Advanced Learning

Tech Talks

This is a grab bag of odds and ends that are essential piece parts to be aware of but not necessarily a deep dive topic. I'll center the discussion on computing in general. What makes this awareness important is various technologies that form critical components of computing systems that have changed over time, i.e., cathode ray tubes used for displays are now thin screen LED systems. Printers went from dot-matrix to laser vector graphics. The functions are still there but how they work has completely changed. To the uninitiated, it would be like thinking in terms of the telegraph instead of smart-phones.

Thinking about this discussion brings to the surface the need to be constantly aware of our surroundings, technically speaking. It's a great idea to keep a glossary of terms on your own to stay focused. What I mean here is the

connotations of terms depend on the timeframe and common usage given by a particular scenario. For instance: Baud rate used to be applied to teletype machines where the term baud implied a symbol per second rate letters could be sent via paper tape encoding using five to seven holes punch across the tape to be decoded on a remote teletype and printed out. No one had memory devices to store the information. You stored information on paper tape. Now baud-rate implies bit-per-second digital transfer rates of a network system. Another redirected concept is bandwidth. Bandwidth originally meant the segment of the electromagnetic spectrum that a RF receiver could be tuned to or a measure of the frequency spectrum under analysis or the range of a filter. Now bandwidth refers to the speed digital data can be transferred.

To have rational discussions, one has to be aware of the connotations of the terms being discussed to avoid arguments for no other reason. Translation from one arena of discussion to another may not be relevant in the new space or better yet, namespace. The meaning of coded terms requires separate namespaces so variable names that are the same don't get confused. Each namespace lives on its own. Programmers are keenly aware of function names or other semaphores and variables written by one agent can be the same as used by another agent but both code sets have to work together. This boundary is mitigated by an API or application program interface. We humans have to do the same when talking up technology or be confused.

Bits and Pieces

1. What are vacuum tubes vs valves vs transistors or maybe FETs? We might begin with relays a mechanical set of contacts switched by applying voltage to a coil to create a magnet force to change the switch position. Crazy different configurations were contrived to do certain functions, but in the end, digital logic pushed this technology off the table. In Britain, they called them valves. In the US, they called them vacuum tubes. Both technologies create an amplified signal within a vacuum maintained by a sealed glass envelope. One element (cathode) generates free electrons by heating a tungsten filament that in turn heats a material that allows a cloud of electrons to float free. A high positive voltage (anode or plate) then pulls the electrons across the gap. This produces a current through the device. Then a screen/grid of sorts is placed in between (concentric elements: cathode/grid/plate) that regulates the current flow by pushing back the electrons. If biased correctly for linear control, a small variation of voltage on the grid could affect a large change in plate current.

This type of amplification was mainly used for audio or radio circuits. It wasn't until the concept of two-state digital logic arrived for computing circuits that the need for electronic switching of two-states using vacuum tubes was done. If you now use the grid to completely cut off the electron flow or allow full current flow you can have a two-state configuration. This approach replaced relays, until the transistor was invented, which was also configured to either be on or off but with much less power being consumed. The size difference was also very dramatic. Digital logic and binary mathematics is very inefficient when it comes to the number of switching gates used. The idea of small size and power consumption led to ever improving these characteristic of silicon based switches, which led to integrated circuits that continues today.

2. A lamp was a general term that meant incandescent illumination by sticking with the tungsten heating element similar to the vacuum tube amplifier but just lets the light go through the glass envelope and illuminate the room. Incandescent lights were also used to turn on signals via a photo-diode receiver, but these systems had a very slow response. Now silicon devices were being experimented with everywhere and the light emitting diode was discovered. The first color to be successfully built was a red LED, and then green. Blue LEDs would be much harder to make. A new manufacturing method had to be realized before we could have a blue LED, but the benefits were tremendous. Now we could blend red, green, and blue light to easily get about 16 million hues of colored light. Just as important as using laser LEDs for indicators is the ability to switch on and off this light down a glass fiber over a vast distance to improved digital transmission speed. Light can be switched at very high frequencies.

3. Printed circuits that we take for granted today also had an evolutionary history. If you look at old radio or TV electronics from the 50's, you will see a hodgepodge of spaghetti wiring and components scattered around soldered to stand-offs. As circuits became faster and the high frequency speeds were desired, these wiring practices led to radiated energy that causes circuit interference. This was solved by printing the conductors in layers of insulation materials where the inductance and capacitance values could be controlled that cause this radiating interference. Printing circuits also accommodates the tiny sizes that IC have become via surface mounting.

Killer Apps

One of the first "killer apps" was Lotus123. First of all, a killer app (...or application) is a program that comes along that everyone wants. It's so important

it has gravitas. Lotus123 was a spreadsheet app that really helped businesses do their accounting. Not only was it needed, wanted, and desired, people would pay for it and the computer to use it. That computer was the IBM Personal Computer, the machine that generated the PC moniker that became the buzz-phase for all of eternity, no matter what computer brand you were talking about. The next was the word processor, and soon to follow, apps that could print your work onto paper.

We talked about Browsers in other Tech-Talks, but really, this type of application not only talks to the Internet, but displays the results on your monitor, provides interactivity over what's know as the UI (User Interface), and boils you a cup a tea all in one app. Down inside, it knows how to use a zillion different languages, and control styling that would make a gay pride parade director envious. Browsers are the gateway to the world and make the World Wide Web a viable reality. That's killer.

Video and audio editing apps that have revolutionized the broadcast and music industry are legendary. Photo editing apps like Photoshop, not to mention all the Adobe product line, have moved civilization along.

Drivers are little apps that make peripheral equipment be able to by utilized by any computer platform. These little guys are the oil in the bearings.

Let's not forget malware. Those apps that secretly hide in the cracks of everyday communication and help destroy the world. They are killer, so we give them a nod. Like the one that wondered the Internet until is found the Iranian centrifuges and spun them up to self-destruction. Codes, ciphers, and general insidious software has proliferated the world of computing, which has spurn an industry to get rid of them. Killer or be killed sort of scenario.

Summary

In technology, where would we be without all these odd and ends? Governments, finance, manufacturing, space flight, the World Wide Web, all would be dreams if all these little things didn't exist. They're fun to discover and talk about even if we don't completely understand how they work. To think almost all the killer apps even work on a phone is close to ridiculous. Every square inch of the planet has buzzing computing devices pumping out data and analyzing it. Even under the oceans, vast amounts to data are flashing inside fiber optic trunklines. Knowledge is power and data is knowledge on steroids.