The use of binary in encoding data within computers goes beyond the ability to store messages and numbers in the form of 1’s and 0’s. Within the computer’s actual hardware, information that we read and write on a PC must be stored in memory in a way that it can comprehend. The 1 or 0 in a binary bit is our abstraction of a physical on or off; it is a switch inside the computer that is either powered on or not which represents a value.

Binary format is chosen for its simplicity, uniformity, and efficiency in both concepts as well as engineering design. A computer can detect the electrical signal of a binary switch in a fraction of a second with minimal interference, making it one of the fastest ways of changing or reading values. The synergy between the hardware and the process allows for high-speed processing of nearly any computing task, as complex data structures and instructions can also be stored in binary patterns. In addition, the nature of modern processors now accommodates multi-processing resulting in simultaneous operations; due to the simple nature of binary, running multiple processes at once actually reduces computational load quite a bit!  
 In my research I found that alternatives to binary encoding have been considered, though none so far have been deemed feasible or as efficient. Ternary computations, a system which uses 3 states (0, 1, and 2) were once considered to represent more information per digit primarily for calculation and arithmetic use. It was used notably in the “Setun” computer, a university project in the Soviet Union in the 1950s which never saw commercial use or export. Quantum computing is a theoretical system using QuBits which can exist in a superposition of both a 0 and a 1 value, which if perfected could result in exponentially more efficient calculations. However, this technology is still in its infancy with steep costs and extreme conditions required for it’s existence.

Sources used:   
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