Unit 1

Embedded system

Communication interfaces

- the place or area at which different things meet and communicate with or affect each other
- : a system that is used for operating a computer : a system that controls the way information is shown to a computer user and the way the user is able to work with the computer
- : an area or system through which one machine is connected to another machine

- the notion of an **interface** in the work environment is used for a point of interaction between a number of systems or work groups. In the manufacturing environment, the coordination and interaction between several work groups is used to communicate plans and control production activity. This interaction can be schedules, human interactions, computer systems, or any other medium of communication. A physical interface is the interconnection between two items of hardware or machinery.

serial communications interface

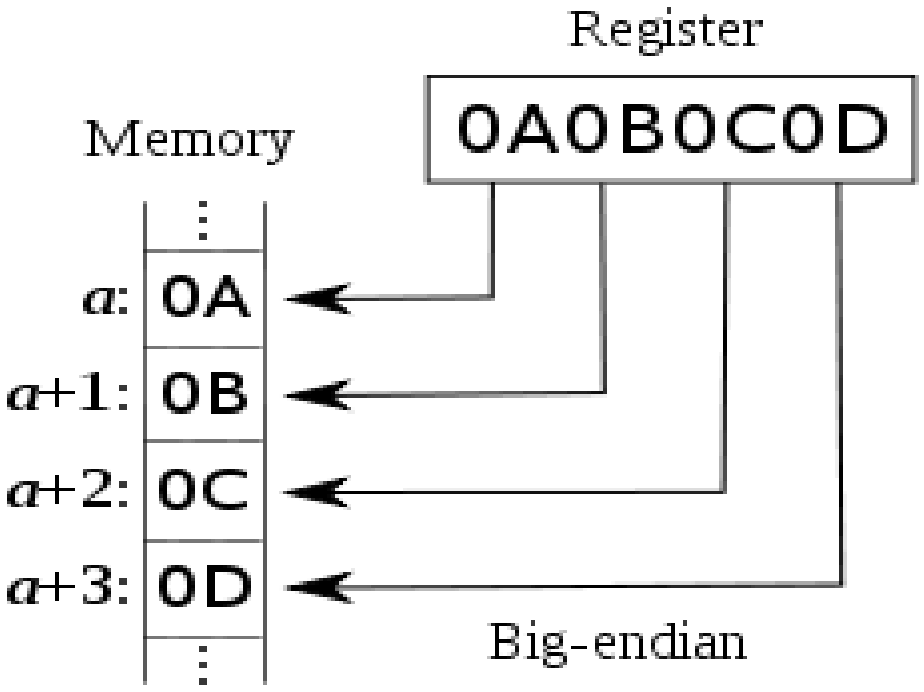
- A serial communications interface (SCI) is a device that enables the serial (one bit at a time) exchange of data between a microprocessor and peripherals such as printers, external drives, scanners, or mice. In this respect, it is similar to a serial peripheral interface
- **serial communication** is the process of sending data one bit at a time, sequentially, over a communication channel or computer bus. This is in contrast to parallel communication, where several bits are sent as a whole, on a link with several parallel channels.

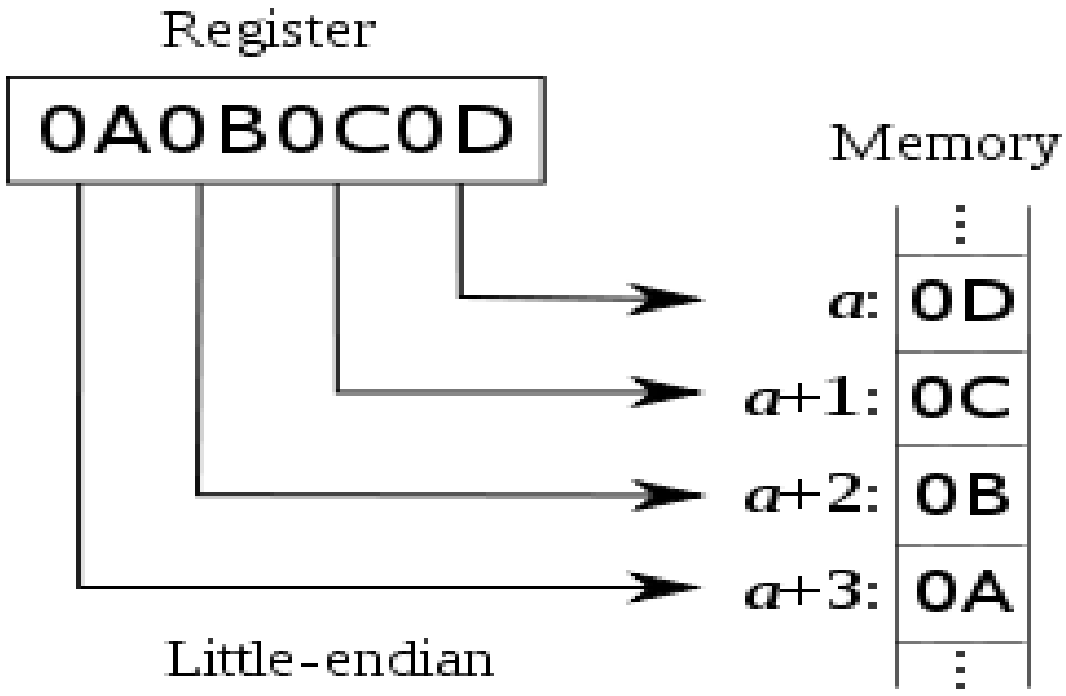
Big and Little Endian

- In order to understand the concept of big and little endian, you need to understand memory
- All you need to know about memory is that it's one large array
- But one large array containing what?
- The array contains *bytes*. In computer organization, people don't use the term "index" to refer to the array locations. Instead, we use the term "address". "address" and "index" mean the same
- Each element is typically one byte. There are some memory configurations where each address stores something besides a byte

- In computing, memory commonly stores binary data by organizing it into 8-bit units called bytes. When reading or writing a data word consisting of multiple such units, the order of the bytes stored in memory determines the interpretation of the data word.
- Each byte of data in memory has its own address(**memory address** is a data concept used at various levels by software and hardware to access the computer's primary storage memory.). **Big-endian** systems store the *most significant byte* of a word in the *address* and the least significant byte is stored in the largest address (also see Most significant bit). **Little-endian** systems, in contrast, store the *least significant byte* in the *address*

- The illustration to the right shows an example using the data word "0A 0B 0C 0D" (a set of 4 bytes written out using left-to-right positional, hexadecimal notation) and the four memory locations with addresses *a*, *a*+1, *a*+2 and *a*+3; then, in big-endian systems, byte 0A is stored in *a*, 0B in *a*+1, 0C in *a*+2 and 0D in *a*+3. In little-endian systems, the order is reversed with 0D stored in memory address *a*, 0C in *a*+1, 0B in *a*+2, and 0A in *a*+3.


Register
0A0B0C0D
Memory
a: 0A
a+1: 0B
a+2: 0C
a+3: 0D
Big-endian


Register
0A0B0C0D
Memory
a: 0D
a+1: 0C
a+2: 0B
a+3: 0A
Little-endian

What is cots

- COTS components generally offer high performance, they can occasionally incur significant timing delays. To prevent this, we propose controlling the operating point of each shared resource (like the cache, memory, and interconnection buses) to maintain it below its saturation limit. This is necessary because the low-level arbiters of these shared resources are not typically designed to provide real-time guarantee

Characteristics of cots

- Commercial-off-the-shelf (COTS) solutions are designed to be easily implemented and interoperate with existing systems and do not require the need for services or heavy customization.
- COTS offer an alternative to developing custom-made solutions. Since organizations invest much time and money in custom-made applications, these solutions are used for long periods of time and are not frequently updated.
- By implementing COTS, customers benefit from significant savings in procurement, development, and maintenance. Initial cost and development time can be drastically reduced, enabling customers to achieve a faster return on their software investment and achieve shorter time to market.

- COTS are used extensively to develop flight simulation software to train pilots, both commercial and military, for real-world situations. A **flight simulator** is a device that artificially re-creates aircraft flight and the environment in which it flies, for pilot training, design, or other purposes. It includes replicating the equations that govern how aircraft fly, how they react to applications of flight controls, the effects of other aircraft systems, and how the aircraft reacts to external factors such as air density, turbulence, wind shear, cloud, precipitation, etc.