English text exercises

For

Computer Sciences

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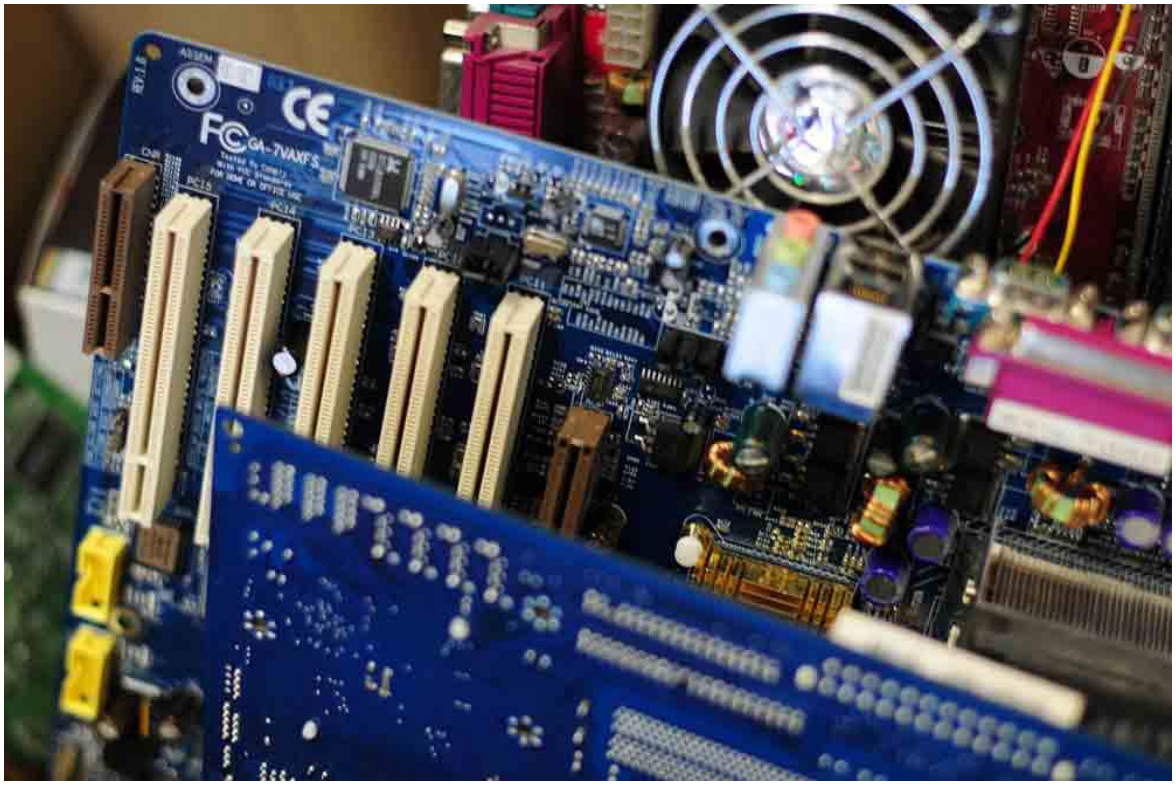
SECTION 1

Computers: Essay on the Importance of Computer in the Modern Society

Read this comprehensive essay on the Importance of Computer in the Modern Society !

As the world progresses on in this never ending chase for a time and wealth, it is undeniable that science has made astounding developments.



As the 21st century looms ahead, it is clear to see that it has advancements that humanity may never have dreamed of and one of these shining developments is the well-recognized computer. Having the Latin meaning of 'computing' or 'reckoning' the computer is an invention that was called the 'MAN OF THE YEAR' in a survey carried out by an international magazine.

The computer system is not a simple machine. It is like a very modern and highly complex calculator. It can do all the functions at a speedy rate and also helps us to search and progress in our homes and businesses. A

computer can therefore be called a calculator with a twist for not only does it perform fast calculations, but it also has other special characteristics. The computer has thoroughly changed the way we witness things, with its special auto correcting tools, which work with all languages, all logic and all subjects.

There was a time when computers were only heard of as a luxury. However today they are an unavoidable part of success and development. No longer are they owned only through theft and by the filthy rich, in fact computers are and will in the coming days and months be used to accomplish the brilliant goals of success and unparalleled development. For example, in India, the accurate knowledge and use of computers will bring change in a big and astonishing way. It will lead to the demolition of illiteracy, and lead to optimism, efficiency, productivity and high quality.

Even now in our day to day lives, computers have been allotted an integral role to play. They can be seen being used not only at the office or at home, but in all kinds of sectors and businesses. They are used at airports, restaurants, railway stations, banks etc. slowly and gradually, as computers are penetrating through the modern society, people are getting more and more optimistic about the promises its invention made. They are also used in the government sectors, businesses and industry, and through witnessing the rapid progress of the computer; mankind slowly sees the lights it has brought along.

One of the best things about the computer is the fact that it can help us to save so much of manual power, cost, and time. By the use of a computer, tasks can be done automatically and that will lead to saving the countless hours that may otherwise have been spent on doing the job manually.

Computers also ensure more accuracy. Examples of such cases include ticket booking, payment of bills, insurance and shopping. Interestingly, automatic operations of vehicles, like trains also help to ensure further safety and reliability of the journey. Computers can be used to observe and predict traffic patterns which would be a grand benefit to all and would save the hassle of getting stuck for hours in the roadblocks and traffics.

Computers can also drastically change the way agricultural tasks and businesses are carried out all over the world. With regard to agriculture,

computers are being used to find out the best possible kinds of soil, plants and to check which match of these would result in the perfect crops. Use of computers thus in this sector along with the use of better agricultural practices and products in several countries, like India, could help the agricultural industry reach soaring heights, directly assuring the welfare of the economy.

It is also wonderful to see that the invention of this unbelievable machine has brought a ray of hope in the darkness of the sick citizens' world. Computers are very capable of bringing along a medical revolution. Where in health sectors computers are being used for research regarding blood groups, medical histories, etc. and helping to improve medicine in a big way. The knowledge that computers are providing in this field may lead to better use and purchase of medicinal drugs and ensure better health. This also leads to a better diagnosing pattern and makes health care faster and more efficiently.

Although computers are bringing the evolution of technology and changing the way lives are lived, it cannot be denied that there are areas where the impacts of the computer system are not fully recognized yet. For instance if we take the education sector, the literacy rates have not been improved by computers the way other sectors have seemed to have gotten better overnight.

The fact remains that 64% of our population remains to date illiterate, and it will be a revolutionary act if computers were made the full use of and worked with to spread educational awareness, in all areas, especially the underprivileged sector. They can be used to plan out lessons, and lessons can be taught on the computers too, the benefit of the prospect lying in the fact that computers excel at lots of different things altogether, which means they can be used to teach not only limited subjects but be used to spread education with reference to all kinds, including text, numbers and graphics.

Perhaps one may think the horrendous thought that computers may take the teacher's place in the classroom, but we must look at the prospect with the brighter side. No longer will the teacher remain a person who only fits data into a pupil's mind; and once again become that one supreme

authority who inculcates both philosophical and spiritual education amongst his or her students, rising in esteem and role play.

The advantage of computers can also be seen in the fact that they might just be able to improve administration through the world. By providing daily accurate information to the administration departments, computers may change the way decisions are taken across the globe. Keeping all the above mentioned things in mind, we must accept that if used the right way, computers are a gift of science to mankind.

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SECTION 2

Introduction to Computer Architecture

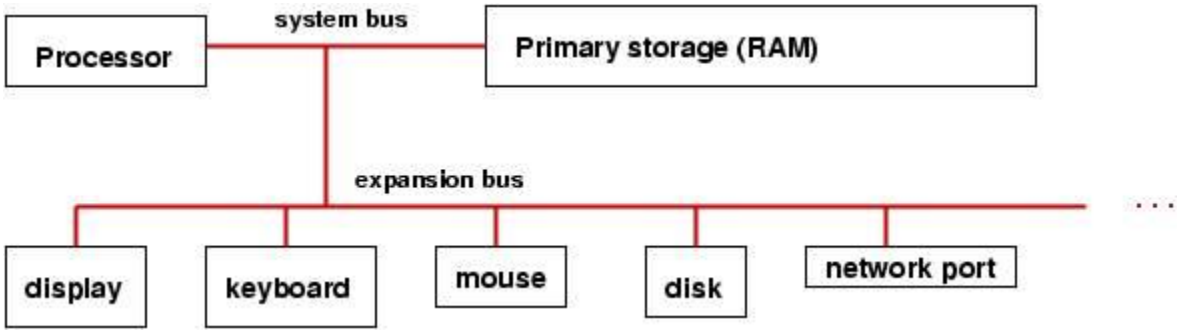
A general-purpose computer has these parts:

1. *processor*: the ``brain'' that does arithmetic, responds to incoming information, and generates outgoing information
2. *primary storage (memory or RAM)*: the "scratchpad" that remembers information that can be used by the processor. It is connected to the processor by a *system bus* (wiring).
3. *system and expansion busses*: the transfer mechanisms (wiring plus connectors) that connect the processor to primary storage and input/output devices.

A computer usually comes with several input/output devices: For input: a keyboard, a mouse; For output, a display (monitor), a printer; For both input and output: an internal disk drive, memory key, CD reader/writer, etc., as well as connections to external networks.

For reasons of speed, primary storage is connected ``more closely'' to the processor than are the input/output devices. Most of the devices (e.g., internal disk, printer) are themselves primitive computers in the sense that they contain simple processors that help transfer information to/from the processor to/from the device.

Here is a simple picture that summarizes the above:



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Information and binary coding

For humans, information can be pictures, symbols, words, sounds, movements, and more. A typical computer has a keyboard and mouse so that words and movements can be sent to the processor as information. The information must be converted into electrical off-on (``0 and 1'') pulses that travel on the bus and arrive to the processor, which can save them in primary storage.

It is premature to study precisely how numbers and symbols can be represented as off-on (0-1) pulses, but here is review of base-2 (*binary*) coding of numbers, which is the concept upon which computer information is based:

number binary coding
0 0000
1 0001
2 0010
3 0011
4 0100
5 0101
6 0110
7 0111
8 1000
...
14 1110
15 1111

and so on. It is possible to do arithmetic in base two, e.g. 3+5 is written:

```
 0011
+0101
-----
 1000
```

The addition works like normal (base-10) arithmetic, where 1 + 1 = 10 (0 with a carry of 1). Subtraction, multiplication, etc., work this way, too, and it is possible to wire an electrical circuit that mechancially does the addition of the 0s and 1s. Indeed, a processor uses such a wiring, which operates on binary numbers held in *registers*, where a register is a sequence of *bits*

(electronic ``flip-flops" each of which can remember a 0 or 1). Here is a picture of an 8-bit register that holds the number 9:

```
+--+--+--+--+--+--+--+--+
| 0| 0| 0| 0| 1| 0| 0| 1|
+--+--+--+--+--+--+--+--+
```

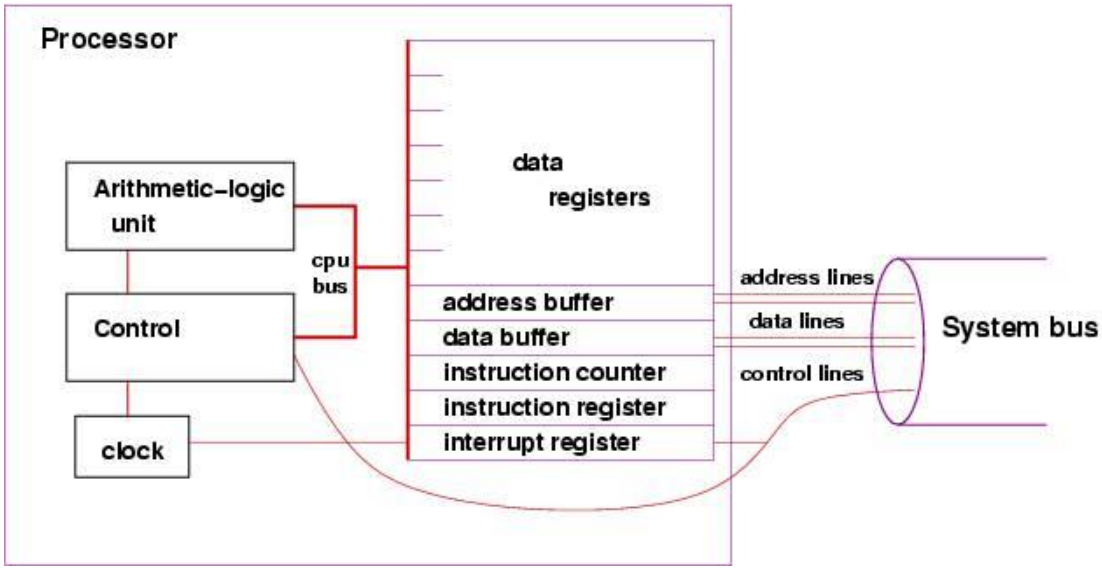
A processor has multiple such registers, and it can compute 3+5 by placing 3 (0000 0011) and 5 (0000 0101) into two registers and then using the wiring between the registers to compute the sum, which might be saved in a third register. A typical, modern register has 32 bits, called a *fullword*. Such a register can store a value in the approximate range of -2 billion to +2 billion.

When an answer, like 3+5 = 8, is computed, the processor might copy the answer to primary storage to save it for later use. Later, the processor can copy the number from storage back into a register and do more arithmetic with it.

Central processing unit

The processor is truly *the* computer --- it is wired to compute arithmetic and related operations on numbers that it can hold in its data registers. A processor is also called a *Central Processing Unit (CPU)*.

Here is a simplistic picture of the parts of a processor:

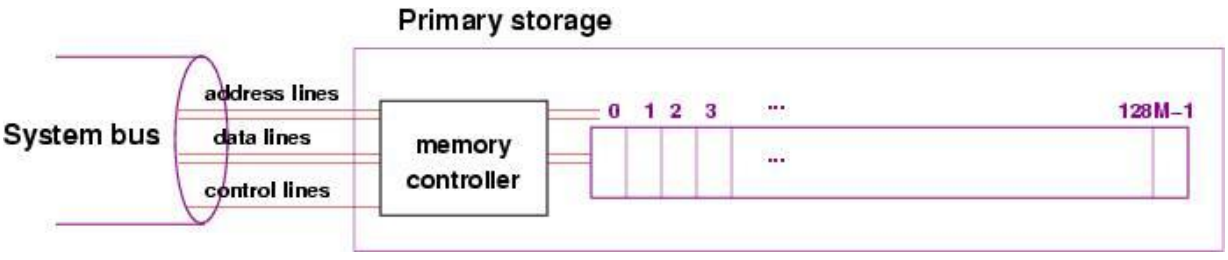


- The data registers hold numbers for computation, as noted earlier.
- There is a simple *clock* --- a pulse generator --- that helps the Control Unit do instructions in proper time steps.
- The *arithmetic-logic unit (ALU)* holds the wiring for doing arithmetic on the numbers held in the *data registers*. (Review the addition example above.)
- The *control unit* holds wiring that triggers the arithmetic operations in the ALU. How does the control unit know to request an addition or a subtraction? The answer is: it obtains instructions, one at a time, that have been stored in primary storage.
- The *instruction counter* is a register that tells the control unit where to find the instruction that it must do. (The details will be explained shortly.)
- The *instruction register* is where the instruction can be copied and held for study by the control unit,
- The *address buffer* and *data buffer* are two registers that are a ``drop-off'' point when the processor wishes to copy information from a register to primary storage (or read information from primary storage to a register). We study them later.
- The *interrupt register* is studied much later.

A processor's speed is measured in Hertz (a kind of vibration speed) and is literally the speed of the computer's internal clock; the larger the Hertz number, the faster the processor.

Primary storage

Primary storage (also called *random-access memory* --- *RAM*) is literally a long sequence of fullwords, also called *cells*, where numbers can be saved for later use by the processor. (Recall that a fullword is 32 bits). Here is a simplistic picture:



The picture shows that each full word (cell) is numbered by a unique *address* (analogous to street addresses for houses), so that information transferred from the processor can be saved at a specific cell's address and can be later retrieved by referring to that same address.

The picture shows an additional component, the *memory controller*, which is itself a primitive processor that can quickly find addresses and copy information stored in the addresses to/from the system bus. This works faster than if the processor did the work of reaching into storage to extract information.

When a number is copied from the processor into storage, we say it is *written*; when it is copied from storage into the processor, we say it is *read*.

As the diagram suggests, the *address lines* in the system bus are wires that transfer the bits that form the address of the cell in storage that must be read or written (the address is transmitted from the processor's address buffer --- see the previous section); the *data lines* are wires that transfer the information between the processor's data buffer and the cell in storage; and the control lines transmit whether the operation is a read or write to primary storage.

The tradition is to measure size of storage in *bytes*, where 8 bits equal one byte, and 4 bytes equal one full word. The larger the number, the larger the storage.

Instruction cycle

The *instructor cycle* are the actions taken by the processor to execute one instruction. Each time the processor's clock pulses (ticks) the control unit does these steps: (actually, modern processors do multiple instruction cycles for each clock pulse)

1. uses the number in the instruction counter to *fetch* an instruction from primary storage and copy it into the instruction register
2. reads the pattern of bits in the instruction register and *decodes* the instruction

3. based on the decoding, tells the ALU to *execute* the instruction, which means that the ALU manipulates the registers accordingly.
4. There is a fourth step in the instruction cycle, an *interrupt check*, that we study later.

Of course, the control unit is not alive, and it does not ``read'' or ``tell'' anything to anyone, but there is wiring between electrical components that propagate electrical 0-1 signals --- a kind of falling domino game--- that gives the appearance of conscious execution.

Here is a small example. Say that the clock has ``ticked'' (pulsed), and the instruction register holds 3. Say that address 3 in primary storage holds the coding of the instruction, ADD R2 R1. The instruction cycle might go like this:

1. Fetch: Consult the instruction counter; see it holds 0000 0011, that is, 3. Signal the memory controller to copy the contents of the cell at address 0000 0010 into the data buffer.

   When the instruction arrives, copy it from the data buffer into the instruction register.

   Increment the instruction counter to 4 (that is, 0000 0100).

2. Decode: Read the first (leading or high-order) bits and see that they indicate an ADD. Extract the bits that state the two registers to be added, here, R2 and R1.
3. Execute: Signal the ALU to add the values in registers 1 and 2 and place the result in register 2.

The previous description reads a bit tediously. This is OK, because the processor is incredibly fast. Nonetheless, modern processors can be made even faster, because while the ALU is doing the execution step, the controller can start the fetch-and-decode steps of the *next* instruction cycle. This form of speedup is called *pipelining* and is a topic intensively studied in computer architecture.

The forms of instruction that the processor can execute are called the *instruction set*.

There are these forms of instructions found in an instruction set:

1. data transfer between storage and registers (LOAD and STORE)
2. arithmetic and logic (ADD, SUBTRACT, ...)
3. control (test and branch) (the ALU perhaps resets the instruction counter)
4. input and output (the ALU sends a request on the system bus to an input/output device to read or write new information into storage)

Even small examples are painful to write in assembly language, and people quickly developed simpler notations that could be mechanically converted to assembly (which could itself be mechanically converted into base-2 codings).

FORTRAN (formula translator language) is a famous example, developed in the 1950's by John Backus. When a human writes a program using FORTRAN, she writes a set of mathematical equations that the computer executes. Instead of using specific numerical storage addresses, names from algebra (``variable names''), like x and y, can be used instead.

Here is an example, coded in FORTRAN, that places a value in a storage cell, named x, and then divides it by 2, saving the result again in the same cell:

```
x = 3.14159
x = x / 2
```

And here is an example that divides x by y, saving the answer in x's cell, *provided that y has a non-zero value*:

```
if ( y .NEQ. 0 )   x = x / y
```

(read this as ``if y not-equal-to 0, then compute x = x / y'')

With some work, one can write a program that mechanically translates FORTRAN programs into (long) sequences of machine code; such a program is called a *compiler*. There is another ``translation program,'' called an *interpreter*, which does not convert a program to machine code, but instead reads a program one line at a time and tells the processor to execute ``pre-fabricated'' sequences of instructions that match the program's lines. These concepts are developed in another lecture.

Languages like FORTRAN (and COBOL and LISP and C and Java and ...) are called *high-level programming languages*.

Secondary storage: disks

The previous section stated that programs and numbers can be saved in primary storage. But there is a limited amount of primary storage, and it is used to hold the program that the computer executes now. Programs and information that are saved for later use can be copied to *secondary storage*, such as the internal disk that is common to almost all computers.

Although it looks and operates differently than primary storage, it is perfectly fine to think of disk storage (and other forms of secondary storage, like a memory key or a CD), as a variant of primary storage, connected to the processor by means of the system bus, using its own controller to help read and write information. The main distinction is that secondary storage is *cheaper* (to buy) than primary storage, but it is *slower* to read and write information to and from it.

A typical computer uses disk secondary storage to hold a wide variety of programs that can be copied into primary storage for execution, as requested by the user. Secondary storage is also used to archive data files.

Secondary-storage devices are activated when the processor executes a READ or WRITE instruction. These instructions are not as simple to do as the LOAD and STORE instructions, because the secondary-storage devices are so slow, and the processor should not waste time, doing nothing, waiting for the device to finish its work.

The solution is: *The processor makes the request for a read or write and then proceeds to do other work*.

Consider how a processor might execute a WRITE instruction to the disk; here is how the instruction cycle might go:

1. Fetch: The control unit obtains the instruction from primary storage and places it in the instruction register, as usual.
2. Decode: The control unit reads the instruction and determines that it is a WRITE. It extracts that name of the device to be read (the disk),

it extracts the address on the device where the information should be written, and it extracts the name of the register than holds the information to be written.

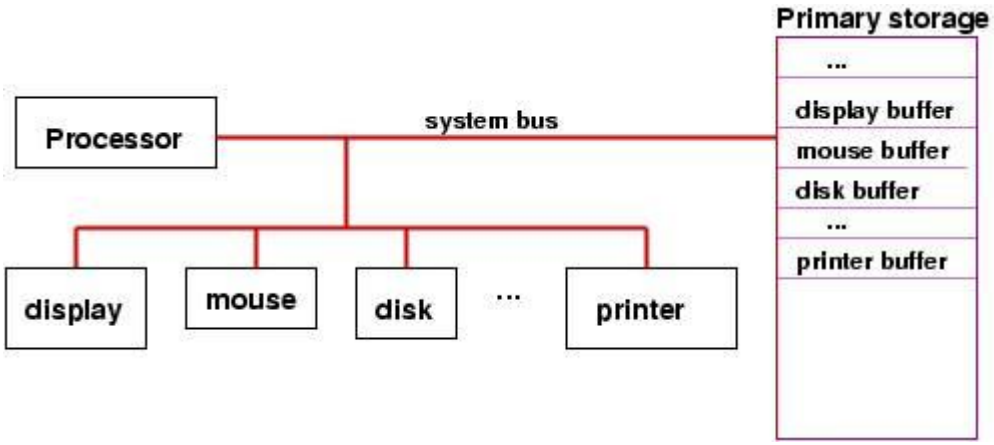
3. Execute: The control unit writes the address and data to the disk's *address buffer* and *data buffer*, which are two full words in primary storage. When these writes are finished, the controller signals the disk along the control lines of the system bus that there is information waiting for it in primary storage.

Now that the processor has initiated the disk-write, it proceeds to the next instruction to execute, and at the same time, the disk starts to spin, its own controller does a read of primary storage for the address and data information saved there, and finally, the data is written from primary storage to the disk.

Each secondary-storage device has its own "buffers" reserved for it in primary storage --- this is simpler than wiring the processor for buffers for each possible storage device.

An important "secondary storage" device (actually, it is an output device!) is the computer's display. A typical display is a huge grid of pixels (colored dots), each of which is defined by a trio of red-green-blue numerical values. The display has a huge buffer in primary storage, where there is one (or more) cell that describes the color of each pixel. A write instruction executed by the processor causes the display's buffer to be altered at the appropriate cells, and the display's controller (called the ``video controller'') reads the information in the buffer and copies its contents to the display, thus repainting the display.

To summarize, here is a picture of a computer with buffers reserved for input/output devices in primary storage:



It is important to see in the picture that (the controllers in) the various storage devices can use the system bus to read/write from primary storage *without bothering the processor.* So, input and output can proceed at the same time that the processor executes instructions.

When a computer is connected to an outside network, the network can also be considered a kind of secondary-storage device that responds to read and write instructions, but the format of the reads and writes is far more complex --- they must include the address of the destination computer, the kind of data transmitted, the stage of interaction that is being done, etc. So, there are standardized patterns of bits, called *protocols*, that must be transmitted as ``reads'' and ``writes'' from the processor to the system bus to the port to the network. To accomplish a complete read or write, there might well be multiple transmissions from processor to bus to port to network. The design of protocols is a crucial issue to computer networks.

Interrupts

The previous section noted that a processor should not wait for a secondary-storage device to complete a write operation. But what if the processor asks the device to perform a read operation, how will the processor know when the information has been successfully read and deposited into the device's buffer in storage?

Here is a second, similar situation: A human presses the mouse's button, demanding attention from the processor (perhaps to start or stop a

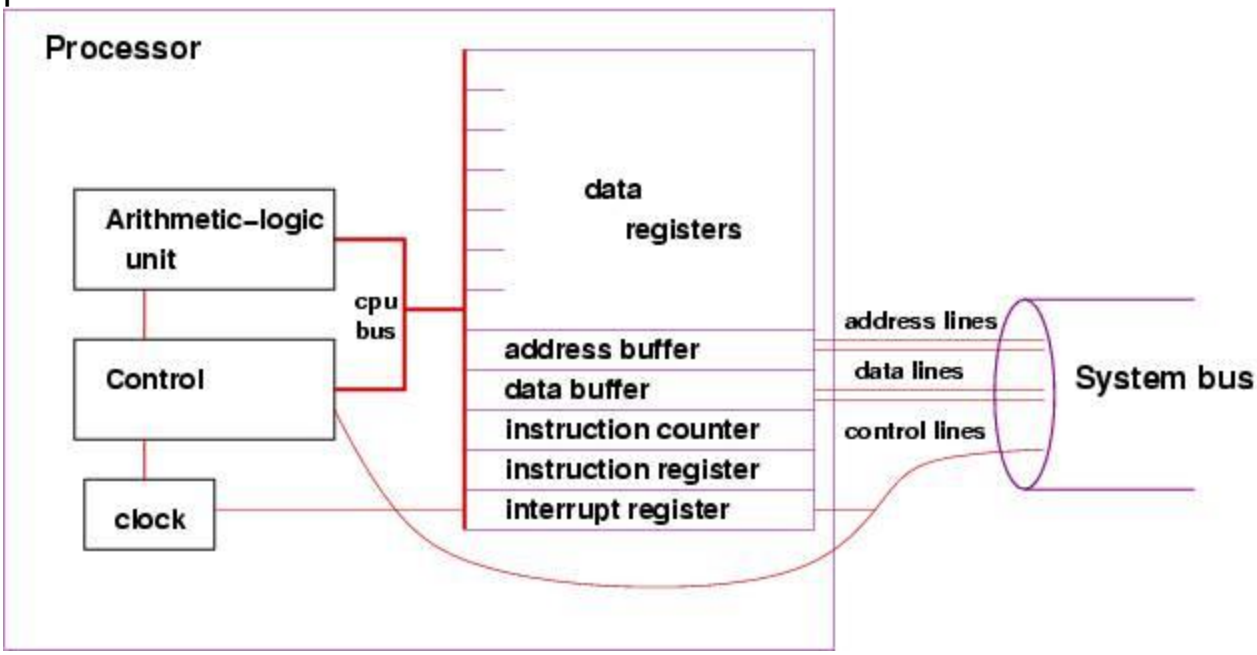
program or to provide input to the program that the processor is executing). How is the processor signaled about the mouse click?

To handle these situations, all processors are wired for interruption of their normal executions. Such an interruption is called an *interrupt*.

Recall the standard execution cycle:

1. fetch
2. decode
3. execute
4. check for interrupts

and recall the extra register, the *interrupt register*, that is embedded in the processor:



The interrupt register is connected to the system bus, so that when a secondary storage device has completed an action, it signals the control unit by setting to 1 one of the bits in the interrupt register.

Now, we can explain the final step of the execution cycle, the check for interrupts: After the execution step, the control unit examines the contents of the interrupt register, checking to see if any bit in the register is set to 1. If all bits are 0, then no device has completed an action, so the processor can start a new instruction.

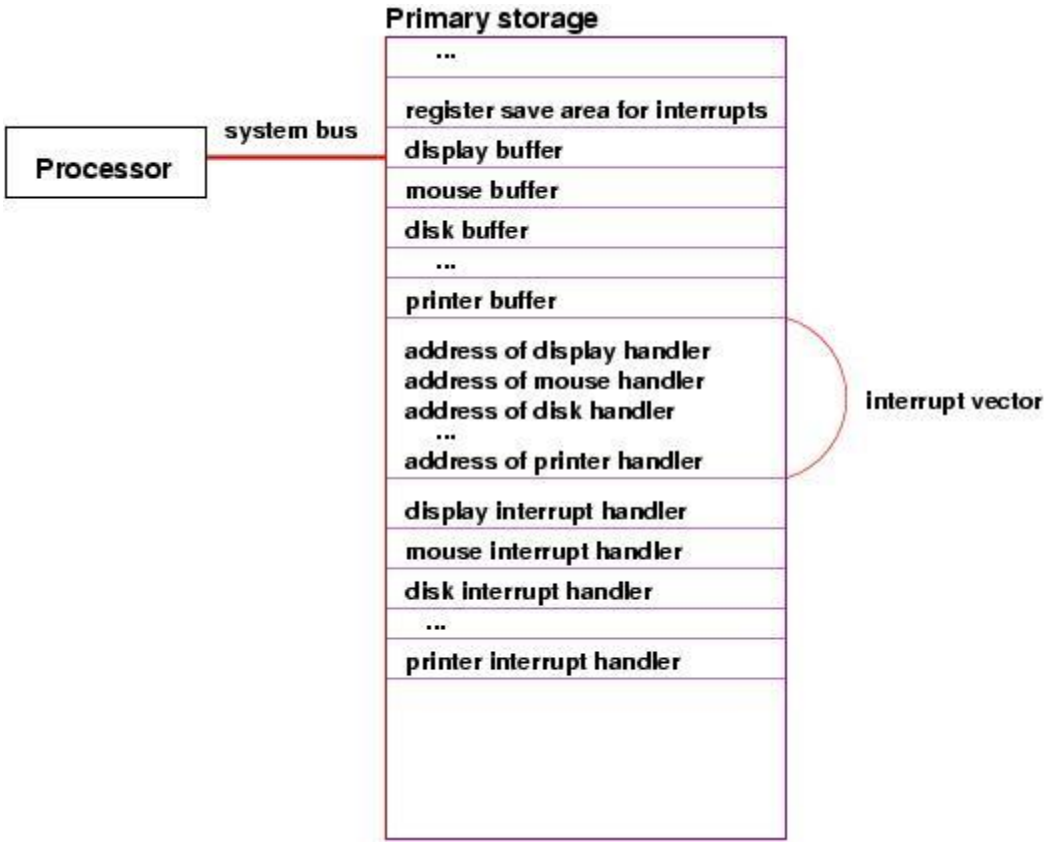
But if a bit is set to 1, then there is an *interrupt* --- the processor must pause its execution and do whatever instructions are needed:

For example, perhaps the user has pressed the mouse button. The device controller for the mouse sends a signal on the system bus to set to 1 the bit for a ``mouse interrupt'' in the interrupt register. When the control unit examines the interrupt register at the end of its current execution cycle, it sees that the bit for the mouse is set to 1. So, it resets the bit to 0 and *resets the instruction counter to the address of the program that must be executed whenever the mouse button is pressed*. Once the mouse-button program finishes, the processor can resume the work it was doing.

The mouse-button program is called an *interrupt handler*.

The previous story skipped a lot of details: Where does the processor find the interrupt-handler program for the mouse? What happens to the information resting in the registers if we must pause execution and start a new program, namely, the interrupt handler? What if more than one interrupt bit is set? What if a new interrupt bit gets set while the processor is executing the mouse-button program?

Some of the answers are a bit complex. Based on this picture, we can provide simplistic answers:



Cells in primary storage hold the addresses of the starting instructions for each of the interrupt handlers for the devices. The sequence of addresses is called an *interrupt vector*. The processor finds the address of the needed interrupt handler from the interrupt vector.

Before the processor starts executing an interrupt handler, it must copy the current values in all its registers to a *register-save area* in primary storage. When the interrupt handler is finished, the values in the register-save area are copied back into the registers in the processor, so that the processor can resume what it was doing before the interrupt.

The case of multiple interrupts is not covered here, but the basic idea is that an executing interrupt handler can itself be interrupted and its own registers can be saved.

SECTION 3

The Operating System

The previous narrative shows that the computer's operation is getting complicated --- there are special storage areas, special programs, etc. It is useful to have a startup program that creates these special items and manages everything.

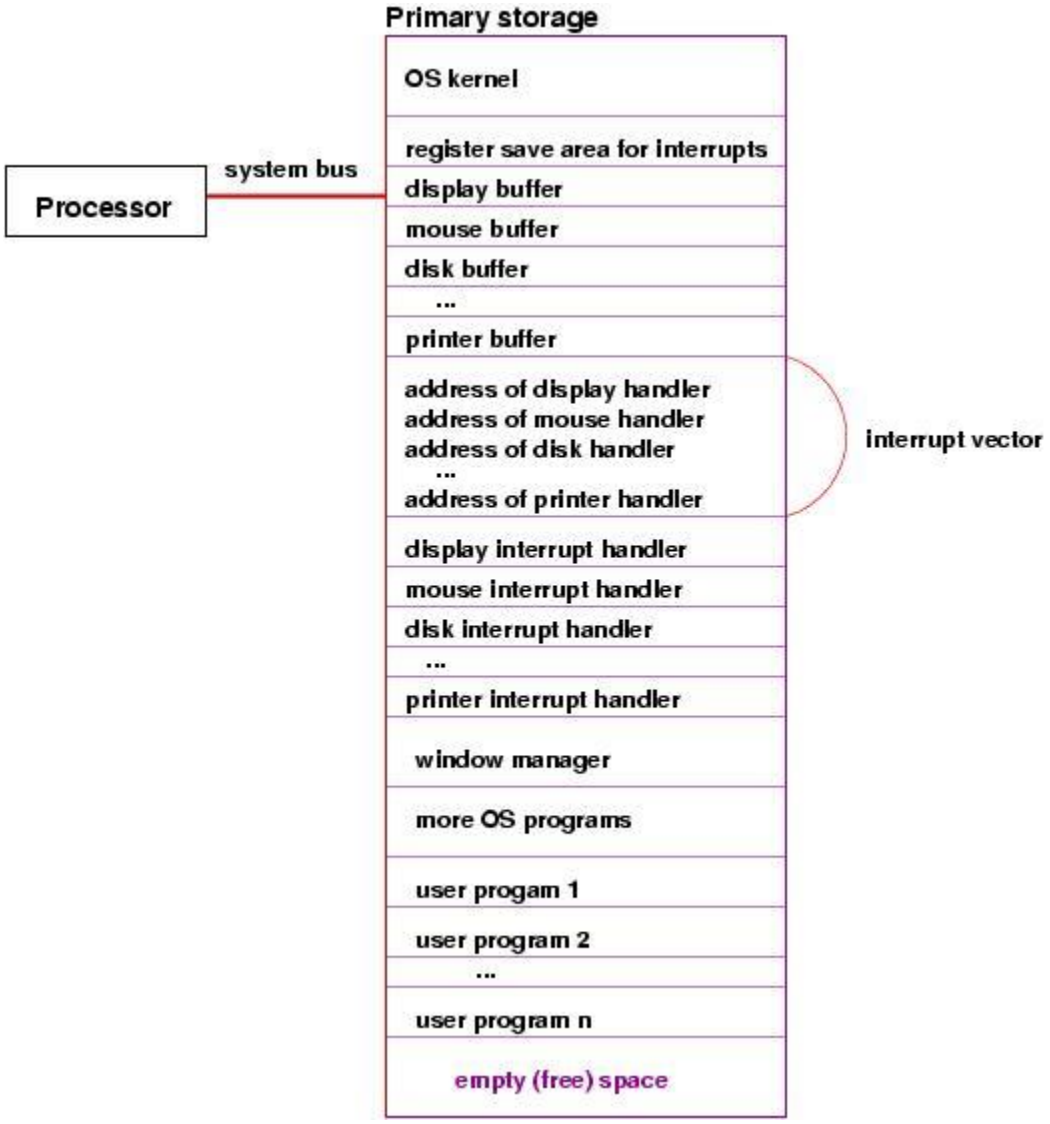
The startup- and manager-program is the *operating system*. When the computer is first started, the operating system is the program that executes first. As noted, it initializes the computer's storage as well as the controllers for the various devices. The interrupt handlers just discussed as considered parts of the operating system.

In addition, the operating system helps the processor execute multiple programs ``simultaneously'' by executing each program a bit at a time. This technique, which is studied carefully in another lecture, is crucial so that a human user can start and use, say, a web browser and a text editor, at the same time.

The operating system is especially helpful at managing one particular output device --- the computer's display. The operating system includes a program called the *window manager*, which when executed, paints and repaints as needed the pixels in the display. The window manager must be executing ``all the time,'' even while the human user starts programs like a web browser, text editor, etc.

The operating system lets the window manager repaint the display in stages: when the window-manager program repaints the display, it must execute a sequence of WRITE instructions. When the processor executes one of the WRITE instructions, this triggers the display's controller to paint part of the display. When the display controller finishes painting the part, it sets a bit in the interrupt register so that the interrupt handler for the display can execute and tell the processor to restart the window manager and continue repainting the display. In this way, the window manager is executing ``all the time,'' in starts and stops.

Here is a revised picture of the computer's storage, which shows the inclusion of the operating system ("OS") and the division of the remaining storage for the multiple user programs that are executing:



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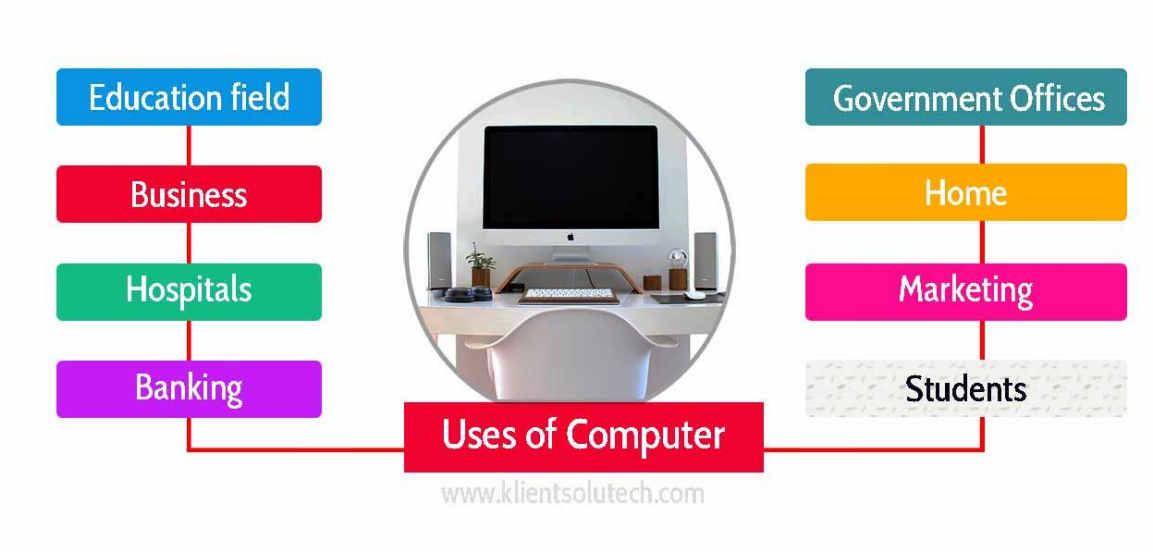
Top 10 Uses of Computer in Our Daily Life



Use of computer on regular basis in our life is very important. Technically in daily life computer is used to convert raw facts and data into meaningful information and knowledge. Computer science is explored and challenged by humans daily. The computer is like an electronic magical device for our life. According to Google Keyword Planner 100 – 1K people searching monthly on Google about " best laptop for business and personal use" and 100-1K for the best desktop computer for small business in last 1 year.

This is one of the proofs that the use of the computer in our life and business is really effective. That's why more and more people are buying and using a computer.

If the uses of the computer are for good purposes then it is a boon for humans. From the government to private sector everyone is using the computer. Users of the computer are constantly growing.

Importance of computer in our daily life

You can understand and analyze the importance of computer by seeing a revolution in offline and online business, online education, online business, online communication and internet banking. To store, access, manipulate,

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calculate, analyze data and information we use hardware devices and software application.

All our daily life activities are based on such online services and products. Computer changed our life 2 decades ago and now it is a necessity to use a computer in daily life to live. **Let's understand the uses of computer in following points:**

1. Uses of the computer in Education field

Schools and colleges around the world are using computer and internet technologies to teach students digitally and creatively with data visualization. Uses of the computer in a classroom will explore creativity and imagination in students mind. Drawing tools, spreadsheet, Audio, Video lectures and power point presentations etc. are very beneficial for students to learn more deeply and accurately. That created the new education business model called small classes, smart classroom, and digital classrooms.

As you know education is most important in our life. Computer reinvented the education system. Schools, colleges and almost all kind of educational institutions are using a computer in the classrooms. There are so many college and universities are now providing online degree programs for college students.

Computers are most important educational tools for teachers and learners. YouTube, Blogs, eBooks, Newsletters, eNewspaper etc. such educational tools are not possible without a computer that we're using today.

So, to become educated, skillful we can use computers and this is one of most beneficial use of the computer in our daily life.

2. Use of computer in the business

Computer with the internet connection we can start the business, run the business and manage the business and we can grow the business by the use of a computer. Google, Facebook, LinkedIn, Amazon, Alibaba etc. all are websites created by the use of computer and internet.

We can't imagine the daily business operations around the world without the uses of computer technologies. In early days when the first mechanical computer invented by Charles Babbage, it was used only to control the business system and speed up the business process accurately. But today everything is controlled and managed by computers.

Businesses and companies use a computer to do marketing and business planning, they use a computer to record customer data, they use a computer to manage goods and services etc.

Computer with an internet connection is really important for businesses. Now they can do Internet marketing, they can sell product and services

online. They can manage; hire employees around the world by the use of computer and internet.

Almost all kind of businesses is using computers in their daily official works. Such Microsoft Office to create professional looking documents, excel spreadsheet to manage goods and services, power point to for project presentations etc. are common these days.

The uses of computer in the business helping companies to grow their customer base faster. Computer use business is also challenging for the companies and small business owners. Because customers have so many options to choose best product or services by the use of the internet.

Any individual today can start their business from home. Freelancing is a big example. Freelancers are working remotely from home with the use of computer and internet.

To start earning money by the use of a computer is not so much tough. You just need to learn or to become a master in few applications or programming languages.

If someone knows about the internet research, data entry, MS Word etc. they can start data typing and editing work from home. Such as resume writing services, eBook writing services.

If someone knows about Adobe Photoshop, Corel Draw they can start graphic designing, logo designing business from home. This is so much simple today to build a career in the IT field by the use of a computer.

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3. Uses of the computer in hospitals

Uses of the computer in hospital provide many benefits for doctors and patient. Hospitals can create a database of a patient with their treatment records, medicine records. Doctors are using a computer to diagnose the diseases of patients faster. They are taking help of various medical applications of computer and hardware devices. The use of computer and its application in hospitals are such as to do the research on diseases, blood test, and urine test, brain testing, and body scanning etc.

4. Uses of the computer in the banking sector

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Banks are using computers daily to faster and accurate the customer demands. Banks are using a computer to deposit customer money in their account. In this case, cashier enters the account number of customer in their banking application, they first confirm the account number and customer details and then enter the deposited amount in their banking application by the use of the keyboard.

This process is faster and accurate. Banks are also providing ATM to withdraw and cash deposit ATM's for their customer. Whenever we deposit, withdraw money we get messages on our mobile number. We can see and print our transaction records without visiting banks. The whole process of banking is done by computer.

The innovative uses of computer in banking are that customer can operate their bank account by doing internet banking. Banks are providing the customer for accessing, transferring money, monthly bills or shopping bills by the use of computer and mobile.

Also by the use computer customer can get knowledge about various bank loan schemes such as a business loan, home loan and car loan. The customer can also check on the bank websites about loan eligibility and if they are eligible they can apply for bank loan.

Such uses of banking in our daily life are stored, calculated and managed by computers with speed and accuracy. The use of the computer in banking not only saving our productive time but also reducing the infrastructure cost of banks.

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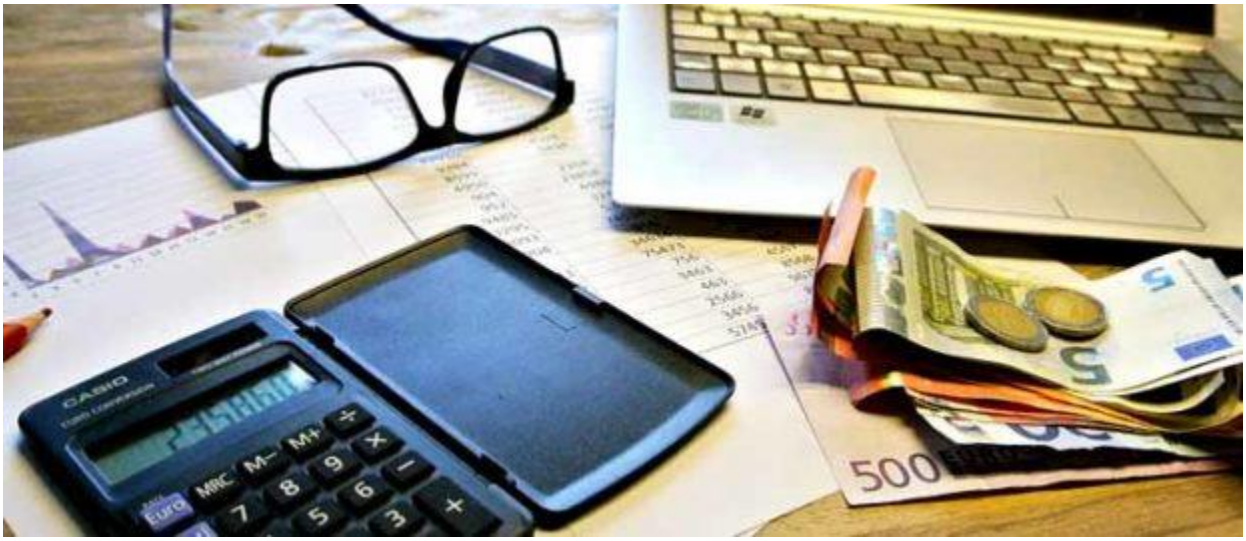
5. Uses of the computer in government offices



The government works or official works take more time to complete in the past. There was lots of staff required in the past to manage citizen's works. But today citizens, consumers are getting a solution with high speed and accuracy. Because of the uses of computer in official works. There are so many applications that speed the process and quality of official works. Such as Microsoft Office package, email, video conferencing tools etc. are few applications that speed the work of government offices with accuracy.

6. Uses of the computer in the home

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Computer uses in home depend on the user. There are so many people using the computer at home. Some people are using the computer to take online classes. Some people using the computer to do online business. Some people are using the computer listen to songs and to watch movies etc.

Else the use of the computer in the home provides great advantages. Such you can access banking and business services from home. You can communicate with people around the world by the use of the computer.

You can use a computer at home for learning new skills and hobbies. You can use a computer to calculate and manage monthly expenses by using MS excel. You can create gift cards, birthday messages by using Microsoft word. You can edit, restore and manipulate family photographs by the use of Adobe Photoshop etc. Else you can use the computer with the internet to do online shopping and you can start an online business too.

The use of a computer in home daily life is saving our time. The computer also saves money in our daily home life. Such as if you have a computer at home, you don't need to buy DVD player to watch movies and to listen to songs. You don't need to go cyber café to collect and print notes. All kind of small works that we do each day cost us money. But using computer application at home save our money, time and also provide entertainment and various ways to pass time.

7. Uses of the computer in marketing

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Use of computer with the internet is creating new ways to do the product and services marketing online. Digital marketing services, products, websites, and businesses are growing. Businesses can use a computer to type marketing content, to publish content marketing article on websites and social media. They can sell and market their product on portals or such as Amazon. Businesses can use PPC to get quick ROI for their marketing budget.

Companies can chat, email, outsource, apply and can do various works that included in Internet Marketing such as website designing, Search engine optimization, PPC, Content Marketing, Social Media Marketing etc. all by the use of a computer to market their product and services in best possible ways.

8. Computer used by various people around the world for different reasons and purposes

- **Kids: –** Kids use the computer in their daily life to play games, to use drawing tools and to watch funny (cartoon) videos.
- **High school students: –** Schools students can use a computer to learn Hindi English Typing. Students can learn and use digital communication tools. They can learn online safety and etiquette. They can use drawing tools to explore creativity and inside artist in them such as by using paint programs in Windows computer. They can also learn to do photo editing and graphic designing. The uses of a computer for school students should be to explore the creativity

and imagination. Online research can help school students to collect and understand the data and information about a particular book and chapters. Students can use MS-Office to create assignments, to do mathematical calculation, presentation etc. I am sure that many Indian schools students are doing these activities in schools and on home computers.

- **College students: –** Use of computer with the internet for college students is really important. Information Technology education helps them in their study no matter which kind of degree they are doing. They not only need to learn about Information Technology but they need use technology for their career. College students use Microsoft Word to create an assignment, notes, letters and books. They use excel spreadsheet to mathematical calculation, data visualization by using Charts, they solve and learn various logical formulas. Many students are learning online etiquette skills and safety. They are using the computer and the internet to create websites. But the biggest use of a computer for college students is that they can join online degree programs. Many students are taking online classes from their home. Students are connecting with teachers by using video conferencing application and devices. Students with the use of a computer are getting faster information and knowledge from multiple sources. Such uses of computer in student's daily life are really important.

- **Job seekers: –** Job seekers use the computer to learn computer skills that help them to get a job. They learn to use Ms-Office, English and Hindi Typing, Internet research, File management, printing, MS-Office, use of the business application and social media skills in their daily life. Job seekers who are IT literate or have productive computer skills get job quicker than people with only job specific skills.

- **Business owners: –** Business owner use computer based on demand and urgency. Commonly they use a computer daily to watch YouTube videos, upload family and travel photos on the social media etc. They also use the computer for business planning and team management. They use a computer to financial management. Also,

the use of a computer is depending on the nature of the business. But commonly project management, financial planning, social networking, emails, letter writing, presentation and Internet research are few uses of computer in the daily life of business owners.

- **Computer Professional & IT people: –** The real truth is that there are no other uses of anything other than the computer in the daily life of IT people. There are more than 12 hours average IT people spend their time on a computer according to me. In which they learn on the computer, they work on the computer, they communicate on computer, they hire people on computer, they order pizza on computer, they transfer and receive money on the computer, they watch movies on the computer, and they are still trying to do everything on the computer.

But the benefits and results you're seeing today in computer and internet world are done by IT professionals around the world. Without IT people in this world, nothing is possible that you're seeing on the Internet and computer today.

9. Uses of computer in new habits—Impact of computer in our life

Our life is fully impacted by computers. Today the use of the computer with internet connection in daily life changed our habits. We're creating new kind of habits. Such as listening music on the computer, earning money online, doing internet banking, communicating online with friends and family, running an online business, taking online classes etc. are new kind of habits. It's good living practice by a human because many people are in the favor of Technology without data analysis.

The computer can impact our life negatively too if above-paragraphed habits turn into bad habits. More use of a computer for daily life activities means less physical works and more mental work. In this case, the accessibility of brain is increased by so many features of computer and Internet. But the physical capacity is decreasing or not growing because of too much sitting all day in front of the computer. It's really important for us to make the balance between brain access and body capacity. Such balanced use of the computer in daily life will be great.

10. Uses of computer to change life: -Computer changed our lives in this way

A digital computer, analog computer and now the use of hybrid computers are growing in our daily life. The problem is that computer is doing our work faster and accurately and save our time. But then why people do not have any time today for their family. You can say the computer is changed our lives yes, computer changed our lives because today we want to use air purifier inside the home rather than planting new trees outside. Funny! Very Funny!

So, my friends, you need to understand and analyze what you want to do today and what is important for to you accomplish today by using a computer. Once you will find out it then start using the computer each day and it will make life easier, faster and more importantly satisfy at the end of the day.

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SECTION 4

Input/Output/Storage Devices

Input Devices:

Definition:

An input device is a peripheral or hardware device, generally external, that is connected or remotely connected to the computer or information appliance.

Input devices are used to provide input which can be understood by the computer such as: raw data, information, command, order, signalâ€¦ To process input, computer absolutely need an input device, it is the most important part of computers.

Categories:

Input device can be categories into four categories:

Typing devices

Pointing devices

Optical devices

Audio devices

These categories represent the way to communicate with computers and the first path to the input-process-output phase.

Typing Devices:

Typing devices are essentially keyboard, used to insert text or command via button. They are the most effective way to input data to the computer. it use the method of binaries code to input data. Typing devices are very reliable for text and numbers data input.

But they can be ergonomically unsafe if not properly used, inaccurate and difficult for bad typist or paralysis and handicapped users

Basically all computers possess keyboard so it is the primary input of computer system.

Pointing Devices:

Pointing devices are used to input data by movement, here are some example of pointing devices: mouse, joystick, stylus, touch screen.

They are usually used to operate with screen or movement based information, all of them are manually used so easy to manipulate due to simple movement, like the mouse who just consist of pointing and clicking.

One of the main disadvantages is that they are limited in task, mouse and joystick means that you are limited in your work, and touch screen can be less responsive compared to keyboard.

Optical Devices:

Optical devices are mostly used in recognition or video and image capture, in the field of recognition there is the OMR (optical mark recognition) and the OCR (optical character recognition), and many others optical devices like: barcode reader, scanner, handheld scanner, digital camera, webcam¦

The OMR reader is used in barcode reader, it scan a mark which indicate the data or information input that is send to the computer to be processed, it is also used in face recognition, finger print scanner, retina scanner and so on. The OCR is for text and character recognition when scanning a text document.

Basically, optical devices are faster than other devices because of a high-speed reading, and are more used by security mean due to their accuracy and reliability.

The disadvantage lies in the raw data, for instance if there is a single change in it, the optical devices may not recognize and therefor give a wrong output to its user

Audio Devices:

Audio devices like his name indicate, is mainly to input an audio data. The devices are: microphone, headset, MIDI keyboardâ€¦ its process is analogue to digital data convertor.

It allows a user to send audio signals to a computer for processing, recording, or carrying out commands, sometimes the main purpose is to transfer input audio to output audio.

The disadvantage is if the source of audio have a bad signals then all the process are wrong.

Output Devices:

Definition:

Like the input, the output device is also a peripheral and hardware device used to receive the result of the processing date that comes from its input. All computer or information system absolutely need output devices.

Output devices are also known as the way that the computer communicates with human.

Types of Output:

There are three principal types of output devices based on the way they deliver the output data:

Display output

Physical output

Audio output

Display Output:

They are commonly monitors, screen or light based devices called Visual Display Unit (VDU). It is the primary output devices and it can also be used as a input device, the computer will display the contents of the information

on the screen to permit the users read or see what are the processes done to the input data, that is called soft copy which mean temporary data copy.

Display output devices is also the wall between computer-language and human-language, without it human can't understand what the computer try to communicate.

Usually, display outputs are called video displays or 2 dimensional displays, like:

Television sets

Computer monitors

Head mounted display

But there are also called segments displays, composed of several segments that switch on and off to give appearance of desired output, they are display that can only show numeric numbers or alphanumeric character, like calculators or digital watch and so on.

The advantages of display device is that you can see the output of a computer program and also use your computer easily by giving it commands from a Command Line Interface or use your Pointing device such as Mouse to point and click to do a task from a Graphical User Interface (GUI). It is fast to acquire, more economical and easily transmittable.

In another hand, disadvantages are that the output is temporary because of the need of power supply and can cause visual problem for users.

Physical Output:

Physical output or hard copy is the permanent output; the most common way to get it is the printer.

There are two type of printer:

Impact printer: use the typewriter approach, impact of between the ink ribbon and the paper. e.g. dot-matrix printers.

Non-impact printers: use electro-static chemicals and ink-jet technologies, can produce color printing. E.g. laser printer, ink-jet printer

So, printer is the principal output devices in terms of physical output; it can produce high-quality printing, can produce a large amount in short time.

The disadvantages are the cost; printing is expensive due to its hard copies compared to soft copies that just need to be displayed.

Audio Output:

Audio output devices refer to any devices that are attaches to a computer for the purpose of playing sound, such as speech or music. It can also refer to the sound of a computer sound card.

Here are some examples of audio output devices with their uses:

Speakers: it is the most common type of audio output device; they can be attached to a computer using variety of audio plugs. It requires a separate energy supply to be operational.

Headphones: they are another type of audio output device. Variations on the headphone concept include ear buds, which fit inside the ear, and headsets, which include both headphones and a microphone. It doesn't require a separate power supply.

Sound card: it is a computer component that converts information from digital audio files into electronic sound signals. These signals are then passed on to an audio output device, such as speakers or headphones. Although sound cards do not themselves play sound, they do output audio signals. For this reason, they can be considered audio output devices.

Without an audio output device, you will miss audio cues from the computer such as error beeps and other important system messages alerting you to system problems. This keeps you in sync with your computer, allowing you to more effectively recognize and identify issues.

There are no real disadvantages for audio output devices, just it need some additional hardware such as sound card and additional power supply, and the possibility of making noise.

Storage Devices:

There are primarily three types of storage a computer possess, first the primary storage, which is more popularly called simply memory; the secondary storage, which is more popularly referred to as simply storage, and finally the offline storage referred as movable storage.

Primary Storage:

Primary storage is where a computer stores data on a temporary basis so it can process the data. Think of primary storage as "short term memory". Primary storage is a type of memory that is directly accessible to a computer processor and it is volatile because it is temporary in nature and is erased when the power is turned off.

The main primary storages are:

RAM (Random Access Memory)

ROM (Read Only Memory)

Data the computer is currently processing or data which the computer knows it is about to need for processing is stored in primary storage. Memory in primary storage can be accessed quickly by the CPU. Its storage capacity, however, is much smaller than what can be stored in secondary or tertiary storage. Computers need just enough primary storage to function and temporarily hold anticipated amounts of data for processing.

Secondary Storage:

Secondary storage is where a computer stores data it is not currently processing but which it may need at some later time. Secondary storage can be thought of as "long term memory", or storage, and it is non-volatile in nature because data remains intact even when power to a computer is turned off. Operating systems, documents, music files and so on are typically stored in a secondary storage device. They can also be external for movement and transport.

The main device for secondary storage is the hard disk drive (HDD). The computer's largest secondary storage location is its hard disk drive, or just

hard drive. Hard drives are platters like dishes which are stacked top, middle, and bottom to make one unit. Hard drives are mechanical devices which store data magnetically. They are considered permanent storage.

Among the advantages of a hard disk drive is its storage capability, from Megabyte to Terabyte. Hard disk drives are durable, with metal casings built around their inner components. Hard disk drives are read/write. They can be read over and over and they can be modified, or written to, over and over.

Offline storage:

Offline storage is storage media which can be inserted into the computer and used but which can then be removed from the computer and stored elsewhere. It can also be external sources which are connected to the computer and then disconnected, like floppy drives, CD drives, DVD drives, USB flash drive, and Blu-ray drives.

Floppy drive is an old form of storage, its capacity is very few up to 1 or 2 Megabytes so it isn't used nowadays, but it is categorised as offline storage because they are non-volatile and be able to read or written to over and over again.

CD drive (Compact Disk) and DVD drive (Digital Video Disc) store data on shiny discs, the capacity of CD drive is up to 700 Megabytes and the DVD drive is 4.7 Gigabytes and 8.5 Gigabytes on a double layer DVD, they are very compact and portable storage with a good amount of storage, so it is the primary commercial storage device, used for video, audio, software, games and so on. But the disadvantages are that it can be infected by virus if used with bad intention, also if the layer of the disk gets damaged like scratch the computer will not be able to read anymore so a loss of data.

USB flash drive, which is the most portable storage device with a great amount of storage, they can support 128 Megabytes to 256 Gigabytes, and it is the easiest way to carry data from place to place due to its connectivity via USB port. Unfortunately, USB flash drive is very fragile, easily breakable, and can be easily get corrupted or infected by viruses, so basically used for a short amount of time before it is useless.

SECTION 5

An introduction to operating systems

1 Introduction There is no single definition of operating system. Operating systems exist because they are a reasonable way to solve the problems created by a computer system. The hardware itself is not easy to use; therefore it is necessary to help both the user and the programmer by abstracting the hardware complexity. The way to do this is by placing a layer of software above the hardware in order to present the user of the system and the applications a virtual machine interface that facilitates the understanding and use of the system. This software layer is called the operating system.

The operating system includes a set of functions to control the hardware that are common to most applications, e.g., functions controlling the devices and interrupt service routines, hiding to the programmer the hardware details and offering an interface comfortable to use the system. From another point of view, the operating system must ensure a proper and efficient system functioning.

A computer system now consists of a large number of components that need to be managed. Throughout the history of computers there has been a significant development affecting the various components of the system. This evolution has been achieved both in the technological aspect (from valves and relays to VLSI circuits) and at the architectural level (different techniques to increase processor speed, memory hierarchies...) and in the field of programming languages (libraries, languages, interfaces...). This evolution was constrained by requirements of efficiency and ease of use of computers. However, it should be noted that the increased efficiency of each system component does not ensure an increase in the overall system efficiency. Indeed, the tuned management of all resources will be largely responsible for the success or failure. From this perspective, the operating system is responsible for providing an ordered and controlled allocation of different resources (processor, memory, Input/Output devices...) to each of the programs competing for them. We can say that the concept of operating system is linked to two different ideas.

For a user/programmer, an operating system is the set of functions that allows him to use the resources of the machine obviating the characteristics of the hardware. This is the functional vision of the

operating system, which allows one to view the system as a virtual machine. This is the vision that this course will deepen. For a system designer, however, an operating system is the software that, installed on the bare machine, allows controlling its resources efficiently. This view corresponds to the operating system implementation. Both views largely refer to the same concepts and terms, but their approach —and their objectives— are different.

In this introductory course to operating systems we will study the Metaphor of the driver and the mechanic In any system it is important to distinguish between interface and implementation. The user of a system must know its interface, but how it is implemented is a matter of the designer or the maintenance staff. The user of a car only needs to know the interface so that the vehicle is helpful. So, he must learn to manage the steering wheel, turn signals, lights, accelerator and brake. To make things easier, manufacturers tend to standardize the interface: the accelerator is a pedal that is always located in the same place; the direction "right" is always represented in the controls as a turn in the clockwise direction...

Since the system is not perfect, the user must perform some "management" tasks: if the car is not automatic, he must choose the right gear, when the tank is empty, he must fill it with a given type of fuel... However, these tasks tend to be increasingly limited. A century ago, the user of the car used to have a driver-mechanic, since the cars were very unreliable, and should be started manually by operating the starter motor from the outside. Today, one can be a good driver without having knowledge of mechanics, and many drivers ignore, for example, that the car has an electric motor for starting. The mechanics are in charge of maintenance, knowing perfectly the internal structure of the car, but they do not have to be good drivers: they might not even know how to drive.

An introduction to operating systems 2KAT/ATC UPV/EHU functionalities offered by operating systems in general, as well as the basics of how the operating system supports them. The techniques and fundamental models of the design of operating systems, as well as the concepts and tasks of system and network administration, including security management, are studied in courses of the Computer Engineering specialization. 2 Functional vision of operating systems Of the two approaches presented out above, this is the less clearly defined and developed in the literature. Perhaps this

is due to the fact that historically it has been the interface programmer who designed the interface functionality, and he does not feel particularly inclined to discuss the specific services that the interface must provide. Hence, often services are later added or modified according to the needs in revisions. In the operating system, in addition, this interface is not unique, in the sense that, besides the set of system calls (primitives of the operating system) provided to applications, it can be considered — historically it has been— the shell as part of the operating system, and even, by evolution, the graphical user interface (GUI). In what follows, we will consider the system call interface as the basic interface of the operating system, which defines the system as a virtual machine.
The set of system calls of an operating system describes the interface between applications and the system and determines the compatibility between machines at the source code level. The end user sees the computer system in terms of applications. Applications can be built with a programming language and are developed by application programmers. If we had to develop applications taking care at all times of the control of the hardware they use, application programming would be a daunting task and probably we could not enjoy sophisticated applications as the ones we have nowadays. In addition, applications also take advantage of a set of tools and services that facilitate even more the work of the programmer, aseditors, compilers, debuggers... Here we also include libraries of functions that are available to applications (mathematical functions, graphical...). Typically, these services are not part of the operating system. Figure 1 presents a summary of this approach.

An introduction to operating systems 3KAT/ATC UPV/EHU 3 Functions of an operating system In general, and regardless of the type of interface, operating systems typically provide a set of functions that can be summarized as follows:
• Program execution. Running a program requires a number of tasks. Instructions and data must be loaded into main memory, files and I/O devices must be initialized... The operating system performs all these tasks.
• Control of I/O devices. Each device requires its own set of instructions and control signals to operate. The operating system takes care of all these details so that the programmer can see the access to the devices as simple reads and writes.

• Access to files. Historically we have used the concept of a file as the permanent representation of a set of information with a global name in the system. Files reside in nonvolatile memory such as disks and flash drives. Besides the nature of the device, the operating system has to manage the file format and the way of storing.

• System access control. For multi-user systems, the operating system has mechanisms to control the access to system resources based on the rights defined for each user.

• Detecting and responding to errors. When a computer system is in operation it may fail. These errors can be hardware (memory or device access error), or software (arithmetic overflow, attempt to access a forbidden memory position...). In many of these cases the system has hardware components to detect these errors and to communicate to the operating system, which should give a response that eliminates the error condition with the least possible impact on the applications that are running. The answer may go from the ending of the program that caused the error, to retrying the operation or simply reporting the error to the application.

• Accounting. It is common for an operating system to provide tools for tracking operations and accesses, and for collecting data regarding resource usage. This information may be useful to anticipate the need for future improvements and to adjust the system so as to improve its performance. It can also be used for billing purposes. Finally, upon a security issue, this information can be used to discover the attacker. 4 Operating system interfaces In a system structured in layers, a layer Lk provides an interface to the upper layer Lk+1, represented by a set of functions which determine how layer Lk is accessed from layer Lk+1. The implementation of layer Lk is independent of the interface and is said to be transparent to the layer Lk+1, in the sense that when designing the layer Lk+1 there is no need to worry about how layer Lk is implemented. An interface must specify precisely the functions offered and how they are used (arguments, return values...). Generally, an operating system offers three different interfaces: User interface. When there were no graphics terminals like the ones we have nowadays, the user had to communicate with the system by typing commands that allowed running programs, consulting directories... To do so, the operating system offered a specific utility, the command interpreter (shell in Unix terminology), whose interface was presented as a set of commands whose

An introduction to operating systems 4KAT/ATC UPV/EHU usage form was (or should be) well specified in a manual (for example the Unix man, Section 1). Nowadays graphical user interfaces greatly facilitate user interaction by means of intuitive concepts and objects (icons, pointers, mouse clicks, drag and drop...). If in the case of shells each system offered its own shell (the user had to learn to use it, usually attending a course), the graphical user interfaces are common and intuitive enough so that their use is available to everyone.

Administration interface. The administrator of a computer system is the person in charge of installing the system, maintain it and manage its use. In a system composed of several computers, this work includes managing user accounts and network resources, with special attention to the care of user privacy and information security. The system administrator is a professional who knows the specific tools and functions that the system offers for it and that can only be used by him, as they require special privileges. Overall, he relies for it on an extension of the shell (for example, in Unix, specified in Section 8 of man), although the use of these tools does not exclude the use of the graphical user interface. Instead, a personal system should not require, ideally, management effort by the user, since he is not supposed to be an expert for it, like the driver of a car is not required to have mechanical expertise. The reality is that, like a car driver should know how to change a wheel, a computer user has to solve nowadays some management problems arising from the immaturity and imperfection of operating systems.

Programming interface. To develop applications on an operating system, the programmer uses, regardless of the programming language used, a set of functions to access operating system services, the system call interface. These functions do not differ in appearance from other library functions provided by the language. However, calls to the operating system are specific to that system and therefore probably incompatible with those of another operating system, since they refer to objects and concepts specific to that system. Actually, it is common that the programmer does not directly use operating system calls, but specific library functions of the language for that purpose. For example, if the C programming language is used, the programmer uses the printf function to output data, regardless of the operating system he is using. However, printf is a function

implemented in terms of calls to the operating system (in the case of Unix, the write system call), so that the code generated is specific to that system. This, in general, is not taken into account by the application programmer, but it is by the library developer, a systems programmer, who is the user of the operating system call interface and will therefore rely on the corresponding specification.

Introduction to Cloud Computing

Cloud Computing: The term "cloud", as used in this white paper, appears to have its origins in network diagrams that represented the internet, or various parts of it, as schematic clouds . "Cloud computing" was coined for what happens when applications and services are moved into the internet "cloud" Cloud computing is not something that suddenly appeared overnight; in some form, it may trace back to a time when computer systems remotely time-shared computing resources and applications.

More currently though, cloud computing refers to the many different types of services and applications being delivered in the internet cloud, and the fact that, in many cases, the devices used to access these services and applications do not require any special applications . Many companies are delivering services from the cloud. Some notable examples include the following:

• Google — Has a private cloud that it uses for delivering Google Docs and many other services to its users, including email access, document applications, text translations, maps, web analytics, and much more .

• Microsoft — Has Microsoft® Office 365® online service that allows for content and business intelligence tools to be moved into the cloud, and Microsoft currently makes its office applications available in a cloud .

• Salesforce.com — Runs its application set for its customers in a cloud, and its Force .com and Vmforce .com products provide developers with platforms to build customized cloud services .But, what is cloud computing? The following sections note cloud and cloud computing characteristics, services models, deployment models, benefits, and challenges .CharacteristicsCloud computing has a variety of characteristics, with the main ones being:

• Shared Infrastructure — Uses a virtualized software model, enabling the sharing of physical services, storage, and networking capabilities . The

cloud infrastructure, regardless of deployment model, seeks to make the most of the available infrastructure across a number of users .
• Dynamic Provisioning — Allows for the provision of services based on current demand requirements. This is done automatically using software automation, enabling the expansion and contraction of service capability, as needed . This dynamic scaling needs to be done while maintaining high levels of reliability and security.
• Network Access — Needs to be accessed across the internet from a broad range of devices such as PCs, laptops, and mobile devices, using standards-based APIs (for example, ones based on HTTP). Deployments of services in the cloud include everything from using business applications to the latest application on the newest smartphones.
• Managed Metering — Uses metering for managing and optimizing the service and to provide reporting and billing information. In this way, consumers are billed for services according to how much they have actually used during the billing period. In short, cloud computing allows for the sharing and scalable deployment of services, as needed, from almost any location, and for which the customer can be billed based on actual usage.

Once a cloud is established, how its cloud computing services are deployed in terms of business models can differ depending on requirements. The primary service models being deployed are commonly known as:
• Software as a Service (SaaS) — Consumers purchase the ability to access and use an application or service that is hosted in the cloud. A benchmark example of this is Salesforce .com, as discussed previously, where necessary information for the interaction between the consumer and the service is hosted as part of the service in the cloud. Also, Microsoft has made a significant investment in this area, and as part of the cloud computing option for Microsoft Office 365, its Office suite is available as a subscription through its cloud-based Online Services .
• Platform as a Service (PaaS) — Consumers purchase access to the platforms, enabling them to deploy their own software and applications in the cloud . The operating systems and network access are not managed by the consumer, and there might be constraints as to which applications can be deployed . Examples include Amazon Web Services (AWS), Rackspace and Microsoft Azure .
• Infrastructure as a Service (IaaS) — Consumers control and manage the systems in terms of the operating systems, applications, storage, and

network connectivity, but do not themselves control the cloud infrastructure .Also known are the various subsets of these models that may be related to a particular industry or market . Communications as a Service (CaaS) is one such subset model used to describe hosted IP telephony services . Along with the move to CaaS is a shift to more IP-centric communications and more SIP trunking deployments . With IP and SIP in place, it can be as easy to have the PBX in the cloud as it is to have it on the premise . In this context, CaaS could be seen as a subset of SaaS.

• Private Cloud — The cloud infrastructure has been deployed, and is maintained and operated for a specific organization. The operation may be in-house or with a third party on the premises.
• Community Cloud — The cloud infrastructure is shared among a number of organizations with similar interests and requirements. This may help limit the capital expenditure costs for its establishment as the costs are shared among the organizations. The operation may be in-house or with a third party on the premises.
• Public Cloud — The cloud infrastructure is available to the public on a commercial basis by a cloud service provider. This enables a consumer to develop and deploy a service in the cloud with very little financial outlay compared to the capital expenditure requirements normally associated with other deployment options.
• Hybrid Cloud — The cloud infrastructure consists of a number of clouds of any type, but the clouds have the ability through their interfaces to allow data and/or applications to be moved from one cloud to another . This can be a combination of private and public clouds that support the requirement to retain some data in an organization, and also the need to offer services in the cloud. Enduser application is delivered as a service. Platform and infrastructure is abstracted, and can deployed and managed with less effort. Physical infrastructure is abstracted to provide computing, storage, and networking as a service, avoiding the expense and need for dedicated systems. Software as a Service (SaaS) Application platform onto which custom applications and services can be deployed. Can be built and deployed more inexpensively, although services need to be supported and managed.Platform as a Service (PaaS)Infrastructure as a Service (IaaS)

Accessing the Communications Capabilities from Within the Cloud Whether businesses are deploying communications services for access from outside of or within the cloud, the environment is one that supports the speedy development and rollout of these capabilities .Communications Scalability. To deliver on the scalability requirements for cloud-based deployments, the communications software should be capable of running in virtual environments. This allows for easily increasing and decreasing session densities based on the needs at the time, while keeping the physical resource requirement on servers to a minimum .Getting Started with Communications Services Businesses desiring to use the communications capabilities of cloud-based services will stand to benefit by determining the right interfaces. Dialogic supports a broad range of interfaces, including Restful APIs, media control interfaces, Java interfaces, and XML-based interfaces, catering to a wide range of application and service creation developers. These interfaces, available over media and signaling capabilities, support the scalability needed in a cloud-based environment while still being easy to deploy and administer.

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SECTION 6

Browser Security

What is Web Browser?

Web browser is used to access the information and resources on the World Wide Web. It is a software application used to trace and display the web pages .The main purpose of a web browser is to bring the information resources to the user. An information resource is identified by a Uniform Resource Identifier/Locator (URI/URL) and may be a web page, image, video or other piece of content. Web browsers are used not only on the personal computers, laptops but are also used on mobile phones to access the information.

Each URL is divided into different sections as shown below:

http:// In short, http means the hypertext transfer protocol and the file is a web page and every time you don't needed to type the http, it is automatically inserted by the browser.
www– notation used for World Wide Web infosecawareness – web site name
.in – It is one of the domains names, which is basically a country name.
Other domain names are .com (commercial organization), .net (network domain) etc.
(The organization address and location of the organization address are known as the domain name).
co.in –suffix or global domain name shows the type of organization address and the origin of the country like the suffix co.in indicates a company in India.
Generally a web browser connects to the web server and retrieves the information. Each web server contains the IP address, and once you are connected to the web server by using http, it reads the hyper text mark-up language (HTML) which is a language used to create document on World Wide Web and the same document is displayed in the web browser.

In short, a browser is an application that provides a way to look at and interact with all the information on the World Wide Web.

Types of Web Browsers:

There are different types of web browsers available with different features.

Some of the popular Web Browsers are :

Internet Explorer: It is known as Microsoft Internet Explorer in short IE. It comes pre-installed on all Windows computers. It is one of the most popular web browsers and latest edition of IE 11 is available on the Internet. It can be installed with the following: windows operating system like Windows 7, Windows 8, Windows Vista and Windows Server's.

Mozilla Firefox: It is a free, open source web browser developed by Mozilla Corporation. It has been said as being stable and safer, less prone to security breaches, viruses, and malware than Microsoft Internet Explorer. The browser can be used in different operating systems like Windows, Linux and Apple MAC operating system etc.

Google Chrome: It is a web browser designed for windows operating system. This browser works on windows vista, windows 7 and windows 8. The chrome can be downloaded and installed for OS X or Linux operating system

Safari: It is web browser developed by Apple Corporation. It is a default web browser of MAC OS X. This browser also works on all windows flavors. Apple maintains a plug-in blacklist that it can remotely update to prevent potentially dangerous or vulnerable plug-ins from running.

Why to secure your Web Browser?

Today, web browsers such as Internet Explorer, Mozilla Firefox, Google Chrome and Apple Safari are installed on almost all computers. And it is easy to notice the increasing threat coming from online criminals that try to take advantage of web browsers and their vulner- abilities. Because web browsers are used so frequently, it is very important to configure them securely. Often, the web browser that comes with an operating system in a default settings not set up in a secure configuration.

Securing browser is the first step that need to be taken in order to assure secure online protection. There is an increase in number of threats taking advantage of vulnerabilities present in the web browsers through use of malicious websites. This problem is made worse by a number of factors, including the following:

- Many computer users are not aware of the click on the web links.
- Software and third party software packages installed combined increases the number of vulnerabilities
- Many websites require that users enable features or install more software, third- party software which doesn't get security updates putting the computer at additional risk.
- Many users do not know how to configure their web browsers securely.

Web Browser Risks and Case Studies

Browsers are used to access various web pages to have a complete online experience. The browsers are enabled by default with some of the features to improve our online sessions, but at the same time these options create a big security risk for our operating systems and databases. The online criminals use available vulnerabilities in our browser and in its additional features to control operating systems, retrieve private data, damage important system files or install data stealing software. Some of the features are important for browser's functionality and the user should understand their importance and should enable or disable for securing the browser.

Browser Cookies:

A cookie is used to identify a website user. A cookie is a small piece of text sent to a browser by a website accessed through the browser. It contains information about that visit like remembering the website visited preferred language and other settings. The browser stores this data and uses it in accessing the features of the website or the next time the same site is visited to make the access more personalized. If a website uses cookies for authentication, then an attacker may be able to obtain unauthorized access to that site by obtaining the cookie.

Case 1: Shania visited a movie website and indicated that she is interested in comedies. The cookies sent by the website remembered her choice and when she visited the same website next time, she sees comedies are displayed on the website.

Case 2: When users log in to a Web site, they enter their username and password into a login page and, if they are authenticated, a cookie is saved that allows the Web site to know the users are already logged in as they navigate around the site. This permits them access to any functionality that may be available only to logged-in users, probably the primary use of cookies at this time.

Case 3: Online shopping carts also use cookies. As you browse for DVDs on that movie shopping site, for instance, you may notice that you can add them to your shopping cart without logging in. Your shopping cart doesn't "forget" the DVDs, even as you hop around from page to page on the shopping site, because they're preserved through browser cookies. Cookies can be used in online advertising as well, to remember your interests and show you related ads as you surf the web.

Pop-ups:

Generally, they show advertising, which can be from legitimate company, but also may be scams or dangerous software. It works when certain websites are opened. Pop-up ads can be part of a phishing scam designed to trap you into revealing your personal or financial information as you visit web sites. Pop-ups mislead you to click the buttons on the pop-up window. But sometimes advertisers create a pop-up window that look similar to a close or cancel option so whenever user choose such options the button performs an unexpected action like opening another pop-up window, performing unauthorized commands on your system. Not all pop-ups are bad some web sites use pop-up windows for particular tasks. You might have to view the window in order to complete that task.

Case 4: Sarah was listening music online from XYZ@music.com, after some couple of hours later I came across a Pop-up which tells to download the latest songs with only one click. I filled the form displayed in my browser download section. After a month I saw my credit card bill information which is showing some unauthorized charges. I was very upset

and surprised, called repeatedly to that particular website where I have downloaded the songs but it was of no use.

Scripts:

Scripts are used to create websites more interactive. It is most commonly used as part of web browsers, whose implementations allow client-side scripts to interact with the user, control the browser, communicate asynchronously, and alter the document content that is displayed. There are specifications in the JavaScript standard that limit certain features such as accessing local files. The same script can be used for inclusion of malicious code which takes control of the web browser there in by allowing to access the files of the system. It may cause damage to the system by accessing the vulnerabilities in the browser.

Case 5: Chintu used to visit at Internet for regular updates for his school work and playing games and listening music. When playing the games I found some news popping about Lady Gaga found dead. When I click on the BBC site a survey dialog is pop out and prompt user to complete a survey form. In the respective survey form it was written "If you are true fan on Lady Gaga" Click for Like Button. As soon as survey completed I returned back to my account homepage and posted the same link for the news to be known for my family and friends.

Plug-ins:

Plug-ins is the in-built applications for use in the web browser and Netscape web browser had developed the NPAPI standard for developing plug-ins. Later this standard is used by many web browsers. Plug-ins are same to ActiveX controls but cannot be executed outside of a web browser. Adobe Flash is an example of an application that is available as a plug-in inside the web browser.

Case 6: For example, users may download and install a plug-in like Adobe Flash Player to view a web page which contains a video or an interactive game. But the plugin may be installed with a key logger which captures all the key strokes of the user typing in the browser and send it to the attacker.

Browser Extensions let you add new features to your browser exactly like extending your browser for customizing your browser with the features that are mainly important to you. In the other words you can say adding new superpowers to the browser. For example, you may install a currency converter extension that shows up as a new key next to your browser's address bar. Click the button and it converts all the prices on your present web page into any currency that you give.

Adding more code to the browser also added to security concerns, as it gave attackers more chances to exploit the browser. Because the code was sometimes hidden, extensions were notorious for causing browser crashes as well.

How to secure your Web Browser?

By default web browser comes with an operating system and it is setup with default configuration which doesn't have all secure features enabled in it. Not securing web browser leads to problems caused by anything like spyware, malware, viruses, worms etc being installed in to a computer and this may cause intruders to take control over your computer.

There is a raise of threat from software attacks which may take advantage of vulnerable web browsers. Some software of a web browser like java script, Active X etc may also be the cause for the vulnerabilities in the computer system. So it is important to enable security features in your web browser to minimize the risk to the computer.

Security zone

Security zone in an Internet web browser lets you to secure the browser and offer to trust the people, companies on the Internet. This helps to decide and adds which sites to be allowed to run the application, scripts, add-ons, install plug-in on your computer. Security zone also contains other features like adding address of web sites under restricted sites this feature is available in Internet explorer and block the untrusted sites or attack sites this feature is available in Firefox, these vary with different web browser.

Trusted site

Internet is a network of people, with all kinds of stuff for different kinds of people through various websites. Generally you don't trust everyone around you so why to trust all the web sites? Also why should you allow everyone to come into your computer without your authorization? Using the feature of trusted sites in your web browser will help you to decide whom to trust.

Internet Explorer

The following are the some of the features and their settings of Internet explorer

- In order to change settings for Internet Explorer, select Tools.
- From the tools menu of Internet explorer select the Internet options and then click on the security tab, check the current security settings and change the settings of security zone as necessary.
- To change the security setting under security level move the slider up to increase the security level and down to, medium, and low levels.
- For more settings and controls click on the custom level and then select the options you want From the tools menu option if required there is an option for: Delete browsing history which deletes all the cookies, temp files, history, active x filtering and more as shown in the figure
- To add or remove trusted or restricted web sites ,click on the sites option and then click on the add or remove button and enter your list of sites for the selected zone
- The Privacy button contains settings for cookies. Cookies are text files placed on your computer browser by various sites that you visit either directly or indirectly through third party web sites.
- From the Advanced button and select override automatic cookie handling. Then select Prompt for both first and third-party cookies. This will prompt you each time a site tries to place a cookie on your machine.
- From the menu select tools and choose the smart screen filter and click on the turn on smart screen filter and enable the smart screen

filter which is recommended, this option is used to "Avoid phishing scams and malware"

- From the tools menu select the option in private filtering settings, this option is used for "Browse privately" which doesn't store any browsing history
- In the tools menu there is an option called tracking protection which protect your information like if some websites try to track your visits to those websites or any of your personal information such information would be stopped. This feature works based on the add-ons we install.
- Enable the protected mode by this option all the web sites are opened in protected mode.
- Select the advanced tab and select the options as you want like enable " Use SSL 3.0, Use TLS 1.0 "

Mozilla Firefox

The following are the features and their setting of Mozilla Firefox web browser.

- Security settings in a Firefox control the level of examination you'd like Firefox to give a site and enter exceptions—sites that don't need the third degree.
- Customize settings for passwords, cookies, loading images and installing add-ons for a fully empowered Web experience as shown below
- From the tools menu of the Firefox browser select the options and then click on the security tab
- Under security tab enable the options like warn me when sites try to install the add-ons in and to add or remove the sites click on the exception tab and add or remove the sites you want
- Enable the option tell me if the site I'm visiting is a suspected attack site
- Enable the option tell me if the site I am using is a suspected forgery Firefox gets a fresh update of web forgery sites 48 times in a day, so if you try to visit a fraudulent site that's pretending to be a site you trust a browser prompts you message and will stop you Disable the option remember passwords for sites Firefox integrated the feature

into your surfing experience. Choose to "remember" site passwords without intrusive pop-ups.

- Select the advanced tab and enable the encryption tab in order to have a secure data transfer and use SSL 3.0
- The other feature is automated updates this lets us to find the security issues and fix updates and make the safe surfing and receive automatic notification or wait until you are ready
- One more feature is tracking which is under options privacy it stops the activities you do from the browser and we can choose the option do not tell sites anything about my tracking preferences which will not track and don't share the information to other websites.

Google Chrome

From the setting menu select the Incognito window a new window appears and pages you view from this window won't appear in your web browser history or search history and they won't leave any traces like cookies after you close the incognito window any files you download or bookmarks will be preserved.

Chrome there is a new feature that it has an own Task Manager that shows you how much memory and CPU usage each tab and plug-in is using.

The safe browsing feature in the Google Chrome displays the warning if the web address listed in the certificate doesn't match the address of the website. The following are the steps for a safe browsing setting in Google Chrome :

- From the settings tab select the options and click on the under the hood
- Enable the option use a suggestion service to help complete searches and URLS typed in the address bar.
- Enable DNS pre-fetching to improve page load performance
- Enable the phishing and malware protection
- Under cookies select the "Restrict how third party cookies can be used" only first-party cookie information is sent to the website.
- Under minor tweaks enable the enable the never save passwords
- Under computer wide SSL settings enable the option use SSL 2.0

Apple safari

The following are the features of Apple safari secure web browser

Phishing Protection

Safari protects you from fraudulent Internet sites. When you visit a suspicious site, Safari warns you about its suspect nature and prevents the page from loading.

Malware Protection

Safari recognizes websites that harbour malware before you visit them. If Safari identifies a dangerous page, it warns you about the suspect nature of the site.

Antivirus Integration

Thanks to support for Windows Attachment Monitor, Safari notifies your antivirus software whenever you download a file, image, application, or other item. This al- lows the antivirus software to scan each download for viruses and malware.

Secure Encryption

To prevent eavesdropping, forgery, and digital tampering, Safari uses encryption technology to secure your web communications. Safari supports the very latest se- curity standards, including SSL versions 2 and 3, Transport Layer Security (TLS), 40- and 128-bit SSL encryption, and signed Java applications.

Automatic Updates

Get quick, easy access to the latest security updates. Safari takes advantage of Apple Software Update, which checks for the latest versions of Safari when you're on the Internet.

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Pop-Up Blocking

By default, Safari intelligently blocks all unprompted pop-up and pop-under windows, so you can avoid distracting advertisements while you browse.

Cookie Blocking

Some companies track the cookies generated by the websites you visit, so they can gather and sell information about your web activity. Safari is the first browser that blocks these tracking cookies by default, better protecting your privacy. Safari accepts cookies only from your current domain.

Security Extensions in Browsers:

AdBlock Plus (Firefox/Chrome)

AdBlock, as its name would imply, blocks certain scripts serving advertisements on a website. As we've mentioned before you can tweak ABP for added security benefit by using a "malicious ad" blacklist. You can, of course, whitelist sites you want to support (ahem), but ABP also provides the more obvious aesthetic benefit of a web less cluttered with ads.

HTTPS Everywhere (Firefox)

HTTPS Everywhere from the Electronic Freedom Foundation will help you to secure the connection between your browser and the servers it is connecting to. It helps to encrypt your connection when possible, even when the default setting on the web site does not offer the added security. A good example is Twitter. The username and password input boxes are encrypted, but after that all text coming to or from the server is sent in the clear. (Very recently, Facebook added an option to always turn on HTTPS. Here's how to do that.) HTTPS Everywhere even helps to protect against hacking tools such as Firesheep.

LastPass (All Platforms)

LastPass secures another vector that hackers can use to try to gain access to your personal information - your password. When you use the LastPass

browser plugin, it stores your password, encrypted, for you and also allows you to easily generate a complicated and hard-to-crack password that is unique to a site. LastPass has plug-in available for every browser under the sun. If you're just getting started with LastPass, here's our introduction to LastPass, our intermediate guide, and a guide to auditing and updating your passwords with Last Pass.

NoScript (Firefox)

NoScript is a Firefox-only plugin that does one thing and does one thing well—it blocks scripts such as JavaScript, Flash, Quicktime, and more from loading in your browser window. (Chrome users may want to check out the similar Chrome extension, NotScripts.) The reason it works so well for security purposes is that malicious web sites can use these scripts as attack vectors in order to cause a browser crash and to gain access to your computer. By blocking these scripts you can make yourself significantly safer on the web.

Keep in mind that for most of us, blocking all scripts would result in a fairly broken internet, given that many websites, such as Google, Gmail, Twitter, Life hacker and others rely on JavaScript to load their pages. No Script allows you to block 3rd-party scripts or even just from unsafe domains. You can manage these settings in detail, giving you the maximum security with minimum inconvenience.

Web of Trust (All Browsers)

Web of Trust is another plug-in that does something different than the above. Instead of halting any attack vectors, it lets you know when the website you are visiting is trustworthy or not. That way if you happen across a website that you think is trustworthy and even look it, you get a warning that you should not submit your personal information to the site. They rely on user-ratings to rate their site and in my experience it has been very accurate and useful.

Tips :

- Always use the secured web browser to avoid the risks .Using secure browser we can gain access the information and resources that are available on the Internet and can have safe browsing over Internet.
- To avoid your PC being compromised and becoming a weapon to attack other machines, web browser and the Internet users are advised to: ensure that your operating system and key system components such as the web browser is fully patched and up to date.
- Install a personal firewall along with anti-virus software with the latest virus signatures that can detect malware such as key loggers.
- Regularly change your passwords with the combinations of letters, numbers and special case characters in critical web applications if a one-time password system is not supported.
- Turn off all JavaScript or ActiveX support in your web browser before you visit any unknown websites.
- Most vendors give you the option to download their browsers directly from their websites. Make sure to verify the authenticity of the site before downloading any files.
- To additional minimize risk; follow the latest good security practices, like using a personal firewall, Updating to the latest browser with security patches installed and keeping anti-virus software up to date with regular scanning the entire system.

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SECTION 7

What Is an FPGA?

At the highest level, FPGAs are reprogrammable silicon chips. Using prebuilt logic blocks and programmable routing resources, you can configure these chips to implement custom hardware functionality without ever having to pick up a breadboard or soldering iron. You develop digital computing tasks in software and compile them down to a configuration file or bitstream that contains information on how the components should be wired together. In addition, FPGAs are completely reconfigurable and instantly take on a brand new "personality" when you recompile a different configuration of circuitry. In the past, FPGA technology could be used only by engineers with a deep understanding of digital hardware design. The rise of high-level design tools, however, is changing the rules of FPGA programming, with new technologies that convert graphical block diagrams or even C code into digital hardware circuitry.

FPGA chip adoption across all industries is driven by the fact that FPGAs combine the best parts of ASICs and processor-based systems. FPGAs provide hardware-timed speed and reliability, but they do not require high volumes to justify the large upfront expense of custom ASIC design. Reprogrammable silicon also has the same flexibility of software running on a processor-based system, but it is not limited by the number of processing cores available. Unlike processors, FPGAs are truly parallel in nature, so different processing operations do not have to compete for the same resources. Each independent processing task is assigned to a dedicated section of the chip, and can function autonomously without any influence from other logic blocks. As a result, the performance of one part of the application is not affected when you add more processing.

2. Top 5 Benefits of FPGA Technology

1. **Performance**
2. **Time to Market**
3. **Cost**
4. **Reliability**
5. **Long-Term Maintenance**

1. **Performance**—Taking advantage of hardware parallelism, FPGAs exceed the computing power of digital signal processors (DSPs) by breaking the paradigm of sequential execution and accomplishing more per clock cycle. BDTI, a noted analyst and benchmarking firm, released benchmarks showing how FPGAs can deliver many times the processing power per dollar of a DSP solution in some applications.[2] Controlling inputs and outputs (I/O) at the hardware level provides faster response times and specialized functionality to closely match application requirements.

2. **Time to market**—FPGA technology offers flexibility and rapid prototyping capabilities in the face of increased time-to-market concerns. You can test an idea or concept and verify it in hardware without going through the long fabrication process of custom ASIC design.[3] You can then implement incremental changes and iterate on an FPGA design within hours instead of weeks. Commercial off-the-shelf (COTS) hardware is also available with different types of I/O already connected to a user-programmable FPGA chip. The growing availability of high-level software tools decreases the learning curve with layers of abstraction and often offers valuable IP cores (prebuilt functions) for advanced control and signal processing.

3. **Cost**—The nonrecurring engineering (NRE) expense of custom ASIC design far exceeds that of FPGA-based hardware solutions. The large initial investment in ASICs is easy to justify for OEMs shipping thousands of chips per year, but many end users need custom hardware functionality for the tens to hundreds of systems in development. The very nature of programmable silicon means you have no fabrication costs or long lead times for assembly. Because system requirements often change over time, the cost of making incremental changes to FPGA designs is negligible when compared to the large expense of respinning an ASIC.

4. **Reliability**—While software tools provide the programming environment, FPGA circuitry is truly a "hard" implementation of program execution. Processor-based systems often involve several layers of abstraction to help schedule tasks and share resources among multiple processes. The driver layer controls hardware

resources and the OS manages memory and processor bandwidth. For any given processor core, only one instruction can execute at a time, and processor-based systems are continually at risk of time-critical tasks preempting one another. FPGAs, which do not use OSs, minimize reliability concerns with true parallel execution and deterministic hardware dedicated to every task.

5. **Long-term maintenance**—As mentioned earlier, FPGA chips are field-upgradable and do not require the time and expense involved with ASIC redesign. Digital communication protocols, for example, have specifications that can change over time, and ASIC-based interfaces may cause maintenance and forward-compatibility challenges. Being reconfigurable, FPGA chips can keep up with future modifications that might be necessary. As a product or system matures, you can make functional enhancements without spending time redesigning hardware or modifying the board layout.

3. Summary

The adoption of FPGA technology continues to increase as higher-level tools evolve to deliver the benefits of reprogrammable silicon to engineers and scientists at all levels of expertise. For more information on how FPGAs are used in a variety of industries and applications, see the Next Steps section below.