Now we've examined most of the general components of a simple example payload except for details about the core itself, the Arduino. Lets dig into what the Arduino itself is.

The Arduino UNO is a type of microcontroller which is a type of computer. Microcontrollers are similar to a laptop or desktop computer except that they don't run full operating systems capable of hosting multiple programs at once, instead they run only one program at a time. Arduino Uno is the flagship microcontroller from the Arduino company that produces it. There are many other Arduino brand microcontroller options as well as many microcontroller options from other companies. Microcontrollers are often meant to control external systems like situations like reading sensors, controlling motors, or interacting with other digital devices while consuming as little space and electrical power as possible. Many microcontrollers like the Arduino Uno have relatively low computing power and are not the fastest at making complex computations like operating on decimal point numbers. The Arduino Uno runs programs written in C++ with additional bits created by the Arduino company to make many common tasks easier and simpler.

Microcontrollers have a bigger cousin, microprocessors, that more closely resemble a desktop or laptop computer. A popular option for microprocessor is the Raspberry Pi (Raspi) single board computer (SBC). SBCs like the Raspi run full operating systems and can run multiple programs at once, though they usually don't have nearly as strong of specs as a desktop or laptop computer. SBC microprocessors are great for crunching numbers for complex math, and for doing complex networking and device interfacing like wifi or use of a VGA monitor. Because a Raspi runs a Linux based operating system, it can run programs written in many languages, but one very common language used with Raspi is Python.

Microcontrollers and microprocessors are different from each other and can be very different from other controllers, as well as processors being different from other processors. So what sets them apart? A common question people might ask themselves when designing an electronic project is, what type of computer is best for their purposes? Lets compare the basic stats of the Arduino Uno and the Raspberry Pi 3 Model B+.

Computer	Arduino Uno	Raspberry Pi 3 Model B+
Type	Microcontroller	Microprocessor / SBC
Logic Voltage	5V	3.3V
Input Power	7-12V & <20ma	5V & 2.5A
I/O Pins	14	40
Current per I/O Pin	20mA	
Core Processor	ATmega328P	Broadcom BCM2837B0
Core Bitwidth	8 Bit	64 Bit quad core
Clock Speed	16MHz	1.4GHz
Storage	32KB program / 1KB EEPROM	
RAM	2KB	1GB
Size	68.6mm X 53.4mm	85mm X 56 mm
Weight	25g	50g
Price	~$22.00	~$35.00

That chart was just a basic comparison of computing capability between the arduino Uno and the Raspi. For example the 8 bit core of the Arduino is more fit for basic integer math like counting up and down, or adding and subtracting integers. Arduino is capable of dealing with decimal point numbers, otherwise known as floating point numbers, but because floating numbers and their operations are complex in binary, performing these operations using only 8 bits takes extra clock cycles and is inefficient. On the other hand, 32 bit microcontrollers are more fit for these types of math operations and a multicore 64bit SBC like the Raspi handles those types of computations extremely easily. Because of this, microprocessors like Raspi are more fit for computation intensive tasks like for example live video processing or complex live data analysis. On the other hand, controllers usually have more internal components for handling low level device to device communication and control. Lets look at another chart to compare the extra features present in both devices to compare what contexts they're most fit for.

Arduino Uno	Raspberry Pi 3 Model B+
Analog to digital converter	2.4GHz & 5GHz Wifi
PWM driver	Bluetooth 4.2 BLE
External interrupt pin / handler	Gigabit Ethernet over USB 2.0
Built in SPI communication interface	HDMI out
Built in UART communication interface	4X USB 2.0 ports
Built in I^2C communication interface	CSI camera port
Power down settings	DSI display port for touchscreen
Capacitive touch capability	4 pole stereo out and composite out
Built in EEPROM long term data storage	Built in micro SD port (stores OS)

From these details we can see that while lots of tasks can be done with both devices just fine, they are actually optimized for quite different tasks. Raspi is more fit for higher level tasks comparable to a full desktop computer as can be seen by the fact that it has a built in HMDI port for a monitor, a port for a camera, ethernet and wifi for networking, bluetooth, and USB ports for connecting to other devices. Say the goal is to design something like a machine that uses a camera to solve a rubik's cube using object and color detection. A Raspberry Pi would be great for this and any other situation that would use camera data manipulation since there's so much data involved. However, maybe you want to design something that is battery powered and optimized for extremely low power or extremely small size or meant to directly manage many sensors, then Arduino is the way to go. Additionally, the Arduino is a simpler type of computer than the Raspberry Pi, which means that a designer can embed an arduino into a larger design and many companies sell their own off brand Arduino, whereas there's no easy way for a designer to completely replicate a Raspi. Two very different devices optimized to solve different problems, analyze your task at hand, and choose your weapon wisely.

SBC computers come in a variety of variants available, Raspberry Pi brand comes in smaller and cheaper footprints with the Raspberry Pi Zero which costs $5, and other brands like Beagleboard are available. Similarly, Arduino has a family of products with different capabilities like the Arduino Due which uses a 32 bit core with more communication protocols available. Even more so, microcontrollers come in a wide variety of available products like PIC and Teensy that offer different computing and communication capabilities.