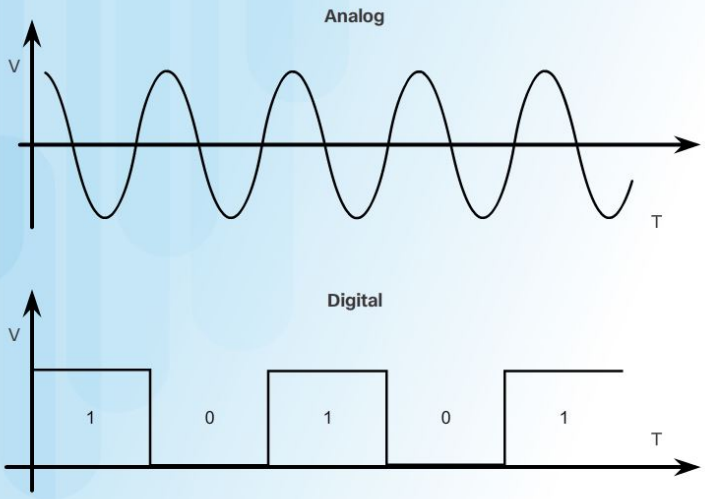
Direct Current

Alternating Current

electronic systems. Direct current can be obtained from alternating current by using a rectifier to convert AC into DC. Rectifiers force current to flow in one direction only and are commonly found in an AC to DC power supply.

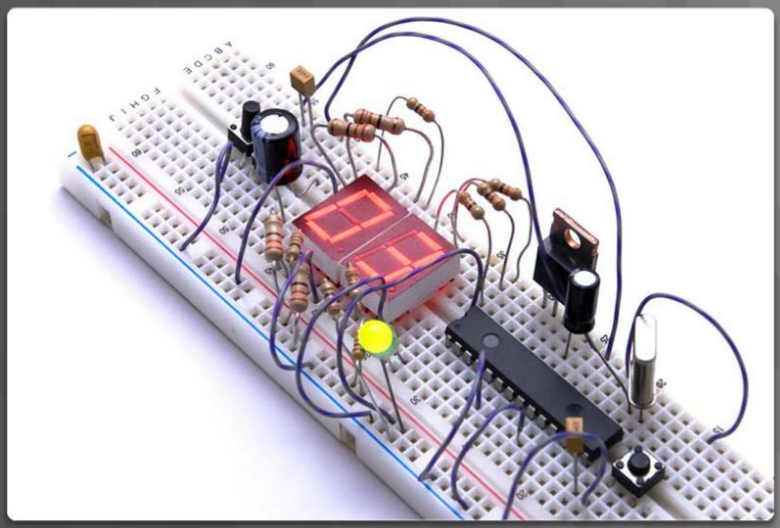
Alternating current (AC) is an electric current in which the flow of electric current periodically reverses direction. AC is the form in which electric power is delivered to businesses and residences. The usual waveform of alternating current in most electric power circuits is a sine wave. In certain applications, different waveforms are used, such as triangular or square waves. Alternate current is produced in the electrical power plant by taking advantage of various forms of mechanical energy (water flowing from a dam or the spin of a wind turbine) to move large scale alternators. The alternators then transform the mechanical energy into electricity. Direct current produced by a solar plant may be converted into alternating current with an inverter or a motor-generator set.



Analog circuits are circuits in which current or voltage may vary continuously with time to correspond to the information being represented. Analog circuits are used in power management circuits, sensors, amplifiers, and filters.

Digital circuits have electric signals that take on two discrete values corresponding to the level of voltage. These values are binary and are represented as 1/0, on/off, or high/low. In digital circuits, binary encoding is used: one voltage represents a binary 1 and another voltage usually a value near the ground potential, or 0 volts, represents a binary 0, as shown in the figure. Digital circuits can be designed to provide both logic and memory by interconnecting these binary signals, enabling them to perform arbitrary computational functions.

Integrated circuits are miniaturized circuits produced on a single piece of semiconductor. Integrated circuits are often referred to as chips



The prototype phase consists of the following steps:

1. **Hardware, Mechanical, and Software Development** - Software is a significant part of the project. Like the hardware, it should start with the high level design.

2. **PCB layout** - The printed circuit board (PCB) design is a major element in electronics hardware development. Signal integrity tests should be carried out as part of this activity. Normally PCB CAD software packages are used to create the designs.

3. **Build prototypes** - Build the prototype of the finished product including graphics and packaging.

4. **Product Testing** - Thorough product testing and Test Readiness Review (TRR) is required before moving on to the next phase.

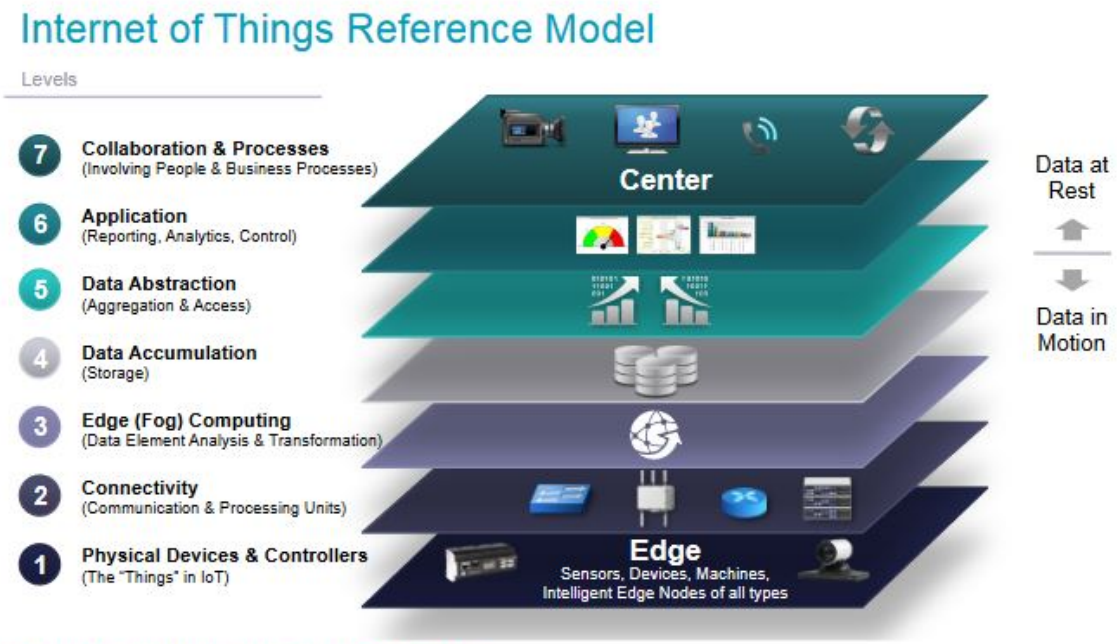
Solderless Breadboard

A solderless breadboard is a tool commonly used in electronic prototyping. The solderless

The IoT Reference Model also allows the processing occurring at each level to range from trivial to complex, depending on the situation. The model describes how tasks at each level should be handled to maintain simplicity, allow high scalability, and ensure supportability. Finally, the model defines the functions required for an IoT system to be complete.

Figure 1 illustrates the IoT Reference model and its levels. It is important to note that in the IoT, data flows in both directions. In a control pattern, control information flows from the top of the model (level 7) to the bottom (level 1). In a monitoring pattern, the flow of information is the reverse. In most systems, the flow will be bidirectional.

Figure 1. The IoT Reference Model



Level 1: Physical Devices and Controllers

The IoT Reference Model starts with Level 1: physical devices and controllers that might control multiple devices. These are the "things" in the IoT, and they include a wide range of endpoint devices that send and receive information. Today, the list of devices is already extensive. It will become almost unlimited as more equipment is added to the IoT over time.

Devices are diverse, and there are no rules about size, location, form factor, or origin. Some devices will be the size of a silicon chip. Some will be as large as vehicles. The IoT must support the entire range. Dozens or hundreds of equipment manufacturers will produce IoT devices. To simplify compatibility and support

Match the layers of the TCP/IP model to their function. (Not all options are used.)

application		represents data to the u
transport		determines the best pat
internet		represents data to the u
network access		supports communicatio

Refer to curriculum topic: 1.2.1

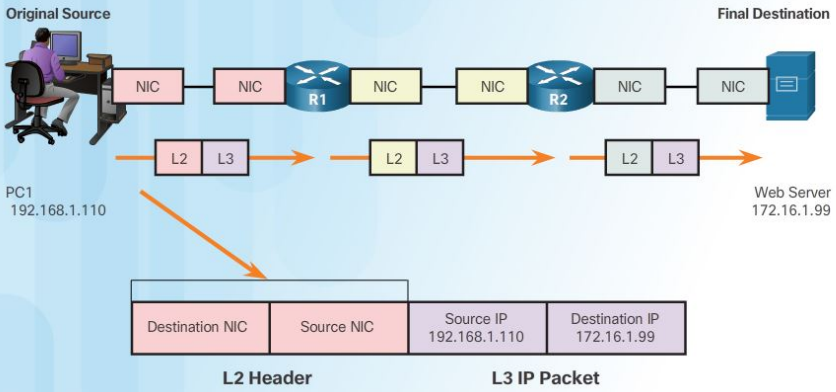
Question 2

2 / 2 pts

What are three components of a control system? (Choose three.)

- [x] plant
- [ ] wearable device
- [x] controller
- [x] sensor
- [ ] thermostat

Layer 2 Data Link Addresses



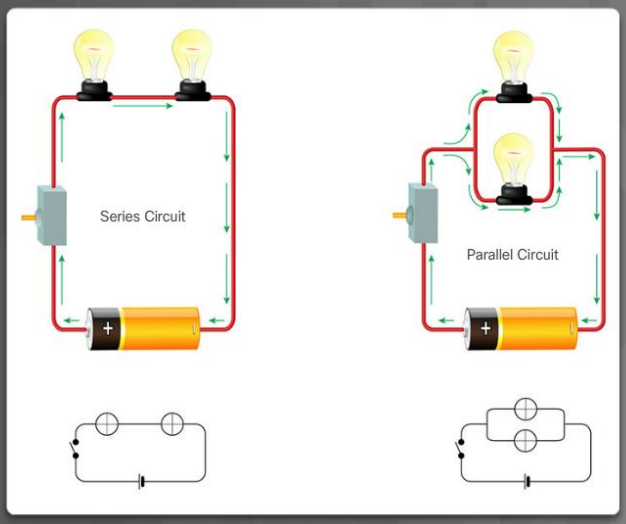
L2 = Layer 2
L3 = Layer 3

- Preparing network data for the physical network
- Controlling how data is placed and received on the media
- Exchanging frames between nodes over a physical network media, such as copper or fiber-optic
- Receiving and directing packets to an upper layer protocol
- Performing error detection

Layer 3 protocols are responsible for providing addressing to reach remote networks. The most common network layer (Layer 3) protocol used in network connections and on the Internet is the IP protocol.

In the figure, the user at PC1 is sending a file to the Web server on a different network. It is important to note that all devices on the network had to agree to use Ethernet and IPv4 for network communications to be possible.

Series and Parallel Circuits

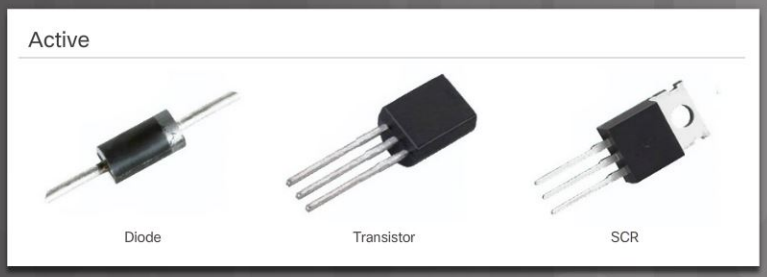


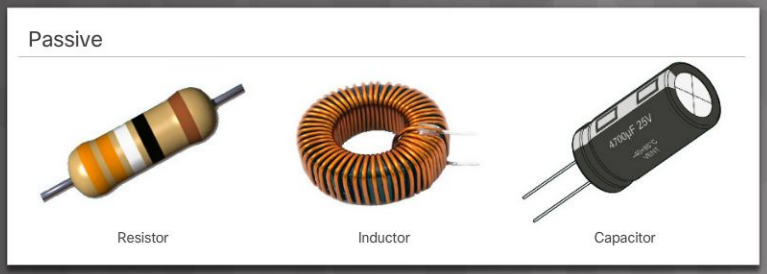
Series and Parallel Circuits

The components in an electrical circuit can be interconnected in different ways.

In a **series circuit** the components are interconnected one after another in a path between the positive and negative terminals of the power source, as shown on the left in the figure. The electric current travels through each component in a linear fashion. An example of a series circuit can be seen in a string of decorative holiday lights with each light connected to the next, one right after another.

In a **parallel circuit**, current flows from the battery terminal but splits at a junction which leads to parallel pathways through the circuit. Components connected along each pathway each get their own share of current, as shown on the right in the figure. In a parallel circuit you can power multiple components like LEDs. However, because each component gets its





Passive, Active, Linear, and Nonlinear Circuits

Simply stated, electronic components that produce energy are active and create nonlinear circuits. Components that store or maintain energy are passive and create linear circuits.

In a circuit, an active component is a device that can control electric current with an external source of energy, either electric voltage or electric current. The part of the circuit that provides energy to the active component is called the direct current (DC) part of the circuit. An active circuit is a circuit with at least one active component. Active components provide power gain or amplification that produces voltage signaling that is discontinuous or nonlinear. Active components include diodes, transistors, and silicon controlled rectifiers (SCRs). Examples of nonlinear circuits are mixers, modulators, and digital logic circuits.


Direct Current


Alternating Current

Direct current (DC) is a type of current in whic the flow of electrons goes one way only. Direc current is produced by sources such as batteries, power supplies, thermocouples, sola cells, or dynamos. Direct current is used to charge batteries and as power supply for electronic systems. Direct current can be obtained from alternating current by using a rectifier to convert AC into DC. Rectifiers force current to flow in one direction only and are commonly found in an AC to DC power supply

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