32-bit

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Bit
1 4 8 12 16 18 24 31 **32** 36 48 60 64 128 256 512
Application
16 32 64
Floating point precision
x½ x1 x2 x4
Floating point decimal precision
32 64 128

In computer architecture, **32-bit** integers, memory addresses, or other data units are those that are at most 32 bits (4 octets) wide. Also, 32-bit CPU and ALU architectures are those that are based on registers, address buses, or data buses of that size. **32-bit** is also a term given to a generation of microcomputers in which 32-bit microprocessors are the norm.

A 32-bit register can store 2^{32} different values. The signed range of integer values that can be stored in 32 bits is -2147483648 through 2147483647 (unsigned: 0 through 4,294,967,295). Hence, a processor with 32-bit memory addresses can directly access 4 GiB of byte-addressable memory.

The external address and data buses are often wider than 32 bits but both of these are stored and manipulated internally in the processor as 32-bit quantities. For example, the Pentium Pro processor is a 32-bit machine, but the external address bus is 36 bits wide, and the external data bus is 64 bits wide.[1]

Contents

Architecture

Prominent 32-bit instruction set architectures used in general-purpose computing include the IBM System/360 and its 32-bit successors, the DEC VAX, the NS320xx, the Motorola 68000 family, the Intel IA-32 32-bit version of the x86 architecture, and the 32-bit versions of the ARM, SPARC, MIPS, PowerPC and PA-RISC architectures. 32-bit instruction set architectures used for embedded computing include the 68000 family and ColdFire, x86, ARM, MIPS, PowerPC, and Infineon TriCore architectures.

Images

In digital images/pictures, 32-bit usually refers to RGBA color space -- 24-bit truecolor images with an 8-bit alpha channel -- i.e., 8 bits each for red, green, blue, and transparency; a total of 32 bits per pixel. A few other much more rarely used images formats also require 32 bits per pixel, such as RGBE image format.

In digital images, 32-bit sometimes refers to high-dynamic-range imaging formats that use 32 bits per channel -- a total of 96 bits per pixel. 32-bit per channel images are used to represent values brighter than white; these values can then be used to more accurately retain bright highlights when either lowering the exposure of the image or when it is seen through a dark filter or dull reflection.

An example of this is the reflection seen in an oil slick; even though the reflection is only a fraction of that seen in a mirror surface, the reflection of highlights can still be seen as bright white areas, not dull grey shapes.

32-bit file format

A 32-bit file format is a binary file format for which each elementary information is defined on 32 bits (or 4 Bytes). An example of such a format is the Enhanced Metafile Format.

See also

- 16-bit
- 16-bit application
- 32-bit application
- 64-bit
- History of video games (32-bit era)
- Word (data type)
- Physical Address Extension (PAE)

References

1. ^ Gwennap, Linley (16 February 1995). *Intel's P6 Uses Decoupled Superscalar Design* (http://www.eecg.toronto.edu/~moshovos/ACA05/read/ppro1.pdf). Microprocessor Report. Retrieved 3 December 2012.

External links

- HOW Stuff Works "How Bits and Bytes work" (http://computer.howstuffworks.com/bytes.htm)
- Ken Colburn on LockerGnome.com: *32-Bit Vs. 64-Bit Windows* (http://www.lockergnome.com/windows/2009/01/07/32-bit-vs-64-bit-windows/)

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