Introduction to microprocessors

Technology, Computer

In the age of computers, it is hard to find someone unaware of basic computer functions or possessing basic computer skills. Many people take for granted that they are able to push the on/off button on their computer and it boots up allowing for the creation of documents or browse the internet. How does this process work? What makes the programs load making it possible to perform tasks utilizing the computer? How do we benefit from this technology? What would make us not want it? There are many companies who create a basic component that make it possible to own a computer in our home. Who are they? How long have we had this technology?

All of these questions and more will be answered soon enough. What is a microprocessor and how does it work? The microprocessor is labeled the “ brain” of the computer. Whether you operate a desktop, server, or laptop, there is one commonality. They all have microprocessors that give these machines their ability to perform simple addition to complex multi-stage operations flawlessly. Microprocessors perform three main tasks: read/write to memory, process information, and communicate with peripherals. The process of reading/writing to memory is one of the most important functions of the microprocessor.

Reading from RAM enables the processor to pull start-up function and instructions to power-on the system being utilized. With this, that system enables main functions of the program and initializes them to be utilized by the operator. Without this, programs would be required to be initialized each time from some sort of boot sequence. This would not only be aggravating, but time consuming. The ability of the microprocessor to pull information

from RAM (Random Access Memory) significantly increases the capability of the computer to perform more efficiently.

This also decreases the amount of time the CPU (microprocessor) consumes in start-up processes and enables that time/power to be utilized performing other functions. After receiving the information from the RAM, the microprocessor must do something with it. Embedded onboard microprocessors are sets of instructions. These instructions initiate commands to be performed in accordance with guidelines set by the initial programmer. As the microprocessor receives information from the RAM, it will interpret it and perform the desired task by applying the required instruction to the given command.

This is how all programs in a computer are initiated. When we click on the Microsoft Word icon, that instruction is sent to the CPU which interprets it into rules to process opening the program. Consumers take for granted the intricacies involved in opening a single program and what is involved within the computer system involved. Once a CPU is able to receive instruction from the computer's RAM and interpret it into usable tasks to open a program or file, there is one last step a CPU is responsible for. Without a keyboard to put commands in or a screen to see the commands, a computer would be useless.

It would be a box full of high-dollar electronics deemed unusable. This is where the final mission of the microprocessor comes in to play. It is required to talk to the peripheral devices attached to the computer, receives commands from the keyboard, processes them, and displays them to the monitor. As an interpreter of instructions, the microprocessor enables all

components of a system to perform in harmony with each other. It is also responsible for the transmission of information from a program to the hard drive for long term storage.

Anyone who has not adequately “ saved” their work realizes how important this process in the responsibilities of the microprocessor. Now that microprocessor functions have been established, the method for communicating these commands needs to be known. Within all computer components there is a set of instructions that commands a microprocessor’s ability to understand them. These “ building block” are written in machine code. (3 The Microprocessor, 2008) This code consists of a series of 1’s and 0’s used in the binary code embedded in the microprocessor that places them accordingly to configure the appropriate command.

For a simple command, such as “ Save As,” a programmer may be required to input several lines of code that allow the CPU to communicate with the hard drive and save the indicated file to the appropriate location. It is taken for granted that these commands just work when consumers tell them to. The intricacies of the precise workings of CPU’s and the language required to process information are intense. With required training, these workings can be understood, but to the common consumer we just “ know” that when we click the “ Save” button that it will do it.

What are the benefits and disadvantages of microprocessors? With the utilization of microprocessors in virtually all aspects of our daily lives, it is difficult to find disadvantages. To the lay consumer, these may not seem to affect us, but to the programmers and manufacturers they may be detrimental. Benefits of microprocessors are commonly taken for granted

and not noticeable to many consumers either. To alleviate misconceptions on either, we will discuss both. Many applications we work with today required hundreds of calculations to come to a final product.

The speed that microprocessors can compute and process information is well above what any human could fathom performing saving valuable time and manpower. To make our lives easier than they already did, modern microprocessors have the ability to “ remember” commonly used variables to assist in future processing. This is also found in music players, such as the I-Pod that use “ Genius” programs to search for songs based on previous listening habits. This “ intelligence” is provided to make our lives easier and make suggestions to improve them. In the past, an amputee would have a prosthetic leg made, but it would be no more than a stiff limb.

Today, the capabilities of making prosthetic components that are microprocessor controlled allow injured personnel to resume their daily lives and activities. One of the newest additions is the microprocessor controlled prosthetic foot, which allows for dorsi- and plantar flexion movements, making the simple task of walking up/down a flight of stairs much easier. (Raemaekers, 2007) With the use of code, a microprocessor can be programmed for a specific function or task. This flexibility provides companies and consumers the opportunity to upgrade the software on their system vice replacing hardware or the system in its entirety.

One major disadvantage of microprocessors is that most are unable to calculate a floating decimal. That is a number that is not a whole number, but contains a fractional number. Due to the cost and complexity of the circuitry involved in creating the ability to calculate these numbers, it

remains a feasible venture to produce these chips in modern day consumer electronics. (Gordon) To enable devices, such as hand-held calculators, to manipulate these numbers with floating decimals, the use processors “ convert” these numbers into usable forms that the code can handle and supply the end user with the required answer.

If required to perform the steps by hand that the CPU performs in a fraction of a second, the consumer would never reach the end of the workday. Thanks to the microprocessor, we are able to greatly shorten our workday and make the time we are there more efficient. What are the origins of microprocessors? The microprocessor stemmed from the desire to combine multiple chips and their processes into a single unit. Originating as a memory company, Intel was contracted by Busicom of Japan to manufacture chipsets for a desktop calculator.

Initially, the design required different chipsets for different operations. Lacking the manpower to design multiple chipsets, Intel contacted Ted Hoff whose solution was one complex chip unit and two separate memory units. The complex unit would be known as the CPU and memory would be known as ROM and RAM. Since Intel’s primary business was memory chips, this became a realistic solution to their problem. (Mazor, 2000) Through the makings of the pocket calculator, Intel kept pursuing a way to put everything into a single chip.

The Intel 4001 (Intel’s ROM chip), 4002 (Intel’s RAM chip), and 4003 (Intel’s I/O chip) combined with a single chip, the 4004, became the beginnings of a “ new era of integrated electronics. ” (Intel. com, 2006) This microprocessor was the size of a fingernail, 1/8th x1/6th of an inch, and was capable of

performing at the same level at the ENIAC, the first electronic computer built in 1946 containing 18, 000 vacuum tubes. Upon first introduction in November 1971, the Intel 4004 microprocessor contained only 2, 300 transistors. The circuit line width within the 4004 was 1/10 the size of a human hair, or 10 microns.

It was composed of 5 layers and is considered " one of the smallest microprocessor designs that ever went into commercial production. " (Intel. com, 2006) Economic impact of microprocessor technology " Microprocessor prices are on the rise. " That is that Rob Lineback, senior market research analyst with researcher IC Insights, speculates due to the lower 8% drop in microprocessor prices this past year. (Carbone, 2009) The competition between Intel and AMD to gain the major market share for microprocessors causes prices to drop.

With the introduction of netbooks and the utilization of a $30 microprocessor, additional companies have entered the microprocessor market (Larry Dignan, 2010). The netbooks may keep the market steady during the recession, but demand for notebooks and servers continue to rise, which use more advanced microprocessors. (Carbone, 2009) As businesses continue to grow, so will their IT departments, increasing the demand for advanced servers. The release of Intel's Xeon 7500 and 5600 microprocessor will transfigure the server market.

The current pricing of $856-$3, 692 for the 7500 series and $387-$1663for the 5600 series make them impractical for smaller businesses. Intel claims to have a ROI (return on investment) of five months with the more reasonably priced 5600 series. The 5600 series will replace 15 previous single core

servers creating a 95% annual savings in energy utilization and total annual savings of $411, 593. As an “ economic no brainer” this reduction in cost should return to the consumers creating increased sales and revenue of the product or service of upgrading companies.

The Xeon 7500 series has the capability to hold up to eight cores while the 5600 can contain up to six. To keep from being “ shown-up” by the microprocessor giant, Intel, AMD has released its own super processor. It is being called the “ World’s fastest chip” by Zacks Equity Research. It contains either 8 or 12 cores; double that of the recently released Intel 5600 series processor. AMD’s antagonistic strategy to market their new Magny-Cours processors involves lower pricing and pairing with Acer, as opposed to Intel’s claim of lower energy consumption.

Zacks Equity Research, 2010) AMD’s new Magny-Cours processor is expected to maintain compatibility with future platform development, causing a reduced production cost and savings returned to customers. This durability in multi-use platforms continues to be a precedence for AMD. (Carver, 2010) Computers have become essential components in lives of many people. Schools, from elementary to college, have evolved into more computer dependent institutions. One organization is doing their part to make owning a computer realistic for underprivilaged, school-age children.

This organization, Computers 4 Everyone, Inc (C4E), continues their benevolence by providing basic computer training, upgrades, and repair training classes to these families. Assets are received from companies whom have upgraded and have resources to dispose of. This program allows the recycling of “ old” computers to less fortunate families while keeping them

out of landfills. Environmental issues of microprocessor from the cradle to the grave The environmental effects of microprocessor development are undetected to the eyes of the majority of Earth’s population.

One organization, The Silicon Valley Toxics Coalition, began tracking the effects on the environment of semi-conductor development in northern California. Ironically, in 1999, with the use of computers they began utilizing geographic information systems (GIS) software to create pollution maps of semi-conductor manufacturers in the San Francisco Bay area. (O'Meara, 2000) The ability to pinpoint areas concentrated with pollution and investigate alternative manufacturing and disposal techniques will allow for a cleaner environment while maintaining the ability to produce semi-conductor technology.

According to O’Meara, the information technology market intersects with three areas with the final goal of building an “ environmentally sustainable society. ” Leading off is the impact of the production, use, and disposal of technologies. The production of microprocessors utilizes a myriad of toxic chemicals, directly causing pollution in the area of the production plant. With that said, the disposal of these same devices causes much of the same problems in the landfills and junkyards, to include the celestial junkyard of old decaying satellites.

As anyone who uses technology is aware, it all requires electricity and paper resources. What most fail to comprehend are the benefits of decreased transportation, due to video tele-conferencing and tele-commuting, and projected displays in lieu of paper copies. These substitutions make the utilization of technology almost a required component of any business and

thus a “ necessary” risk to the environment when manufacturing them. Second is the observation and manipulation of manufacturing plants and surrounding areas for better utilization of components and reutilization of products when practical.

With the aid of computer generated maps and satellite imagery, researchers gain a better knowledge of problem areas. This information provides insight to what problems exist and what can be implemented to reduce or eliminate them. Researchers are utilizing computers at a greater rate than before to monitor Earth and evaluate different scenarios from “ urban transportation alternatives to the burning of fossil fuels. ” (O'Meara, 2000) The third area of overlap provides the ability of information to be accessed from remote sections of the world.

O’Meara refers to this as “ networking for sustainable development. ” In today’s society, the exchange of information through the use of cellular telephones and the internet provides for prompt transmission and reception of information across wide areas with minimal delay. (O'Meara, 2000) This technology is utilized by the military in areas where doctors are less available and x-rays require further interpretation for a proper diagnosis. These x-rays are taken in digital format and sent electronically to hospitals where specialists analyze them and provide a precise diagnosis.

It also allows ECG results to be sent from an ambulance to area hospitals in preparation of an incoming patient. More personally, it allows for the pursuit of a college education without the need to “ attend” a university or community college. The sustained development of technology and the networks involved have directly affected me and will continue to in the

future. Another ecological impact is the use of electricy and water in the production of semi-conductors. In a typical plant, producing 5, 000 eight-inch semi-conductors a week, the water and electricy consumed is equal to that of a small city.

This consumption of water has caused grave shortages in the Santa Clara Valley, where aquifers that once supported their agriculture market have been consumed by chip-producing factories. Residents there now depend heavily on imported water to support their economy. To add to water shortages, the valley is “ polluted” with waste sites of 23 former factories involved in the manufacturing of computer chips. (O'Meara, 2000) An impact on both economic and ecological aspects of the world is the fact that technology becomes obsolete so quickly.

In 1998, as estimated 26, 000, 000 personal computers became obsolete with a resale and recycled percentage only reaching 14%, leaving many to occupy our landfills. Due to the speed of which technology becomes obsolete, the cost to repair old units in comparison to buying new is heavily out-weighed. It is easier and more cost efficient for a consumer to buy newer, faster, more efficient technology and old units are simply thrown away. With advances in technology, specifically microprocessors, the package becomes smaller and smaller with more and more capabilities.

This makes recycling old components difficult for manufacturers due to designs not being condusive to recycling. Europe makes manufacturers responsible for their products from the cradle to the grave. Germany has laws in place requiring the manufacturers and distributors to recover old packages for reutilization. (O'Meara, 2000) Due to this, designs remain

rather simple allowing them to be used over and over. With the ability to reprocess previous less complicated components, companies could save thousands bypassing the need to develop new components and packaging.

References

http://www. howstuffworks. com/microprocessor. htm

http://www. cpushack. com/history. html

http://www. intel. com/museum/archives/4004facts. htm