

Review Class

Daniel B. Garrie, Esq.., co-founder Law & Forensics and Neutral with JAMS

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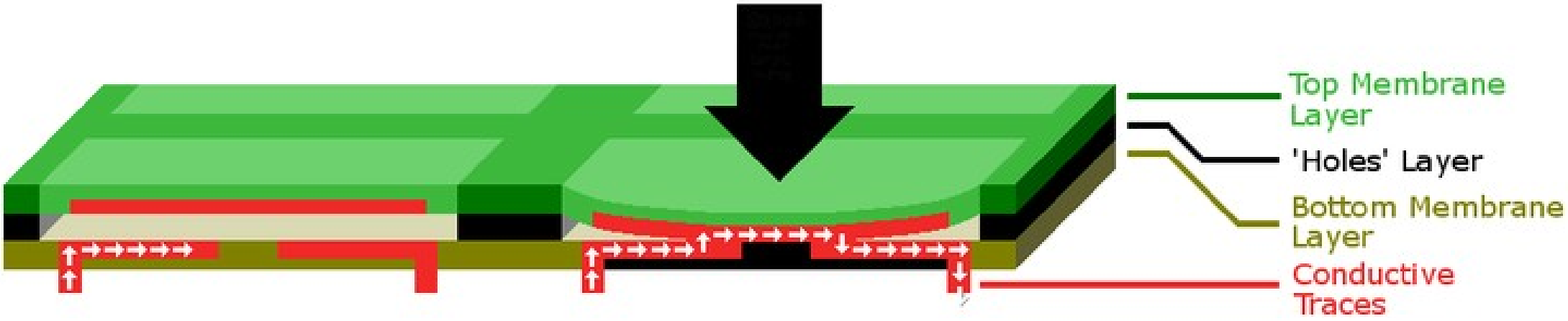
A computer is like a kitchen at a restaurant.

- The computer's processor is like a chef, who works to prepare the food. The faster the chef, the faster food is ready.
- The computer's RAM is like counter-top space. Everything in RAM is easy for the processor to get at, so if you have a lot of counter space, the chef can work on preparing more things at once.
- The computer's hard drive is like the cupboards and refrigerator. These things hold the ingredients until the chef needs them. If space runs out, then the old ingredients need to be thrown out to make room for new ones.
- You, the computer user, are then the customer who is ordering things from the kitchen. If the chef is slow, or their isn't enough counter-top space, it's going to longer for things to get done, especially if you are ordering a lot of things at once.
- The motherboard is the kitchen structure where everything is connected.

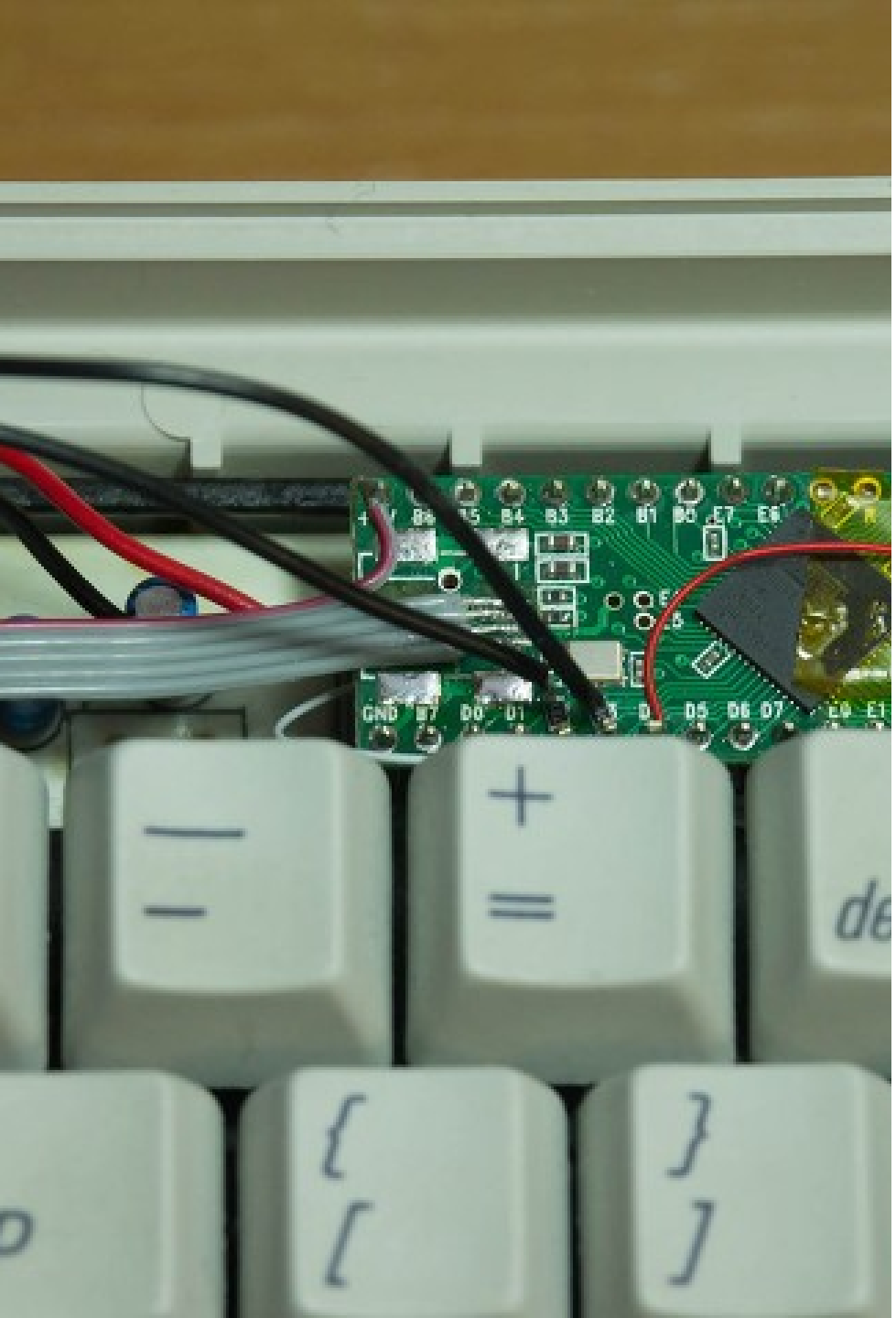
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What Happens When You Hit the Letter “J” (01001010)

The keyboard sends an electrical signal, called a scan code, to the computer saying that a button was pressed. Switches and circuits to translate a person's keystrokes into a signal a computer can understand, called a bit.



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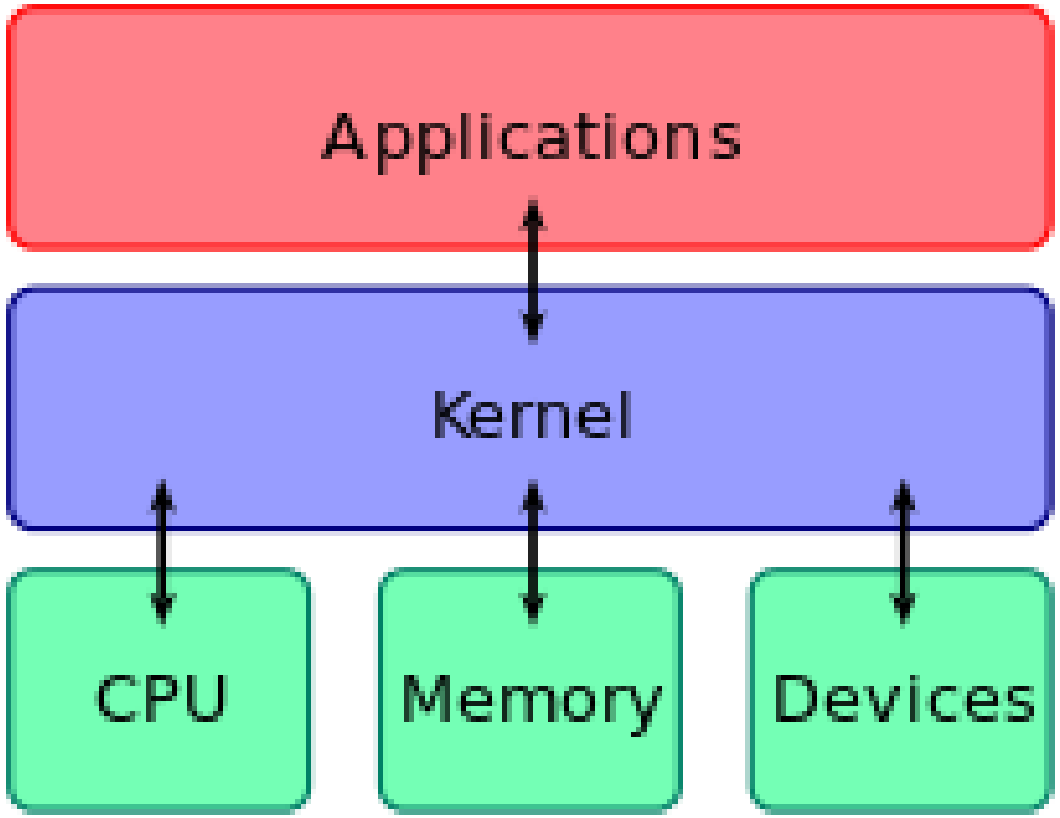


Then what happens?

- The keyboard controller interprets the scan code and determines that the letter pressed was a “J".
- It stores this “J" in a special memory location until the processor is ready to deal with it.
- Controller sends a signal to the processor, called an interrupt. An interrupt tells the processor that some part of the computer has information for it to process and wants its attention.
- Operating system determines which window you pressed the key in and sends a message to that window telling it a key was pressed.

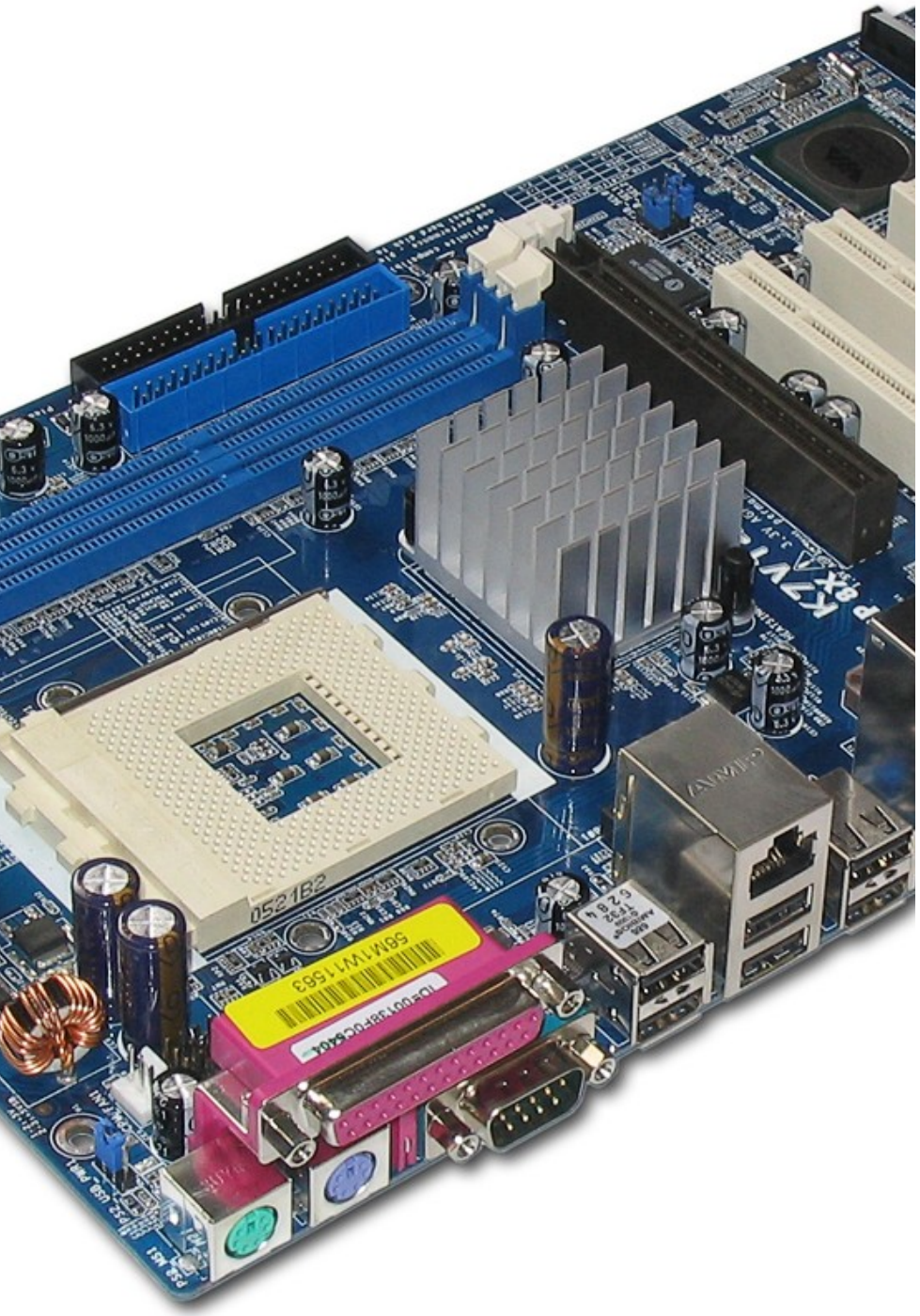
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What Happens When You Press the "J" Button?



- The window decides what to do with the keypress.
- Since in this case it's your word processor window, and the key you pressed was an ordinary letter, the word processor will add that letter to its working area for the file you have open.
- The window will then call the operating system to display the letter on the screen. The operating system will display the letter on the screen by adding it to your video card's video memory.
- The next time the video card refreshes your monitor (re-displays what is in its video memory) the letter will appear on the screen.

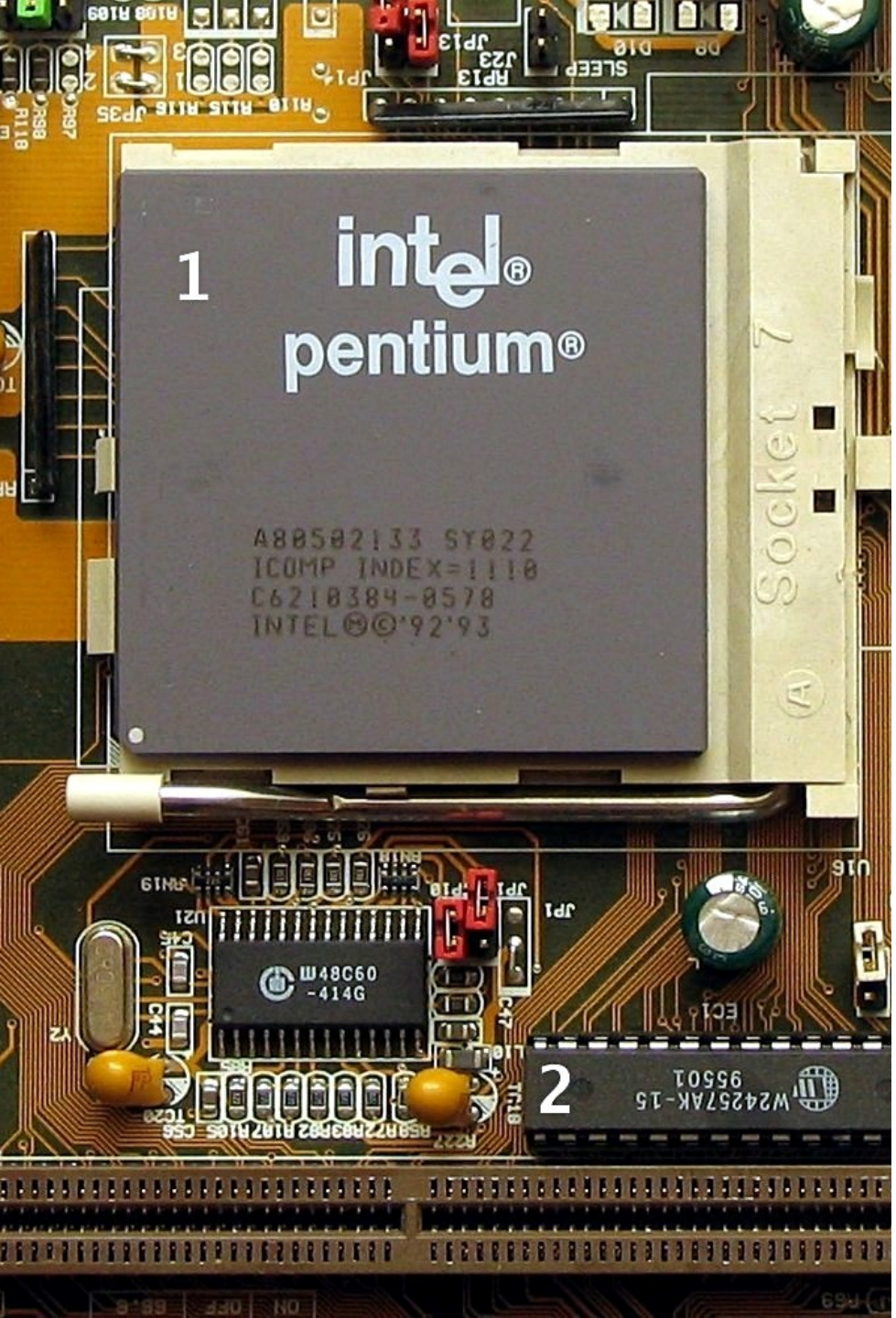
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Motherboard

- The motherboard is a printed circuit that acts like the mother of the computer.
- The motherboard organizes computations that the CPU performs and their results.
- The motherboard can be thought of as the 'backbone' of the PC.
- Phones, tablets and other small devices have motherboards too but they're often called logic boards instead and are usually soldered directly onto the board to save space – no expansion slots to upgrade easy like computers.

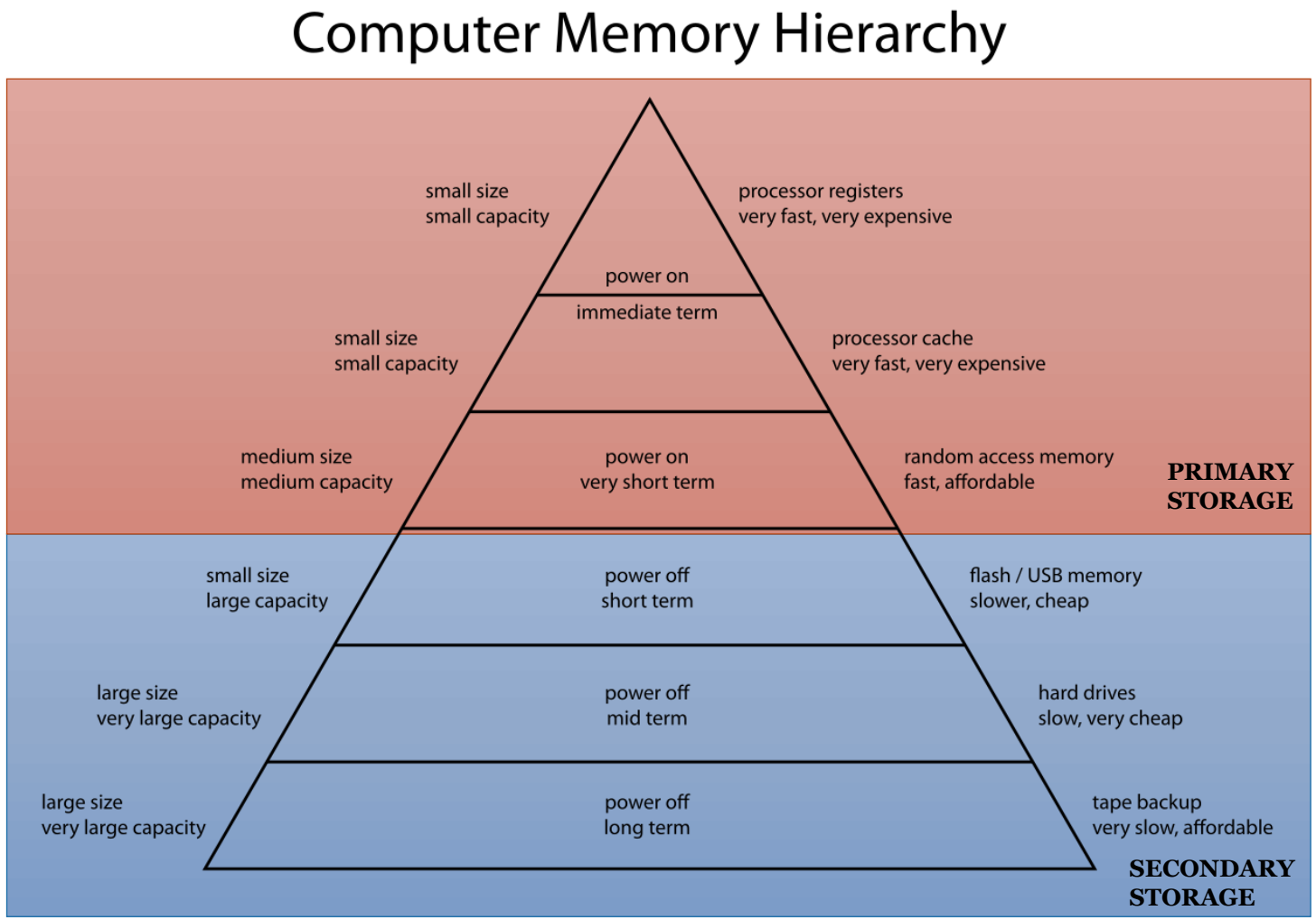
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Central Processing Unit

- The CPU itself is a core component of what makes a computer a computer, but it isn't the computer itself — it's just the brains of the operation.
- It's a small computer chip that sits atop the main circuit board (motherboard) of a computer, whether that's a desktop PC, laptop, or tablet.
- It handles basic instructions and allocates the more complicated tasks to other specific chips to get them to do what they do best.
- CPUs are built by placing billions of microscopic transistors onto a single computer chip, which allow the CPU to make the calculations it needs to run programs that are stored on your system's memory.
- Originally, processors had a single processing core. Today's modern processors are made up of multiple cores which allow it to perform multiple instructions at once. They're effectively several CPUs on a single chip.

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Storage Device

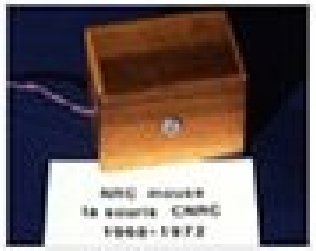
- A storage device is any hardware capable of holding information either temporarily or permanently. Computers don't remember or forget things the way that human brains do.
- **Primary Storage** or random-access memory or read only memory – stores data directly accessible by CPU.
- **Secondary Storage Device** or hard-drive that is known as auxiliary memory - stores data not constantly accessible by a device.

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e-reader


gloves and rings


handheld


mouse


pedal


pen comput


stylus


tablet


touch pad


watch


miscellaneous

Input and Output Devices

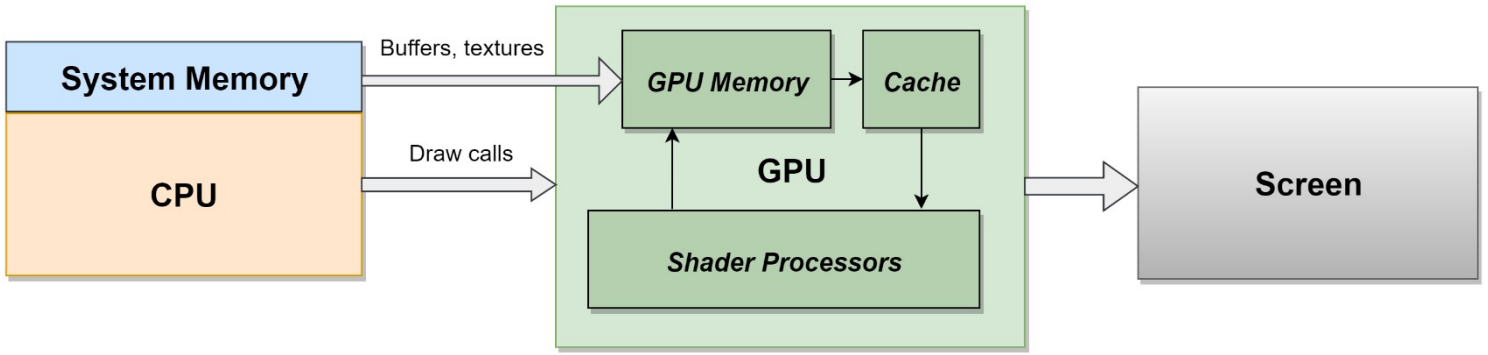
- An **input device** is any **device** used to insert data into a device for display, processing, outputting, storing or transmitting
  - Do not receive data but instead convert user actions into digital signal processed by a computer.
  - Any device that can be connected to a computer and transmit data, such as picture or sound, constitutes an input device.
- An **output device** is any device used to send data from a computer to another device or user.
  - This can include peripherals, which may be used for input/output (I/O) purposes, like network interface cards (NICs), modems, Infrared ports, radio-frequency identification systems and wireless networking devices, as well as **mechanical output devices**, like screen, motors and other electromechanical devices.

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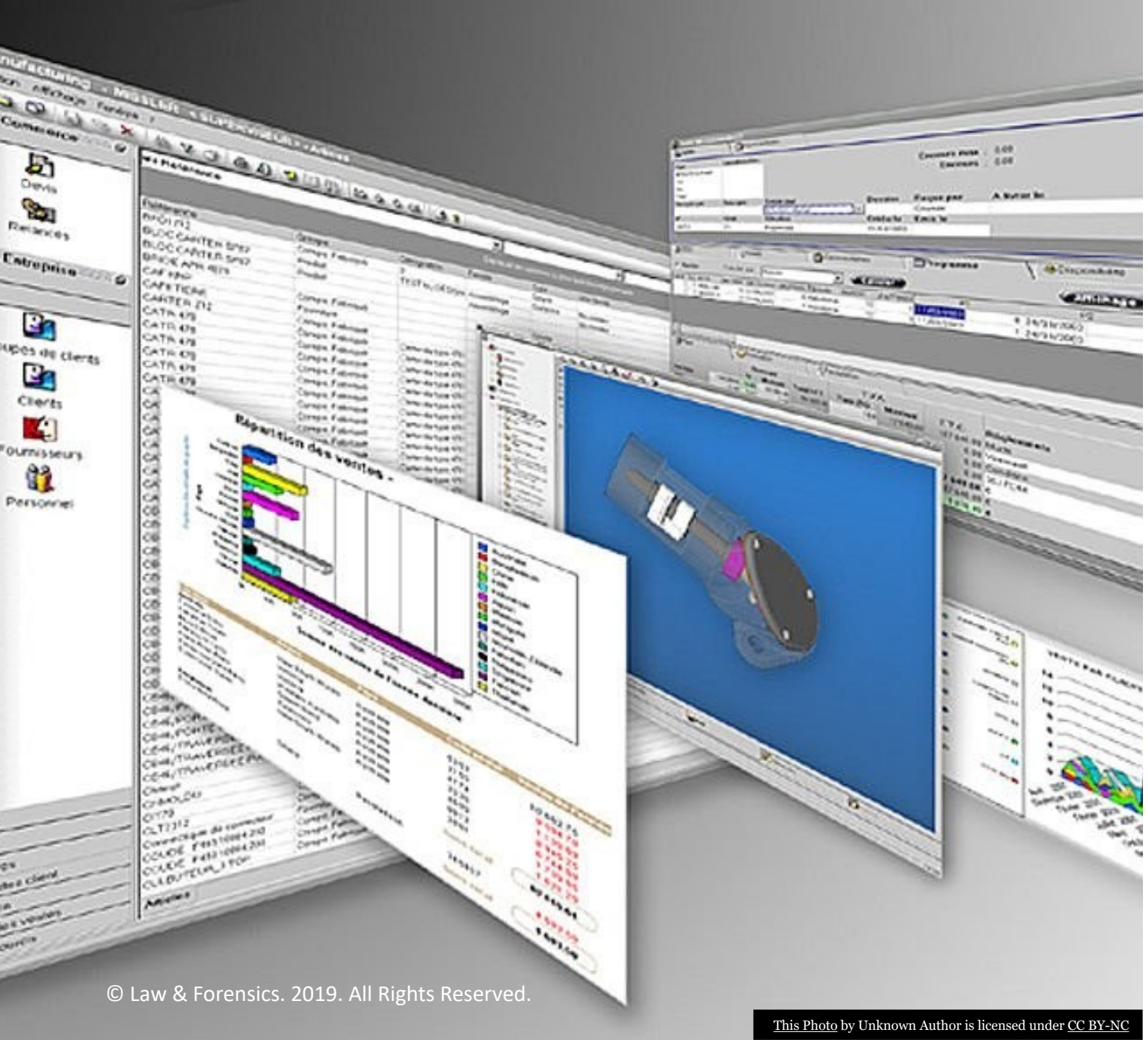


Graphics Card

A graphics card is primarily used to remove the graphical processing tasks from the processor or RAM. It **includes** a dedicated graphical processing unit (GPU) and a dedicated RAM that help it process graphical data quickly.



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Programming/ Software

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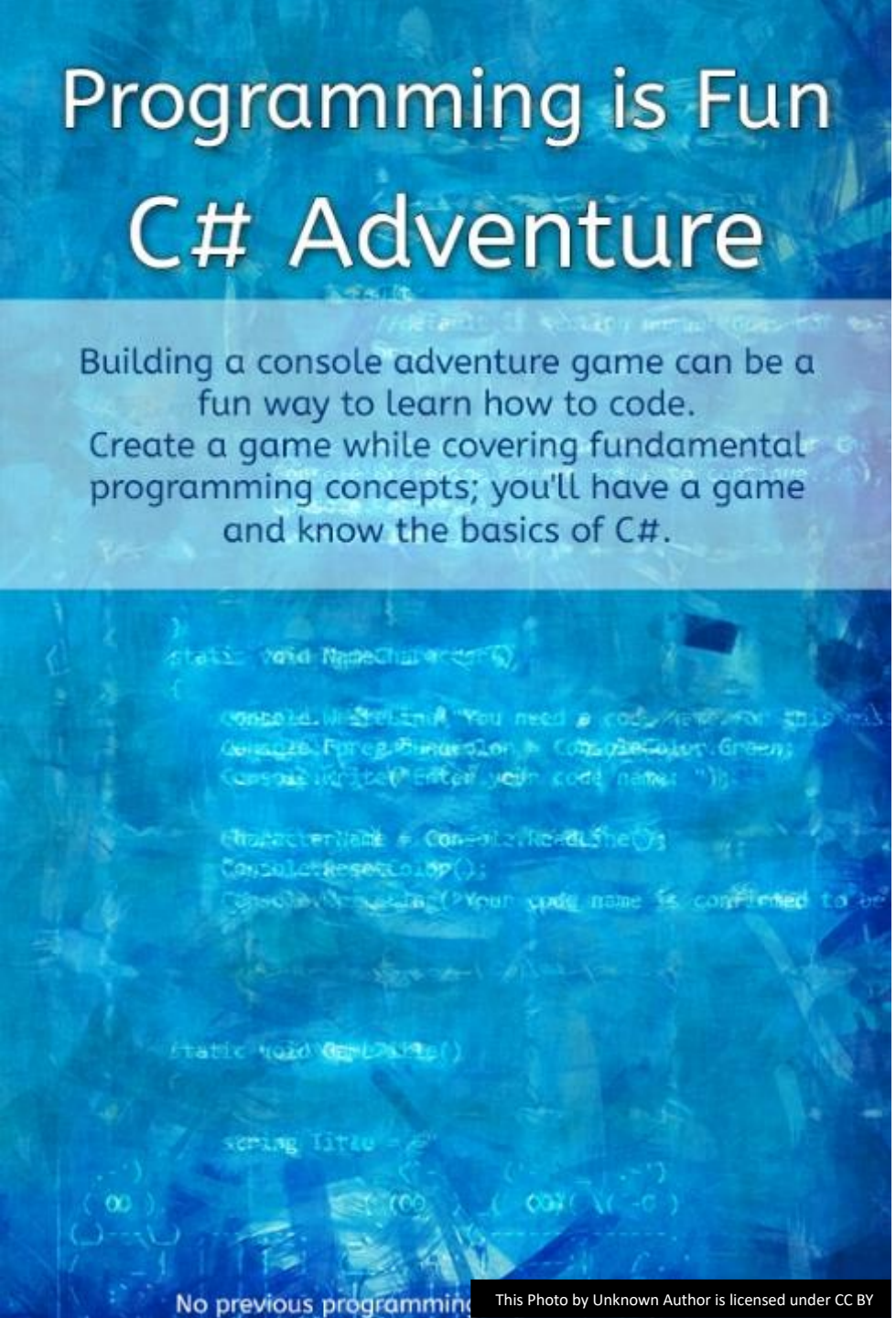
Software Development and Design

- **Software Development -** A profession concerned with specifying, designing, developing and maintaining software applications by applying technologies and practices from computer science, project management and other fields.
- **Software Design -** Software engineers design the basis or architecture of the software. The computer program is built by software developers. The developers take the architectural design document and write code based on these design documents.



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Coding using programming languages

Coding is a communication technique for expressing instructions to a computer and it provides a set of syntactic and semantic rules used to define computer programs.

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Building software is akin to building a kitchen sink

BUSINESS MODELING DESCRIBES THE STRUCTURE AND DYNAMICS OF THE ORGANIZATION

REQUIREMENT DESCRIBE THE USE CASE-BASED METHOD FOR ELICITING REQUIREMENTS

ANALYSIS AND DESIGN DESCRIBE THE MULTIPLE ARCHITECTURAL VIEWS

IMPLEMENTATION TAKES INTO ACCOUNT SW DEVELOPMENT, UNIT TEST, AND INTEGRATION

TEST DESCRIBES TEST CASES AND PROCEDURES

DEPLOYMENT COVERS THE DELIVERABLE SYSTEM CONFIGURATION



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Machine Language

Machine code	Assembly code	Description
001 1 000010	LOAD #2	Load the value 2 into the Accumulator
010 0 001101	STORE 13	Store the value of the Accumulator in memory location 13
001 1 000101	LOAD #5	Load the value 5 into the Accumulator
010 0 001110	STORE 14	Store the value of the Accumulator in memory location 14
001 0 001101	LOAD 13	Load the value of memory location 13 into the Accumulator
011 0 001110	ADD 14	Add the value of memory location 14 to the Accumulator
010 0 001111	STORE 15	Store the value of the Accumulator in memory location 15
111 0 000000	HALT	Stop execution

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- A series of instructions written in the language a computer can follow
- The only language level that computer hardware understands or executes
- Written in binary code, 1's and 0's
- 1's and 0's indicate the presence or absence of an electrical charge

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Assembly Language

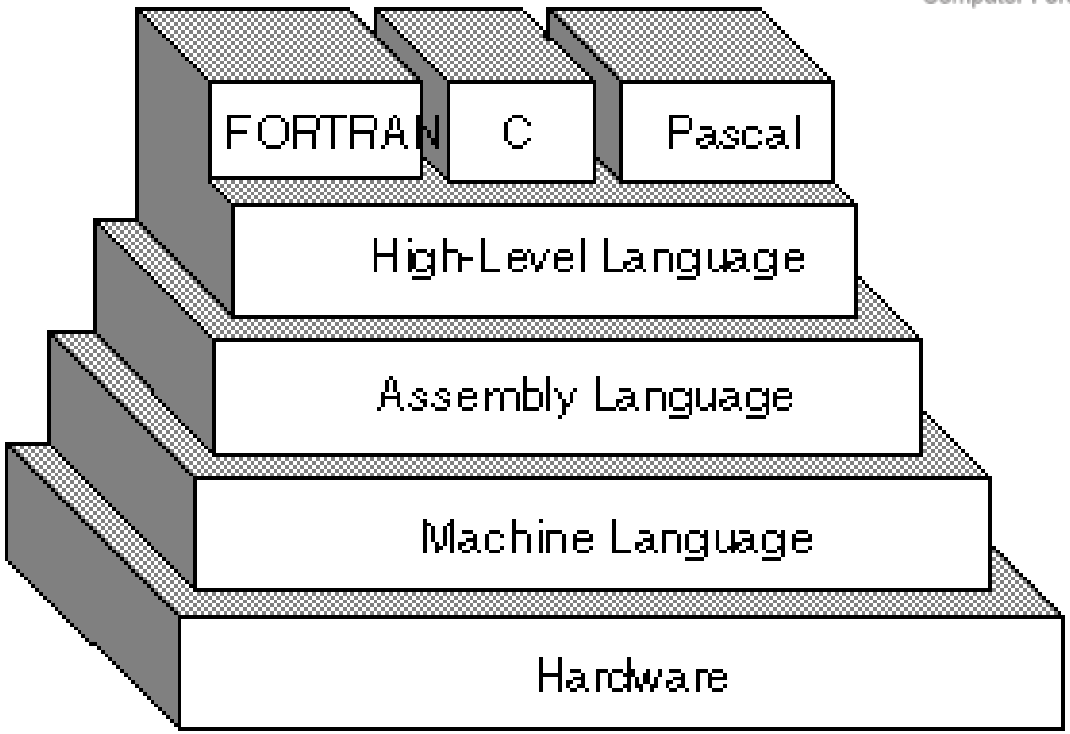
- One level of abstraction above machine language
- Each assembly language statement corresponds to a single machine language instruction
- Assembly languages act as the middle man between high level languages and machine language.
- Uses the alphabet, typically in abbreviated words

```
# 100                   # Preds ..B1.2
$4, %eax
..B1.8                  # Prob 25%
                        # LOE rbp r12 r13
# 75                    # Preds ..B1.3
$2, %edx
%esi, %esi
$8, %eax
%edx, %esi
                        # LOE rbp r12 r13
# 100                   # Preds ..B1.4 ..
$_2__STRING.0.0, %edi
%eax, %eax
printf
# 25                    # Preds ..B1.3
$5, %esi
..B1.5                  # Prob 100%
```

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High-level language (C, Java, Python)



Software written in either assembly or high-level language must be converted to machine language for the computer to follow.

High-level programming languages enables programmers to write programs that are much more independent of a particular type of computer.

Compiled and Interpretative languages.

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Programming Examples

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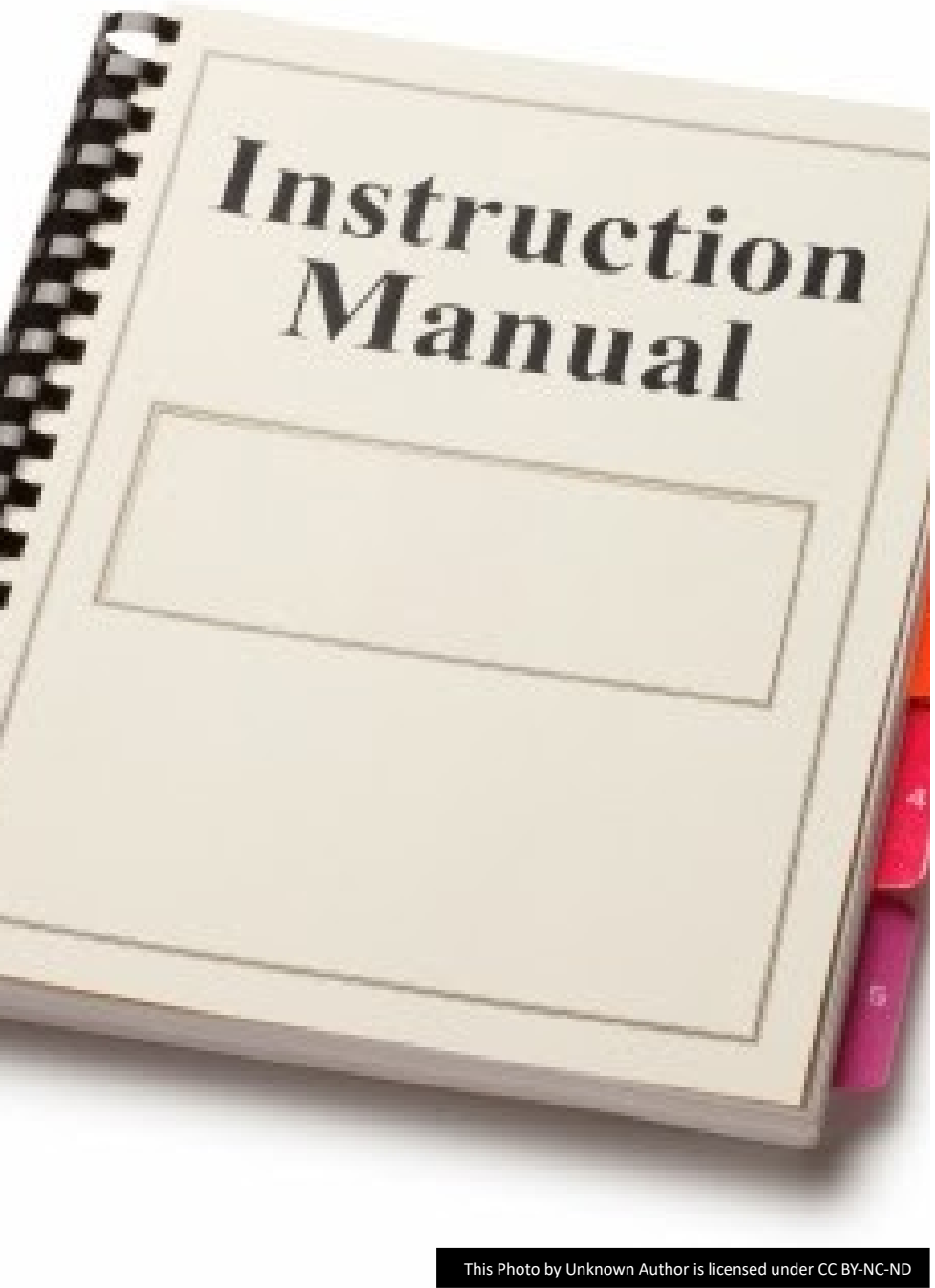
A few examples

- Jumping off a cliff
- Recipe to make pizza
- Assembly instructions for Ikea furniture
- Filing complaint in court.

What is common about these activities?

Sequence

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Programming concepts: Sequence structure

Instruction 1;

Instruction 2;

Instruction 3;

…

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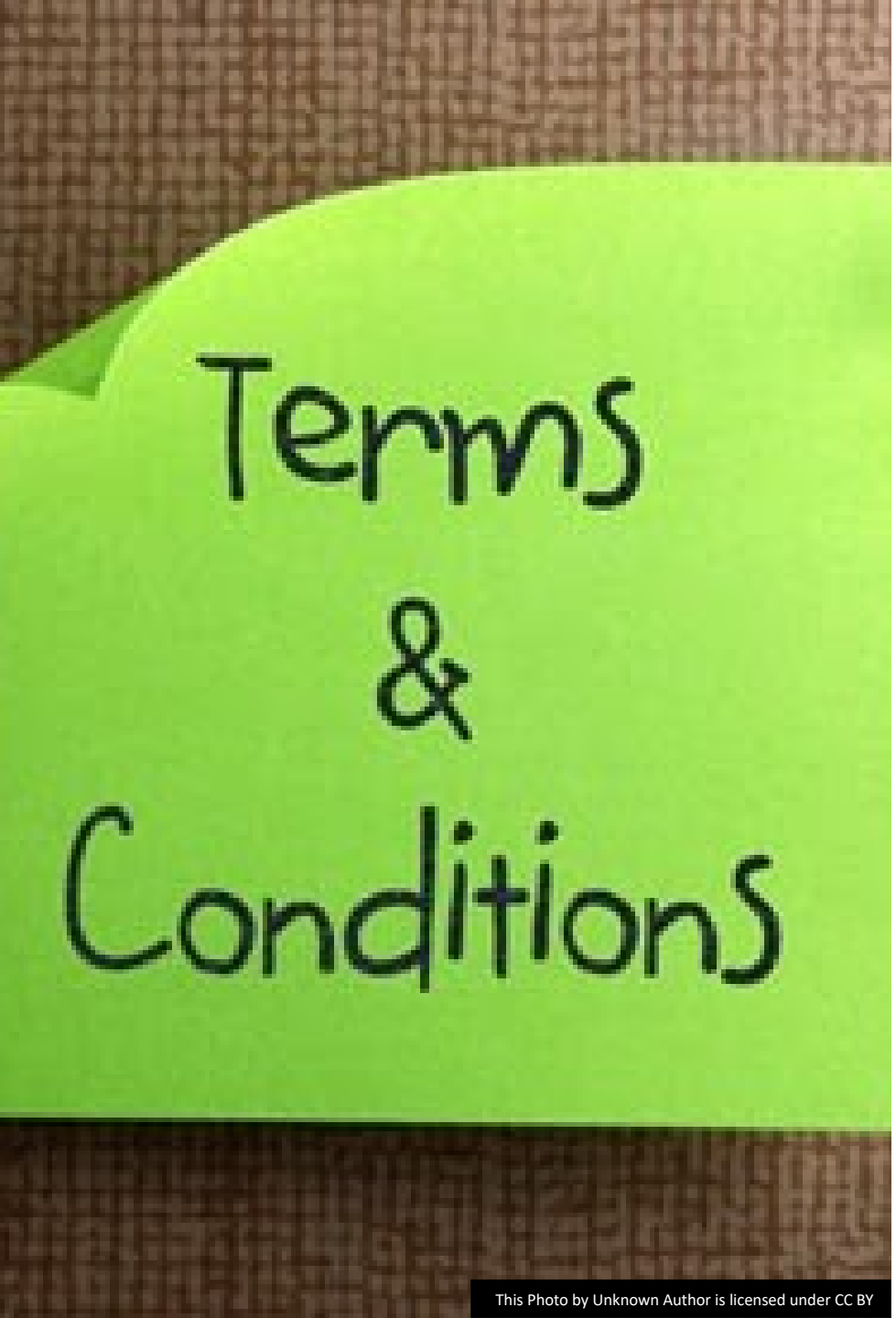
A few more examples

- Go to dentist or candy store?
- Go to Italy or to work?
- Commute via uber or subway?
- Go to the white house or the bighouse?

What is the common thing here?

Selection or IF statement

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Selection Structure

IF condition is true THEN

    do this;

ELSE

    do that;

ENDIF

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A few more examples

- Brushing your hair
- Running on a track 10 miles
- Binging a NetFlix series

What is the common thing here?

Repetition / Loops

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Repetition structure

```
WHILE (more items to process)
      process the next item;
ENDWHILE

FOR  lap = 1 to 12
     do running
ENDFOR
```

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Programming Concepts

- Structures: Sequence, Selection & Repetition
- Principles of Programming
- Every program is a combination of these structures.

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More things we do…

- You are mediating a case moving papers from one room to another.
- Carry a dozen Dunkin Donuts to work on your anniversary!

What is the common thing here?

Collection / Arrays

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Arrays

- Enable us to store data of similar type together.
- Enables us to handle varying size data.
- Lines of code do not increase with more data!

```
FOR each item in array
        add item to total
ENDFOR
```

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Even more things we do…

- Get phone call when you are in court
- Traffic accident on the way to work
- Child wakes you up when you are sleeping

What is the common thing here?

Interrupts / events

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Event driven programming

- Suspend current processing to process the event, or process it in parallel.
- “Regular” processing flow & separate processing routine for each event.

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Discussion and review of Projects Done to Date

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Networking

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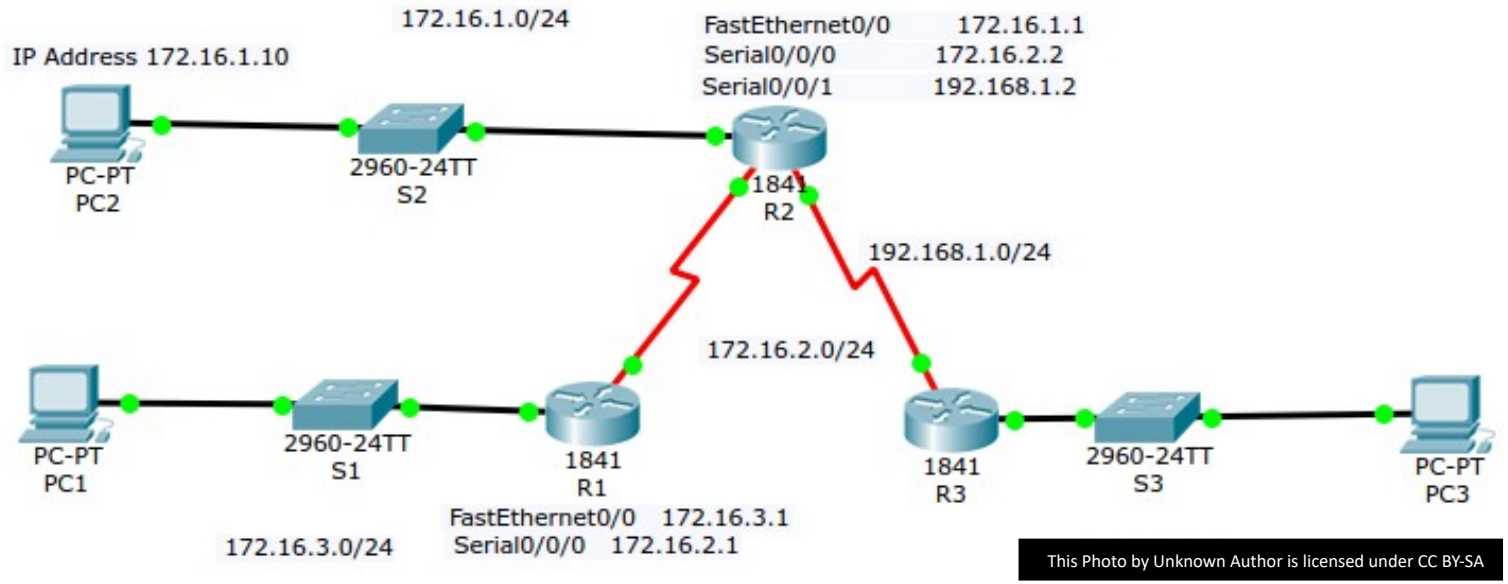


What is the Internet?

- The Internet is a global network connection of computers. It is a public network, neither controlled nor owned by any single person or entity.
- There is no central storage location of information transmitted via the Internet, nor is there a universal channel of communication.
- It is “a vast collection of computer networks which form and act as a single huge network for transport of data and messages [...].”

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Traffic Cop

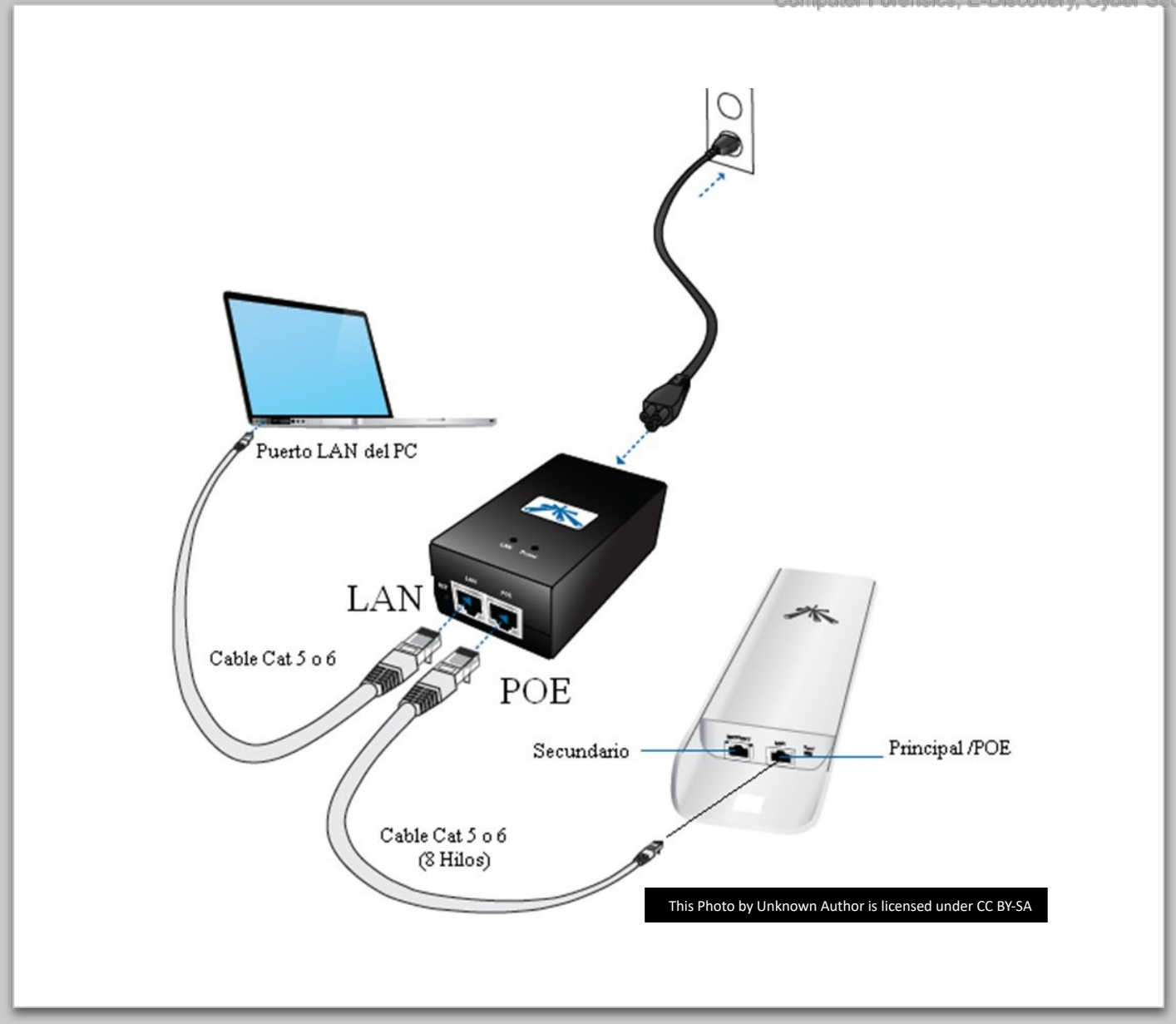


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- Data is transmitted through the use of routers, which facilitate the transmission of data packets over the Internet.
- The router receives and forwards packets through the sub-networks (the tiers discussed above) and autonomous systems that constitute the Internet.

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Depending on geographic location and available technology, Internet connectivity is achieved through a variety of different media.



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Networks



Local area networks (LANs)

Typically Ethernet networks that connect multiple computers via Ethernet cables to a centralized router(s).



Cellular Networks

Cellular networks are networks provided by cellular providers.

This service has gone through iterations of speed, including 3G, 4G and LTE-Advance , and 5G most recently.



Wireless Networks

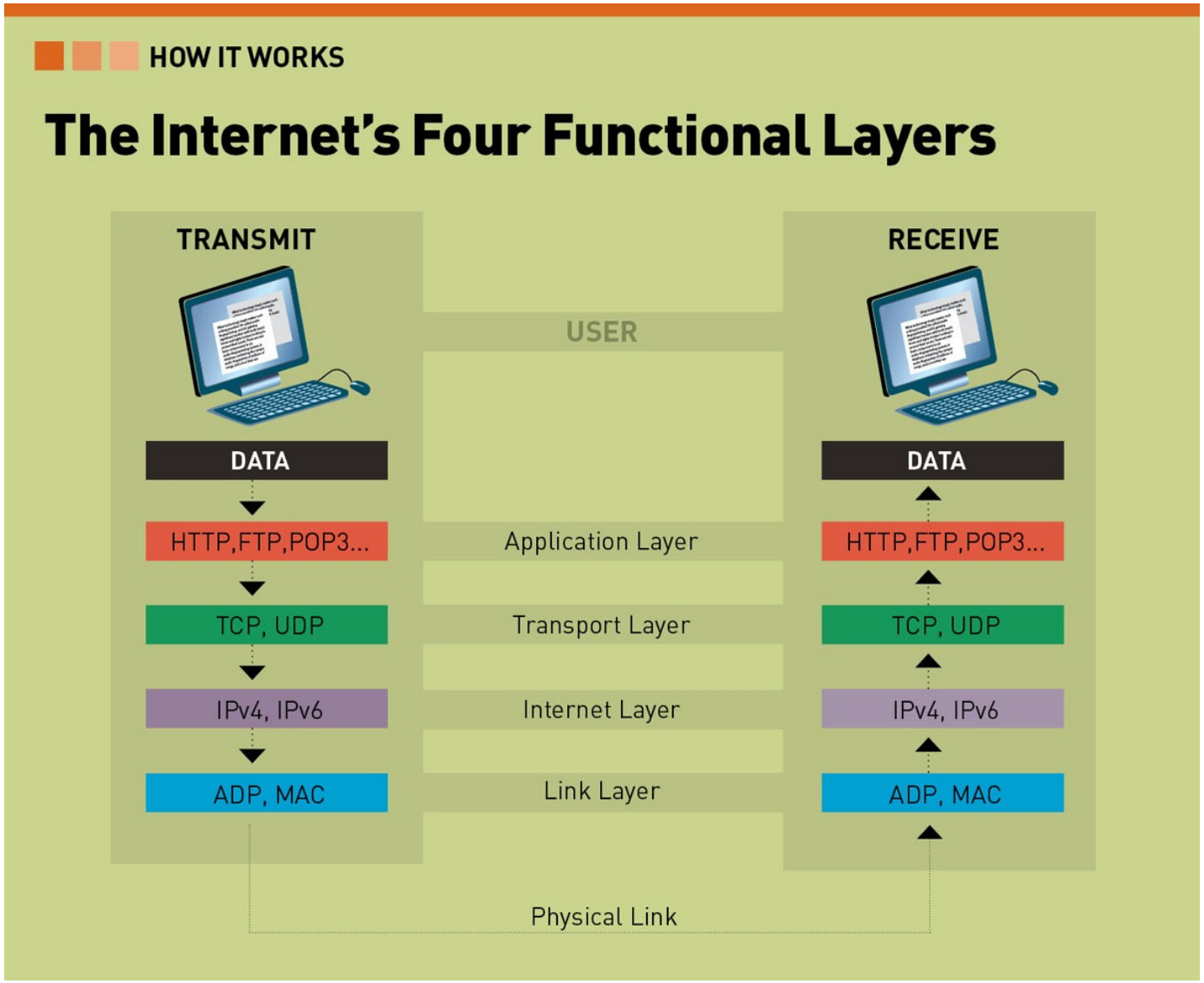
Wireless networks connect end-users to the internet in a variety of ways.

Wireless routers convert signals from a cable internet connection to local devices under the IEEE 802.11 wireless Ethernet standard.

Bluetooth technology and Infrared Data Association (IrDa) protocol are also commonly used wireless networks.

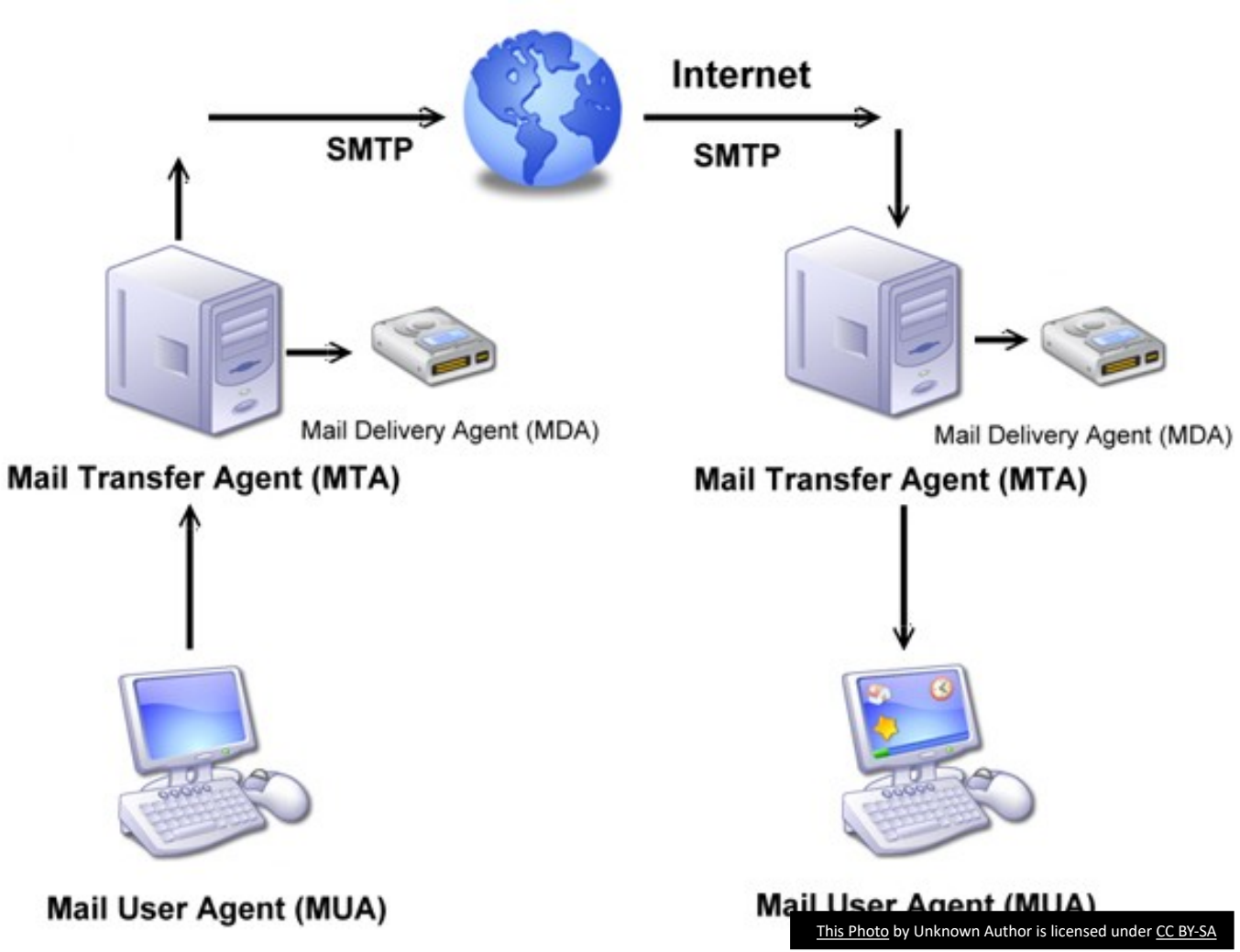
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How does the Internet Work?



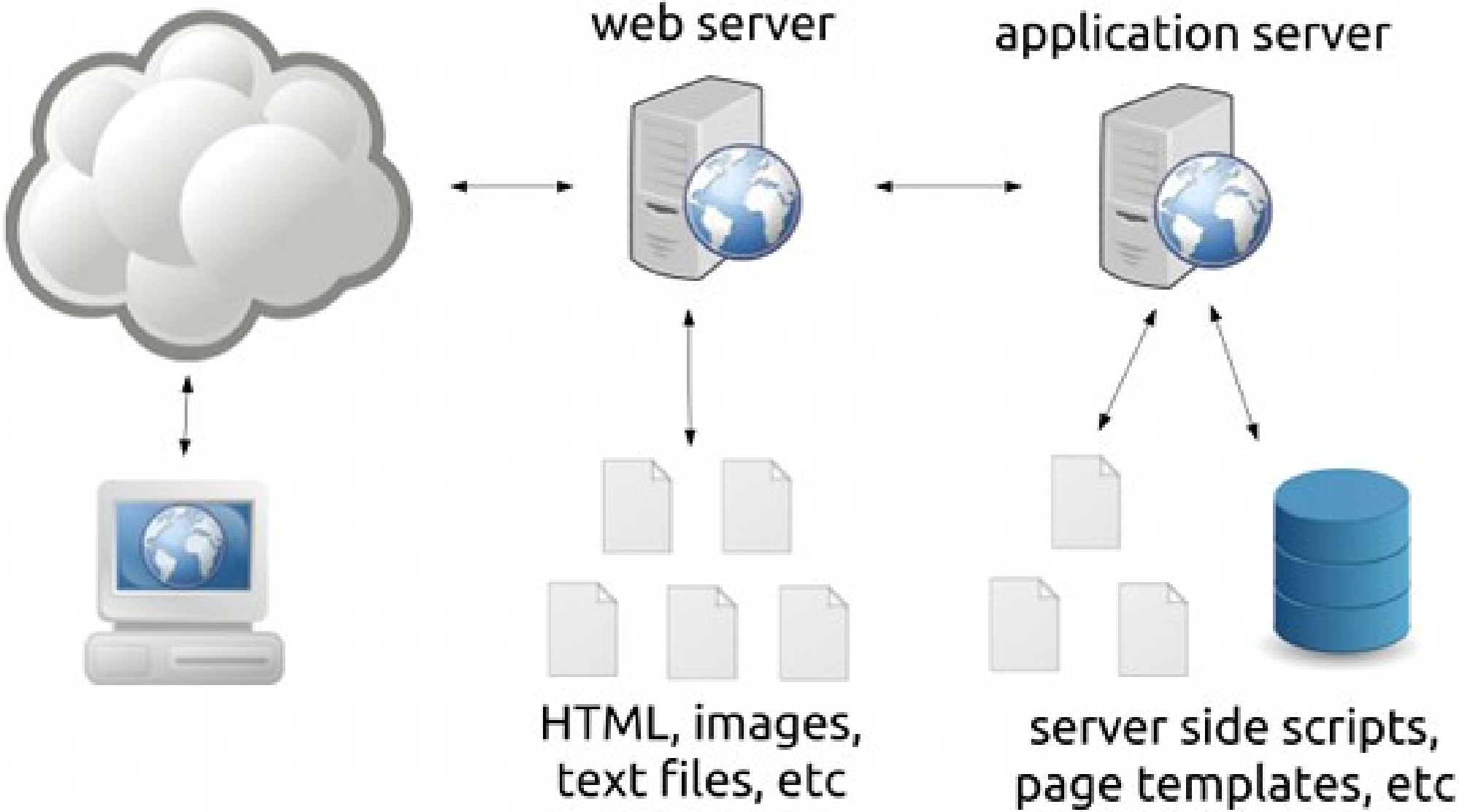
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How email works?



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Web Browser

- A user with a web browser can view a web page. When a user requests to view a web page on the internet, they are requesting the page from a web server.
- For example, when a user types the Uniform Resource Locator or URL (for instance http://www.whitehouse.gov), the web browser on your computer requests the page from the web server and the web server sends the page back, as shown in the diagram.

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```
<!DOCTYPE html>
<html>
    <head>
        <title>Example<title>
        <link rel="stylesheet" href="styl
    </head>
    <body>
        <h1>
            <a href="/">Header</a>
        </h1>
        <nav>
            <a href="one/">One</a>
            <a href="two/">Two</a>
            <a href="three/">Three</a>
        </nav>
```

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Class Exercise

Looking at HTML Code on your computer (Ctrl+U)

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Questions?

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