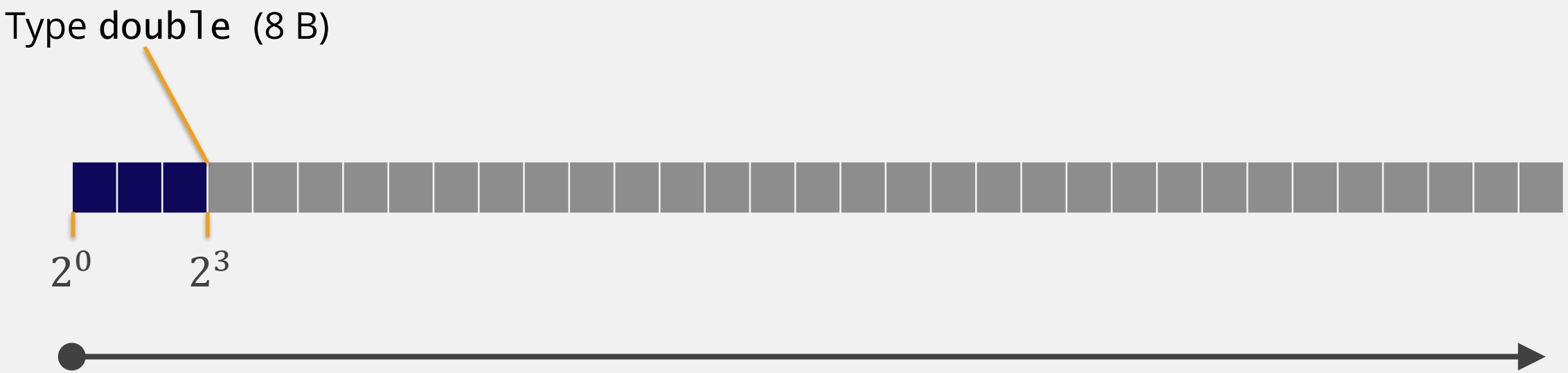
UNIVERSITÉ DE GENÈVE

MEMORY: SIZE COMARISON INDIVIDUAL READING

MEMORY: SIZE COMPARISON



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.

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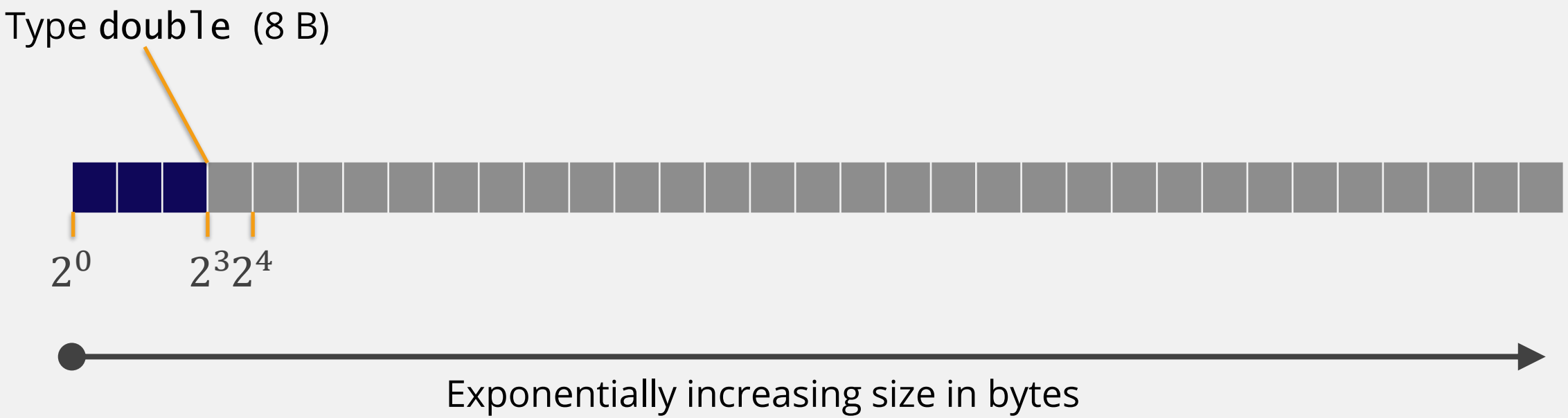

From left to right, size expands exponentially.

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

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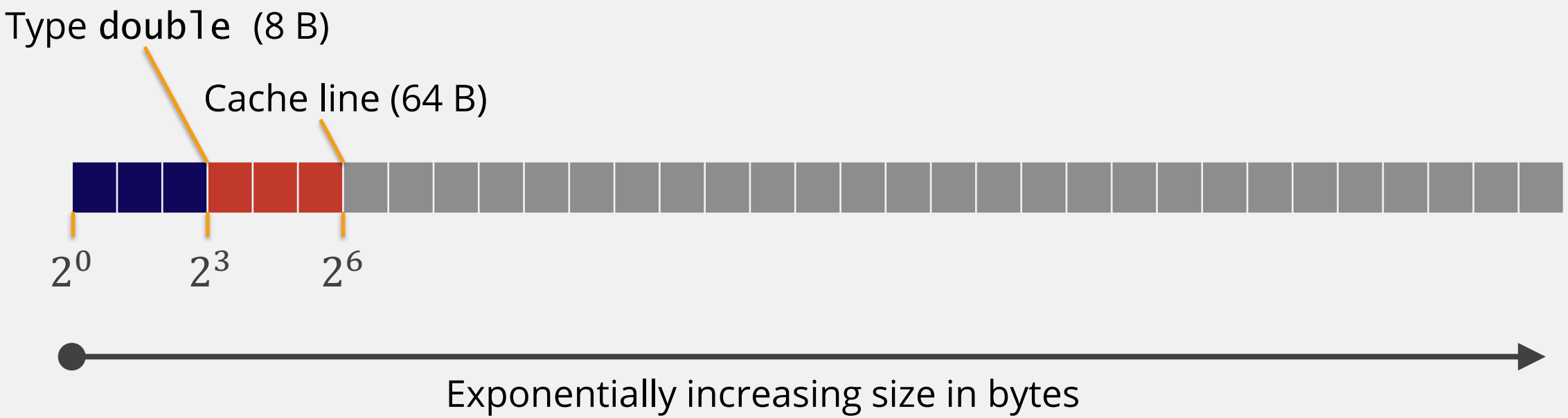

Our next milestone is a cache line, with a typical size of 2^6 = 64 bytes.

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

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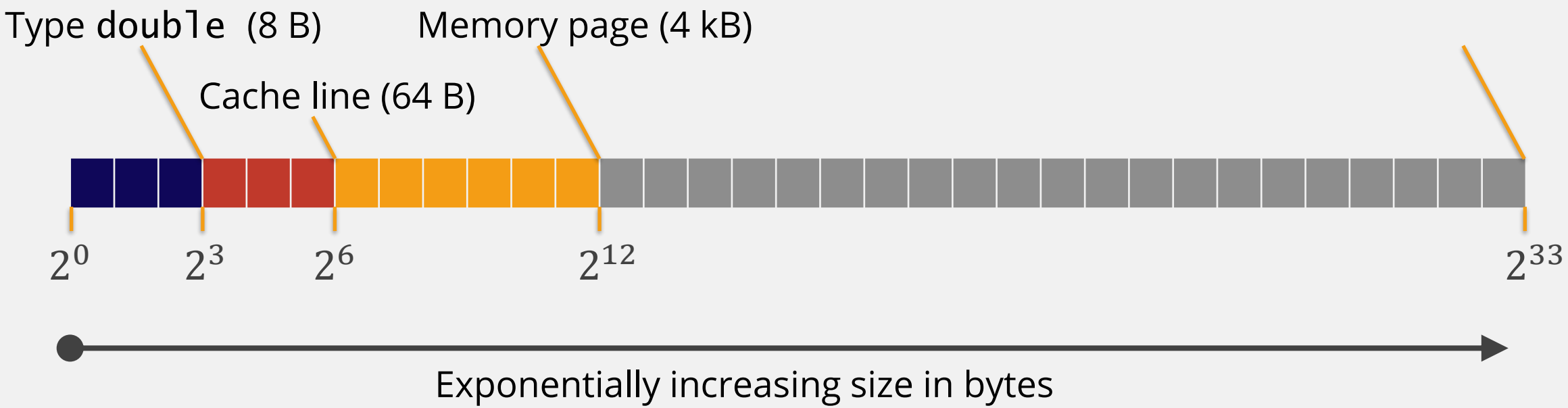

Virtual memory works with memory pages.

One memory page hold 212 bytes = 4 kB.

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

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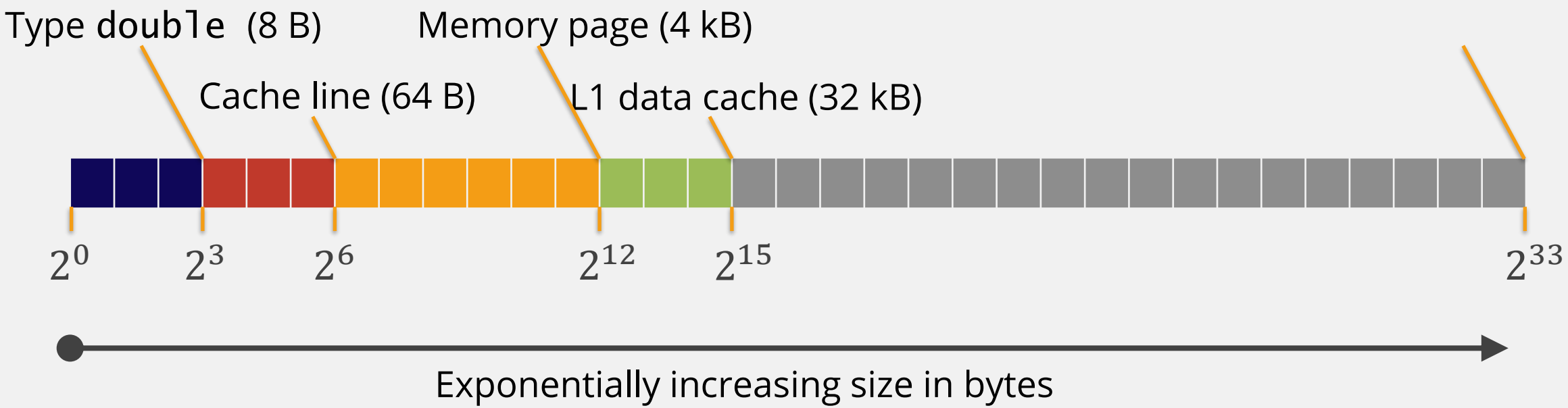

L1 data cache can have a size of approximately 2^{15} bytes = 32 kB.

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

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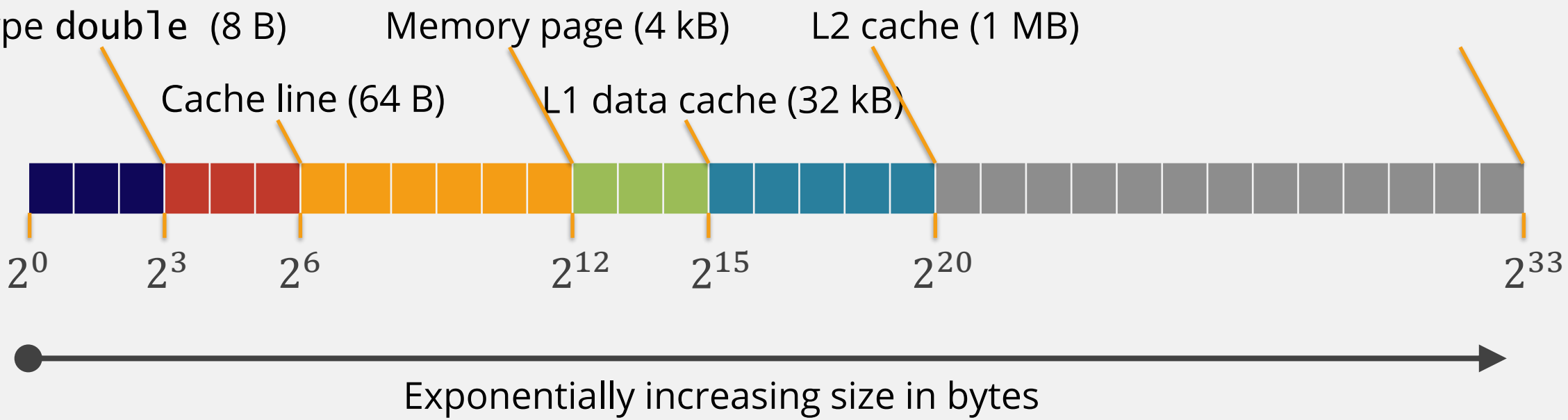

L2 cache is usually much larger, for example 2^{20} bytes = 1 MB.

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

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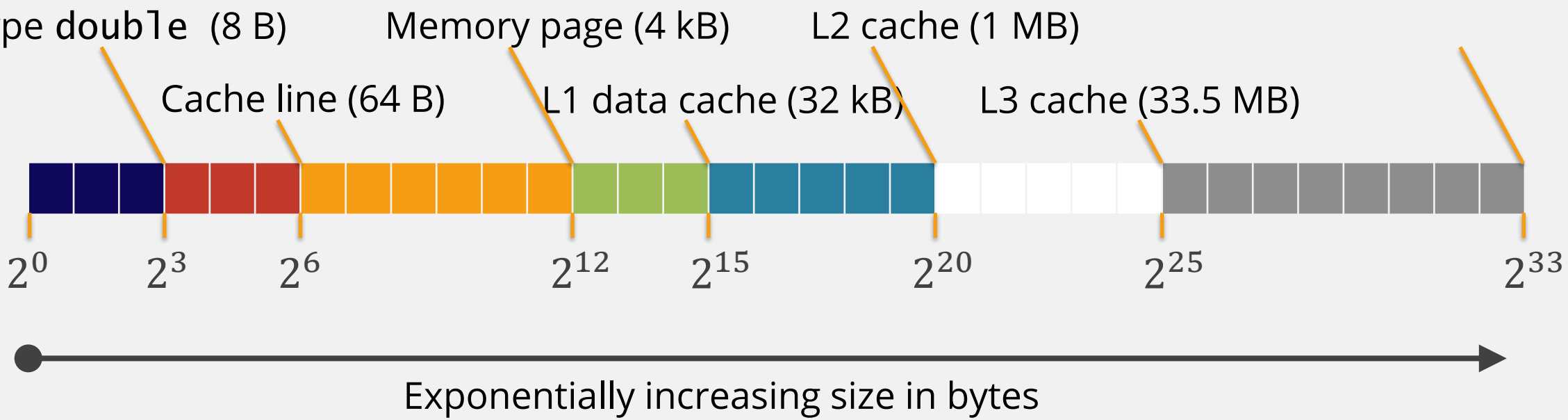

L3 cache can be again 32 times larger: 2^{25} bytes = 33.5 MB.

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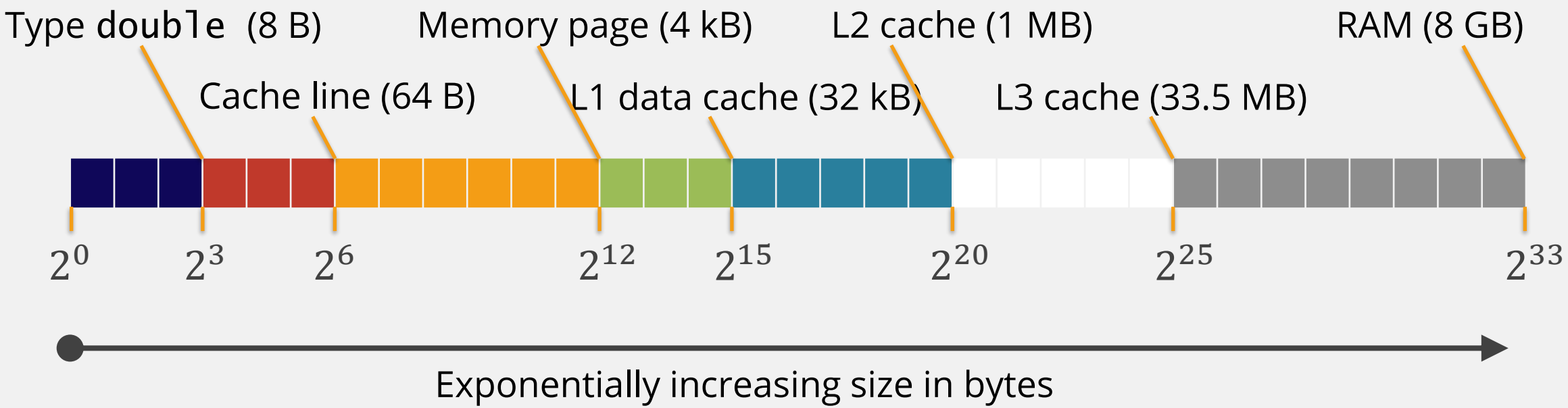

The main memory is substantially larger.

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

That's 256 times the size of L3 cache.