Number Systems & storage

Number systems

- A number system is a way of expressing numbers using a consistent set of symbols (digits) and rules.
- The decimal (base-10) system is the most used number system and consists of 10 digits: 0–9.
- The binary (base-2) system uses only two digits: 0 and 1. It is fundamental in computing and digital electronics.
- The hexadecimal (base-16) system uses 16 digits: 0–9 and A–F (where A = 10, B = 11, C = 12, D = 13, E = 14, F = 15). It is often used as a shorthand for binary values due to its compactness.
- Each number system is a positional system, meaning the position of a digit determines its place value (e.g., ones, tens, hundreds).
- Number systems can represent integers, fractions, and even non-numeric data (e.g., characters using ASCII or Unicode encoding).
- Arithmetic operations, such as addition, subtraction, multiplication, and division, follow specific rules within each number system.
- Conversion between number systems (e.g., binary to decimal) involves applying algorithms to translate a number's representation from one base to another.

Why Binary?

- Computers use binary in storage because it aligns with the electronic nature of computer hardware.
- Binary simplifies electronic circuitry design and facilitates logical operations and mathematical computations.
- Binary storage is reliable, scalable, and compatible with various storage media.
- Binary's two-digit system (0s and 1s) efficiently represents and processes information in computers.

Common Storage Standards

- Signed integers: Sign and Magnitude, One's Complement, Two's Complement, and others.
- Floating-point representations: IEEE 754, which includes variations such as single precision (32 bits), double precision (64 bits), and others.
- Text: ASCII, Unicode, UTF-16, and others.