



2.2 Microcontrollers: The SparkFun Inventors Kit



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Microcontrollers: The SparkFun Inventors Kit

2.2.1 Introducing the Kit

- Introduction to the SparkFun Inventor's Kit (SIK)
 - This is a starter kit for building circuits and includes:
 - Solderless breadboard
 - SparkFun RedBoard (Arduino-like board)
 - Various resistors, diodes, LEDs, sensors and actuators
 - Connecting wires (jumper wires, mini-B cable, ...)
- Arduino Microcontroller
 - The Arduino is a popular microcontroller for prototyping.
 - Instructions for the Arduino are programmed using the Arduino integrated development environment (IDE).
 - The SparkFun RedBoard is an Arduino-like board that can be programmed using Arduino IDE.





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2.2.2 Simple Circuits

■ Building a Circuit

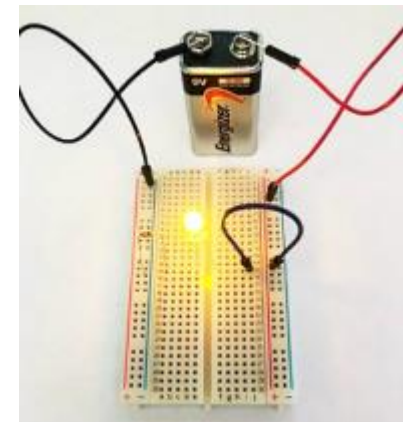
- A simple circuit can be created by:
 - Connecting electronic components (LED, resistor, and jumper wires) in series along a row on the breadboard.
 - Connecting the power source to the lower red and black jumper wires.
 - This should complete the circuit and light the LED.

■ The Arduino IDE

- Free, downloadable software used to interact with the Arduino board.

■ Writing code

- Programs written using the Arduino IDE are called sketches and are saved with the file extension of .ino.
- Arduino sketch keywords can be divided in three main category types: structures, values (variables and constants), and functions.
- Keywords used include void, setup(), loop() function, and more.





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Simple Circuits (cont'd)

■ Testing

- To test and verify the sketch code, click on the checkmark toolbar icon.
- The IDE compiles the code and checks for syntax errors.
- To upload the sketch to the Arduino and test the code, click on the second toolbar icon (⇒)



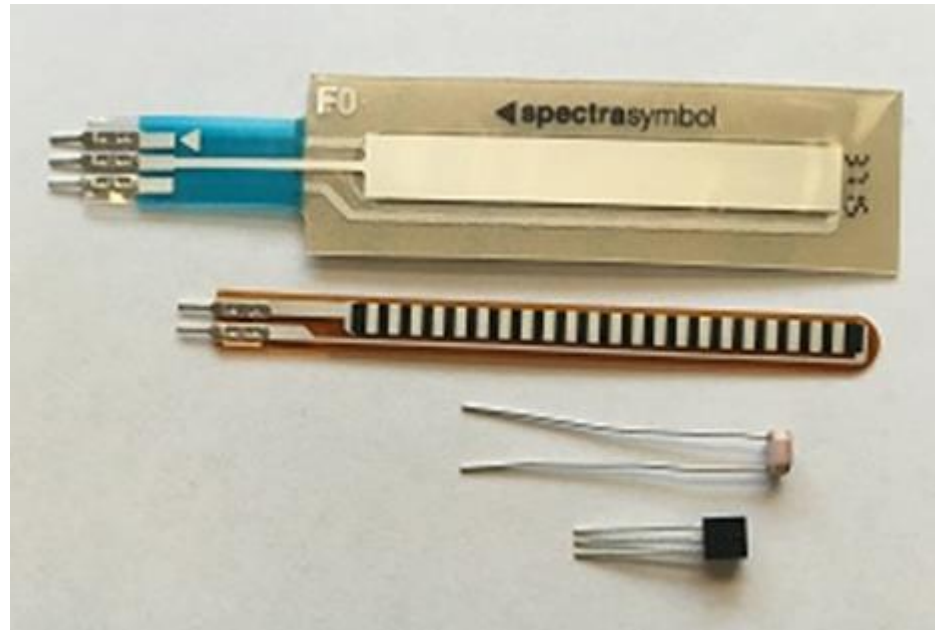


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2.2.3 Sensing the Environment

■ Sensors

- Devices that detect an event from the physical environment and respond with electrical or optical signals as output.
- The SIK contains various sensors including Soft potentiometer, Flex sensor, Photo resistor and Temperature sensor.



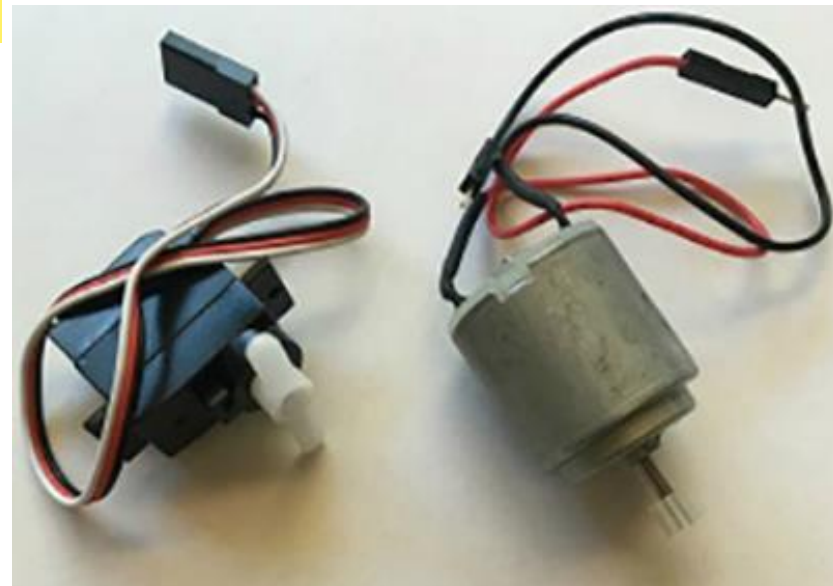
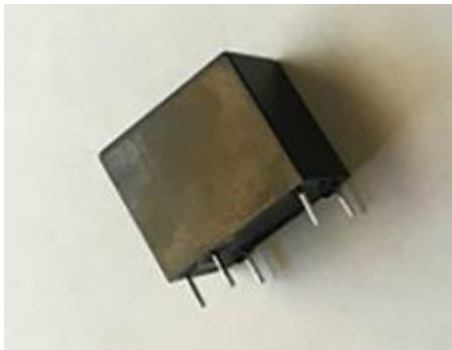


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2.2.4 Making it Happen

■ Actuators and Relays

- An **actuator** is a **type of motor** that is responsible for **creating movement**.
- The SIK includes **two types of electric actuators** that **convert electrical energy into mechanical torque**.
- A **relay** is **an electrically controlled mechanical switch**.
- The SIK includes a **plastic box that contains an electromagnet** that **causes a switch to trip** when it receives a current.





2.3 Packet Tracer 7.x and the IoT



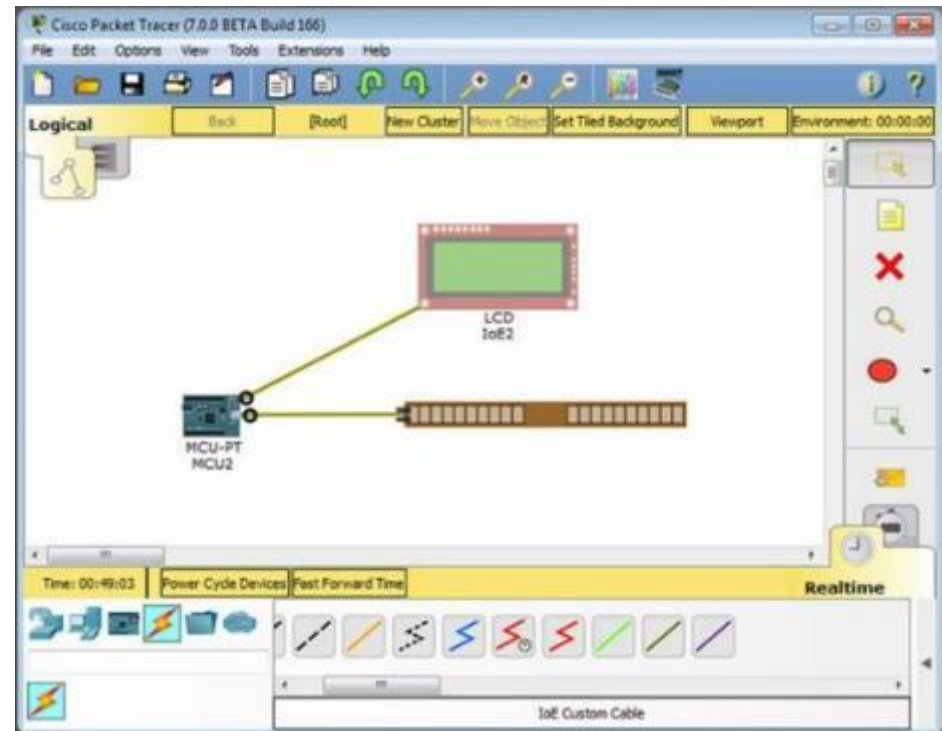
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Packet Tracer 7.x and the IoT

PT 7.x – End-to-End IoT System Model

- How Everything Connects in PT
 - Packet Tracer 7.x can be used as a prototyping tool.
 - There is a new group icon contained in Packet Tracer version 7.1 that is labeled Components.
 - The PT IoT boards contains an MCU and a SBC.
 - The MCU and SBC are similar to an Arduino and a Raspberry Pi, respectively.
 - There are also actuators and sensors that can be used in prototypes.
 - The IoT Custom Cable found in the Connections group can be used to connect IoT things to an MCU board.





2.4 Chapter Summary



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Chapter Summary

Summary

- Electronics is an important part of the IoT.
- IoT devices are often built from scratch; therefore, understanding electronics concepts, components and terminology is critical. It is also important for an IoT professional to be able to read and create electronics schematics.
- The SparkFun kit contains a number of devices and parts to help a beginner to get started with electronics and microcontrollers. It also introduces important concepts such as electronic circuits and how to program Arduino microcontrollers. Working with the kit, a beginner can also learn how to program sensors to monitor the environment. Actuators and relays are often used to influence the environment or create action.
- Students can use Cisco Packet Tracer 7.x as a tool for modeling and prototyping IoT systems.



