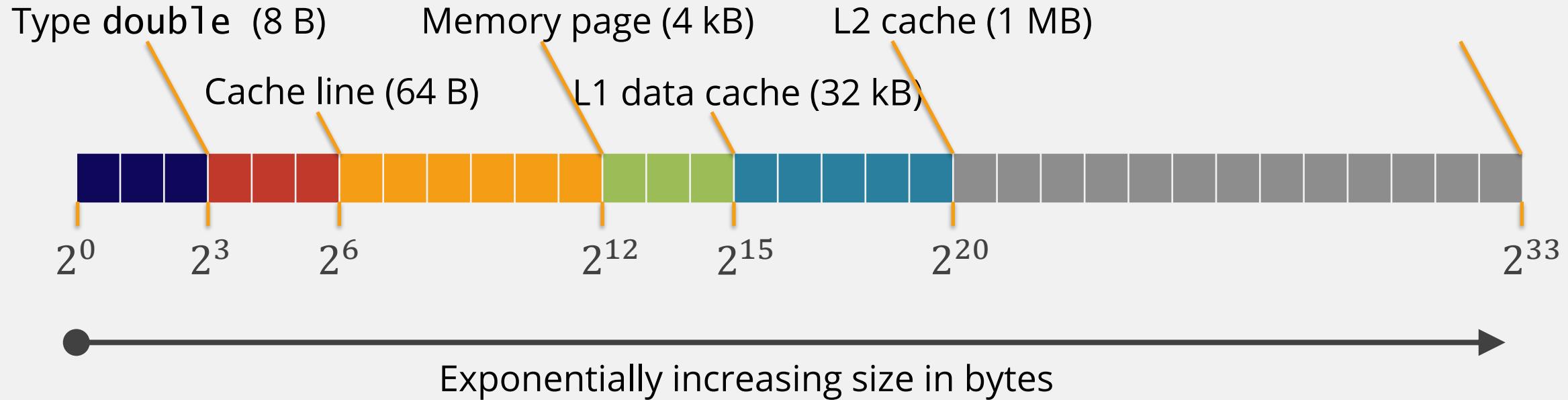
MEMORY: SIZE COMPARISON



L1 data cache can have a size of approximately 2^{15} bytes = 32 kB.

With this size, you can fit 8 memory pages into the L1 data cache.

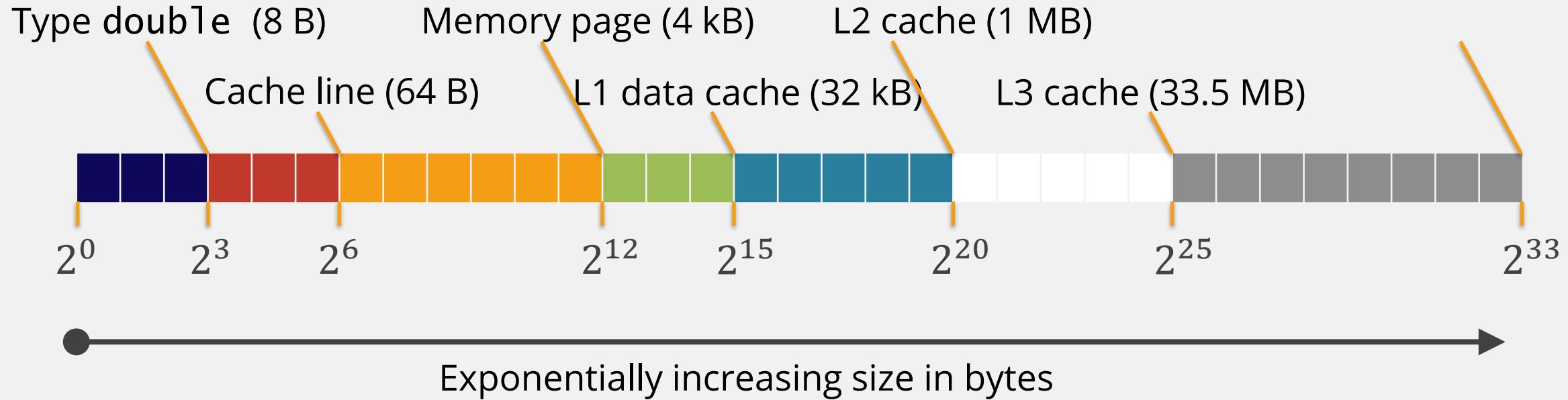
MEMORY: SIZE COMPARISON



L2 cache is usually much larger, for example 2^{20} bytes = 1 MB.

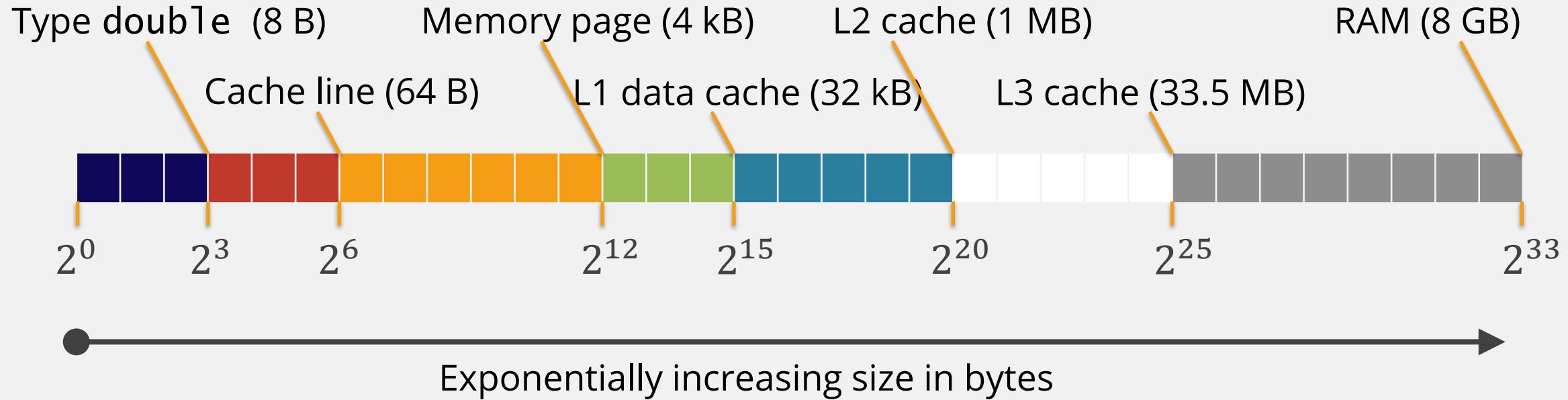
This makes it 32 times larger than the L1 data cache.

MEMORY: SIZE COMPARISON



L3 cache can be again 32 times larger: 2^{25} bytes = 33.5 MB.

MEMORY: SIZE COMPARISON



The main memory is substantially larger.

In this example, the system has 2^{33} bytes = 8 GB of RAM.

That's 256 times the size of L3 cache.