VOLUME 6

http://goo.gl/ihAbH

PROTOCOL

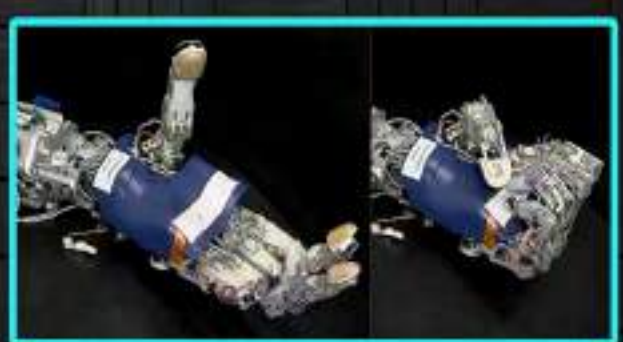
CSI STUDENT CHAPTER, D.J.S.C.O.E

SECURITY

WINDOWS 8

NVIDIA TEGRA 4

LEAP MOTION



BIONIC ARM

From The Principal's Desk

I am glad to note that the Protocol magazine of the CSI DJSCOE student chapter stands with our growing concern about the negative impacts of technology on current day life and its complex surroundings. The current issue of Protocol brings to you the information about the technology and latest developments, but in a broader sense with the deep understanding of its effect on the human life and the entire society. Technology and its implementation according to me is a very crucial and critical topic that requires attention from everyone. With the unbelievable and very rapid advancements that are taking place; I sense rising alerts for the social life of everyone especially the present generation. I am a firm supporter of overall progress in the society, but do also wish that our students and the current younger generation do not fall slaves to the invisible and grave side effects of the same which I call as the Digital Dark Side. I wish for all our students success, that is accompanied by a healthy, happy and a peaceful life. Let everyone succeed in fulfilling a meaningful life for themselves. Best Wishes.

- Hari Vasudevan

From The Branch Counselor's Desk

The CSI student chapter at Dwarkadas J. Sanghvi College of Engineering was incepted in 2001. The aim of this student forum is to provide them a platform to develop managerial skills and team work by organizing various technical events such as seminars, workshops, paper presentations, etc.

In 2007, I took over as a branch counselor of CSI student chapter at DJSCOE and in 2010, we started a News Letter come technical magazine named 'Protocol' to keep the students abreast with latest developments in IT world. I, with the help of students and faculty members present the sixth volume of Protocol.

I take pride in mentioning the fact that the student members of CSI DJSCOE chapter work round the year with the vision of taking the student branch to greater heights.

I also take this opportunity to thank our Principal, Dr. Hari Vasudevan and Vice Principal, (Admin) Prof. Ashish Daptardar for their indispensable support. I would also like to thank all the faculty members who have been actively involved and contributed to the success of 'Protocol'.

I wish Team Protocol the very best.

Dr. Abhijit R. Joshi

Our Sincere Thanks To

The CSI magazine committee would like to thank Prof. Mrs. Neepa Shah for her firm support and constant help. We take this opportunity to express gratitude to her and the entire IT faculty for the guidance without which smooth functioning would not have been possible. They created a friendly working atmosphere. We also thank the entire CSI committee for their help and assistance.

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Contents

Manisfesto

What prompts me into saving some space of Protocol-6 for this article is the manner in which the employment of technology in our day to day life is proliferating. We all are very well updated with the latest technologies, applications that are introduced every single instant (literally!) and newer versions of gadgets with better features that seem more promising than ever. We get up to the alarm-snoozes, reminders and to-do's for the day, travel in the company of ears plugged with music and fingers constantly on the qwerty, express love and hate on status updates, kill boring lectures with 'Temple Run', 'Where's my water' etc and refer to the notes that are forwarded emails or slides. And after a hectic day, the resort for relaxing and recreation varies from the latest eBook named A to the episode B of season C and the mind boggling beats of my favorite artist Z! Blah!

And after integrating the effects of all the above I see formation of indelible marks on all our lives, many of which are not appreciable. I do not plan on drawing a debate on the pros and cons of technological advancements. I solely intend to throw some light on the perspective that claims us to be the 'Masters' of technology and hence gives us the power to decide how far and to what extent our lives can be governed by the same.

To convey my dilemma through a simple thought I would like to put forth a question. What would you like to go back to as memories when you turn a little older? A few emails marked as favorite; chats saved on the memos of your phone; screen grabs and photos on your 'then' best friend's profile? Or would you prefer going back to the letters; rich with nostalgia that would have turned yellow with time and those variations in your handwriting that would perfectly reflect what your feelings and emotions while writing those were. 'Digitalized' memories will carry the same alphabets and statistics in much faster and a convenient way. Agreed. Will they carry the same meaning? And value?

In the web browsing and link clicking world we humans are constantly prowling over infinite data. No doubt it has transformed an entire age and lead to the most rapid progress. But we humans have been created to achieve more goals than just this; to understand a better purpose of life and a better reason to exist!

Enjoyment, happiness or recreation does not always mean losing one's self to loudest heart thumping music or running your fingers over the best touch screen gadgets. Happiness in the true sense is realizing and answering all the calls your soul makes to you while you are too busy leading the digitalized and the so called modern life. The most successful people are those who have the best realization of their own self. And this can be achieved by allowing yourself a little time that is (a) Away from the 'non-living' and (b) Closer to the people in your life (apart from the friend list that crosses a hundreds!)

So as we attempt to bring an edition of Protocol with the best hopes to provide all the information about the latest and most important advancements of the digital world, we also hope that it will be used in a correct and the most effective way. A way in which it will improve lives without taking the elementary meaning out of it!

- Priyanka Dalvi (TE IT)

Interview

Aditya Modi is one of the few students who make their college, teachers, friends and family proud. His vibrant personality reflects the success he has achieved from years of sincerity, dedication and his passion for the work he does. "I got my Bachelors Degree in Information Technology from D. J. Sanghvi College of Engineering. And I completed my masters in Computer Science from the University of California, Los Angeles (UCLA). Soon I landed up as an intern at LinkedIn; a business-oriented social networking site and at present I am at the position of a Software Engineer" Aditya took time out from his busy schedule to share with us his experiences and thoughts so as to enlighten us a little more about the paths to a successful career.

Journey To Linkedin

I can now claim that my hard work has paid off. I stood second in my engineering college. I was an active student programmer during my college days. I wrote a few programmes for the college including the SAP ID programme. The course gave me an opportunity to get an internship and then I got associated to LinkedIn.

Choosing programming as your profession?

The first year opened the doors to programming and grabbed my interest. I honed my skills in the subject. I started exploring the subject of Data Structure and Algorithm (DSA). Under the guidance of our professor Mrs Deepali, I started writing software programmes for the college. The experience of writing software programmes helped me in developing my programming and algorithm skills. The college now takes various initiatives to introduce competitions in this field.

Importance of programming?

One cannot learn English without learning the alphabets ABCD. The two languages i.e. C++ and Java are the basics of programming. Knowing the basic concepts well helps to avoid or reduce the problems that might arise in the further studies. Programming demands a balance between algorithm and selection of language.

Data Structure & Algorithm?

The most important element for IT and Computer students who sit in front of a computer for coding is DSA. Programming languages change frequently. Today it is Java tomorrow it might be Python, RubyRails etc. But the basic logic behind coding remains the same. And even today whenever I get time I revisit algorithms. Studying DSA today is bit simpler as compared to our times with various online courses and lectures. To get true grip in DSA, determination towards the subject is required. Learning advance algorithms like dynamic programming which are not a part of the syllabus is now a priority.

Approach towards Master's?

After my Sixth semester got over I started studying and studied for one and half month. Before the completion of the seventh semester I got a call from UCLA. One needs to get above average scores for getting admission in reputed colleges of reputed universities. I would say that all the tasks I undertook as a student programmer helped me a lot.

Importance of 4 years in Masters

UCLA was more of a research college. We didn't have more of algorithm but we had subjects like advance computing, artificial intelligence etc. So the previous knowledge wasn't that helpful here. But to apply that research into actual world, we definitely require algorithms! For example in one of the subject I had to build neural networks which emulate animal behaviour. This was based on pure research but the implementation of the same demands algorithm knowledge.

Experience in UCLA...

People tend to think that it is difficult once we get into foreign universities. But Indians perform much better compared to others provided they are focused and their basics are strong. However in my opinion one should do

Continue reading on page 29

Top 5 Gadgets Of 2012

Mobile Phone [Samsung Galaxy Note II]

With a screen as big as 5.5 inch the Note II is the best mobile phone for the year. It has a resolution of 1280x720 and is packed with a Exynos Quad Core processor clocked at 1.6 Ghz. The S pen has got some new features which makes multitasking even more simple.

Tablets [iPad 4th Generation]

The latest incarnation features a retina display for accurate colours and great viewing angles. The new iPad also features a faster SoC called A6X which has quad-core graphics for smoother gameplay. The 5MP iSight camera continues to be the best one fitted on any tablet till date. It is capable of full HD recording and really good Macros and Low Light Photography.

Television [LG 84LM9600]

The LG 84 inch TV is packed with a resolution of 3840x2160 which is 4 times the resolution of full HD and is as thin as 4mm. It makes use of edge lit LED's which provide deeper black levels and large color saturation. Other features include in built Wi-fi and WiDi, Cineme 3D, Apps, etc. Though content of this high resolution is hard to find but it definitely gives us a hint of what we are going to have in the future.

Camera [Canon EOS M]

The camera is based on the new EF-M mount system and comes with a 22 mm f/2 STM lens. The camera packs in an 18MP sensor with Canon's Digic 5 Image Processor. You have the option to shoot up to an 12800 ISO level for still and 6400 ISO for video. It's also capable of full HD recording, Pictbridge, supports HDMI, Direct Print, and lots more.

Laptops [MacBook Pro Retina Display Mid 2012]

Apple is a company known for its build quality. The MacBook Pro Retina display has resolution of 2880x1800 which is more than 2K. The color saturation has been improved and the text appears sharp. Apart from the screen the MacBook Pro is packed with Intel IVY Bridge Quad Core processor which can be clocked up to 3.7 Ghz. It uses Nvidia graphics using Keplar architecture. It is an ideal PC for gaming and multimedia use.

- Kashif Memon (SE IT)

Gadgets To Look Forward In 2013

Oculus Rift

Virtual Reality gaming is no longer a dream. Started from a Kickstarter campaign the all new Oculus Rift VR Headset resents your environment in full 3D with a 110° field of view that tracks your head movements so you can look around virtual worlds when connected to a PC. It has been given the go signal by leading game creators like John Carmack ,creator of Quake. Ranging under $300 it is an unprecedented cost for this kind of technology.

Xbox 720

Successor to the Xbox 360 and codenamed "Durango", the Xbox 720 is circled with a lot of rumors. The console will include Blu-Ray support, the ability to record from live TV, 3D gaming and a renewed Kinect device that will supposedly work with augmented reality glasses. It is expected to be packed with 8 GB RAM and a Quad Core processor.

OUYA

OUYA is a new gaming console which will be powered with Android 4.2. The console will cost $99 and will be packed with 1 GB RAM. It is powered by Nvidia Tegra 3 processor which has a system architechture of ARM Cortex A9. It has Wi-fi., Bluetooth 4.0, Ethernet port and it has 8 GB internal flash storage.

Amazon Phone

The internet giant is said to be adding a phone to its range of Kindle readers. Don't expect any revolutionary hardware but the software will allow seamless integration between Amazon's Appstore, Amazon MP3, Amazon Cloud Player and Kindle books. It's likely to be cheap. This is because Amazon is expected to subsidize the cost of the handset and the monthly price plan using the revenue from the vast amount of Amazon media, electronics and everything else you are going to purchase with it. It is also likely to come pre-loaded with a bar code scanner, which will point out how cheap everything is on Amazon.

- Jash Ajmera (SE IT)

Project Glass

In a year marked by prolific developments in technology, right from a real controllable bionic arm, to a curiously beautiful indoor cloud; Google has managed to hold its own with the announcement of Project Glass- A research program that aims to mass produce augmented reality head mounted displays (HMDs). Wait, what?

Augmented Reality is an enhanced, more detailed view of the things around you. It is akin to the HUD options in racing games that give you the speed, acceleration, rear view and a variety of other details while you focus on driving that car. The Glass project is similar, except that it's real. A head mounted display with an eye-piece that doubles as a mini-computer; capable of feeding you live data of your surroundings in real time. Quit drooling over Bond and Ethan Carter, the future is here!

The minimalistic design makes the glass look stunning. A subtle aluminium strip with two nose pads and the HUD right in place of an eye-piece, give the wearer an instant air of importance. Future glasses may have HUDs integrated in the wearer's glasses itself, which is quite enough to wag tongues all around. What's more is that the whole system will be built around Google's own Android OS, dragging with it the familiar Android feel. Quite literally, it's like a smart-phone right in your eye which brings in augmented reality.

The HUD is designed to produce information in a smart-phone like format. This instantly brings to mind the First-person shooter games of old, many of which included in-game augmented reality displays to provide a futuristic air. An innovation such as this has immense military as well as medical applications. A team of army men needn't use bulky gadgets, but simply obtain the topography of any region with pin-point accuracy, straight in the eye! Surgeons might be able to use the same too, although it is unlikely the glass will meet such highly specific needs in its formation years.

As if that just isn't good enough, Google X Lab has gone all the way to offer internet interaction using natural language voice commands. However, this might just prove to be the cog in the wheel, given the absence of a truly infallible voice command system, with the exception of Apple's Siri having gained moderate success. How well Google manages to implement this will be crucial to consolidate Project Glass's image as a truly path-breaking product using technology, that isn't in any way new.

But one way or other, the Silicon Valley giant stands to benefit from the lack of competitors in this market. The device is expected to be released for developers in early 2013, and shall be made available for consumers a year later. The introductory Developer's edition is set for a retail price of $1500 USD. Fancy that!

- Pratik Mehta (SE COMPS)

Bionic Arm

Since eternity, mankind has been researching for perfect health i.e. an all-healing herb: sanjeevni, etc which has been the driving force in medicinal research. And since the escalation of war, different governmens have also been researching for methods to minimize collateral, & to try to give their disabled soldiers a 2nd lease at life. For which a very high amount of money is spent every year on R&D in integrated bionics.

Those people who have lost a leg, can use crunches , in some cases Jaipur Foot (like famous dancer Sudha Balakrishnan), and if economically feasible, a mechanical leg (used by many paralympian athletes). But for those who have lost an arm, did not have any such substitutes. But all this can soon be a story of the past.

The worlds 1st thought controlled implantable robotic arm is being developed by Max Catalan , researcher at Chalmers University. This technology helps amputees in controlling the mechanical arm, much like a normal arm. In this technique the mechanical arm is implanted directly into nerves & remaining muscles.

Electrcally controlled prosthetics have been since 1960s but unfortunately, the technique has not evolved much sinse then, and advance electrical prosthetis are available, but their functioning is lilmited, because they are difficult to control, uncomfortable ,& require lot of pre-programming.

This Project involves a process called Osseointegration, which anchors the prosthetics directly to the skeleton. This operation will consist of placing neural and muscular electrodes on the patient's stumps, as well as placing the bidirectional interfaces into the human body.

The electrical impulses from the nerves in the arm are captured by a neural interface , which is then send to the prosthesis, which then works like a normal handThe 1st operation is going to be carried out this winter& the 1st volunteers will get their limbs by 2013. (A glimpse of this technology was seen in Will Smith in the movie iRobot)

Also with a little modification in the technology , prosthetic legs with fully functional fingers can also be developed, research on which has already started. Each amputee is different, so integration will be difficult to achive but not impossible.

- Vivek Sanghvi Jain (SE COMPS)

Logo Quiz

Answers (Left to Right) - Atari, Cisco, Ubisoft, AMD & Gnome)

Mind Reading

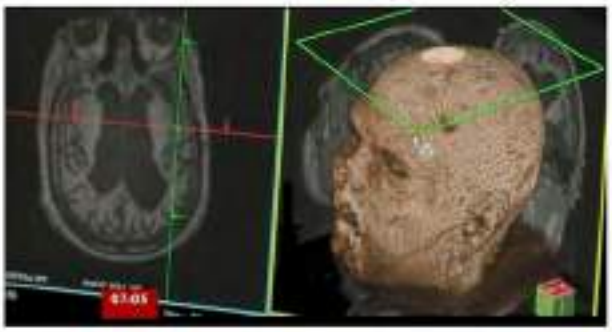
A canadian man Scott Routely was left with severe brain damage after a car crash 12 years ago. Although his eyes could open, and his body followed normal sleep/wake cycle but all the tests showed that he had no perception of him or the outside world, and that he was in a vegetative state.

Using some new techniques in his research, Dr. Adrian Owen Research Team Leader of the Brain and Mind Institute of Western Ontario stated that the MRI machine with a few modifications could be used to decipher the brain waves of Scott and find out whether he had any awareness, by giving him certain instructions, and then checking the MRI machine for any Brain Activity. His parents were convinced that he was conscious and trying to respond by moving his thumb, but medical staff didn't believe them.

Scott was instructed to imagine playing tennis for 'No' & walking in his house for 'Yes', for any questions asked. Readings on the machine are deciphered based on the blood flow pattern in different parts of the Brain of the patient.

And since then he has been able to use his thoughts to communicate with his family & has told his family, that he is not in any pain.

There was another team of Doctors & Hospitals at a private research centre in US, that worked on a case, where a machine similar to an MRI machine, was modified such, that it could convert thoughts, into crude or negative like images.



With a little more research, this might become the biggest revolution in medicine & technology in th 21st century.

Although this device has tremendous applications not only in medical, but in several other fields, it can also be gravely misused, which is one of the main reasons for this great discovery not being made too public.

Such a device can be used to steal secrets, and data from a person's head like showed in the movie Inception. But looking at the bright side many people who die by living such a life can be given new life.

- Vivek Sanghvi Jain (SE COMPS)

Hackable Insulin Pumps

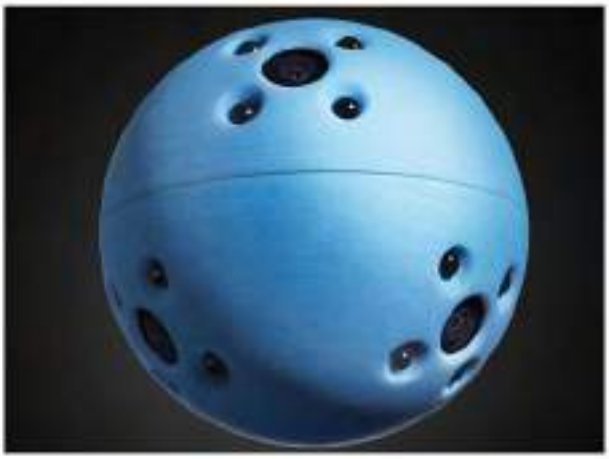
If you are a diabetic and carry an insulin pump you better watch out as you could become a casualty of insulin overdose! Jay Radcliffe, director of the Smart Device Threat Intelligence Centre discovered serious loop holes in the insulin pumps that diabetics carry.

Until now all devices mentioned may have been threatening your data, car etc. But this has just taken it to a new level! In the Red Hat Technical Security Conference methods of hacking and subsequently altering the settings of Insulin Pumps made by one of the world's renowned medical device makers-Medtronic has been accomplished. The insulin pump is designed to deliver a continuous amount of insulin 24 hours a day according to a programmed plan which is unique to each pump wearer. The amount of insulin delivered can be changed by the user. The insulin system consisting of a wireless insulin pump in combination with a glucose monitor is susceptible to wireless attacks thus making it

Bounce Imaging

Two MIT students , Francisco Aguilar and Dave Young came up with the idea of a cricket ball sized slightly damage resistant orb capable of clicking 360° pics with 6 small cameras integrated in the orb. It also has sensors enabling it to detect air quality, temperature & radiation.

As this throwable device can relay panoramic images to let first responders or soldiers know what they're getting into. It is also termed as a low cost sensor for 1st responders.



This device was made primarily to help firefighters & cops to provide them with an accurate & a safe picture to carry out rescue operations in a burning building, in a hostage situation or in a building leveled by earthquake. You can easily toss the ball into the required area, & it wirelessly sends the readings & the recorded pictures to a mobile device located nearby.

First responders and military personnels repeatedly put themselves in harms way to scout out places of interest.

There are other devices also to perform a similar task like the FirstLookRobot which is very costly, & comparatively complicated to operate, hence this device offers the option, of easily scouting an area which might be life threatening to directly enter.

Google's mobile OS Android 4.2 also makes use of this type of imaging and has named it as Photo Sphere. It allows users to take 360 degree panaromic images. The rear camera is only used.

The difference between the Android version and the actual device is that the Android device is with many people and users will get the feature with just a simple update. But the device can be used in places where the phone cannot be used. Even at the image quality the Android device will be no match to the actual device. The device also has an upper hand because of the multiple cameras.

Priced at $500, this device is going to be released this year, The device has received lot of funding and support from many police and fire departments in the US.

- Vivek Sanghvi Jain (SE COMPS)

possible for hacking. It is also believed that intercepting wireless signals and broadcasting a stronger signal to change the reading in of the monitoring device can cause changes to the dose of the person. Also this could be done even from a distance of like a few hundred feet. And once these setting are tampered they force the pumps to release new quantities of insulin thus capable of instant death! With hacking of wireless devices taking quick strides it may not be far that this technological brilliance could fall into the wrong hands and result in catastrophic effects.

The live saving devices are being used to do just the opposite! It is time we all get cautious and make every possible effort to not let these misuses reduce the importance of such brilliant technologies.

- Prahalad Prabhakar (SE IT)

Leap Motion

Leap Motion is an advanced motion sensing technology that seeks to make interaction with computers better and more natural and intuitive.

The Leap Motion controller looks to do away with the standard keyboard and mouse technology and replace it with intuitive gesture control. Whether you're on a Mac or PC, now you can click, grab, scroll and pinch, using only your hands.

3D gesture control has long been imagined and now, it has made its way out of science fiction to real life. Leap Motion will open doors to a new age of computing and transform human-computer interaction like never before.

Playing Angry Birds on your touch screen smartphone is so last year. Now you can play it touch-free with your natural hand movements in the air.

Leap Motion is an upcoming motion-sensing platform that aims to let you type, click, scroll, draw, shoot and almost anything you can do on a computer with the wave of a finger.

The Leap Motion Controller is a two-inch sensor that you place in front of your laptop/desktop keyboard. The black glass on the Leap's upper side hides two small cameras and a handful of infrared LEDs, which track the motion of a person's fingers to an accuracy of a hundredth of a millimeter. Minute movements of individual fingers can be mapped. Using Leap Motion enabled software, the controller creates a 3D interaction space inside which it tracks hands and fingers as well as tools such as pencils very accurately and maps them accordingly on the screen.

All of the processing needed for gesture tracking is done by the driver software installed on a user's computer.

Leap Motion's system is available to pre-order for a mere US $69.99 and will play nice with either Windows or Mac.

Just connect this iPod-sized device and instantly get 8 cubic feet of awesome, intuitive, 3D interaction space. Leap Motion is a clear indication that it wants to give some real touch competition to gaming consoles like Xbox Kinect, Wii U, etc.

Get Started

- Priyanka Kulkarni (SE IT)

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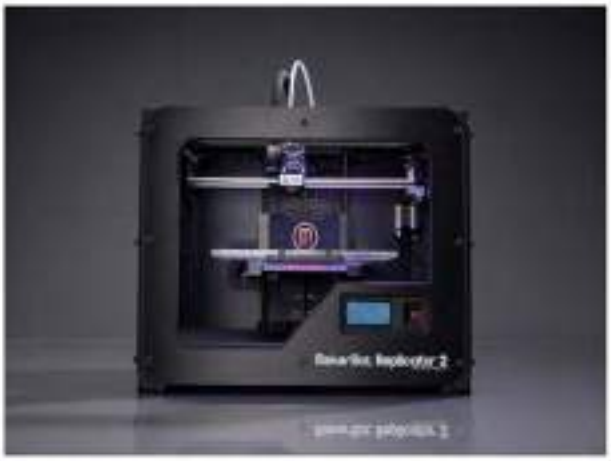
Maker Bot Replicator 2

Imagine a future when a device connected to your computer can print a physical solid object. Although this seems rather far-fetched, this technology actually exists and is now available to purchase in stores.

New York-based 3D printer manufacturer MakerBot has advanced the phenomenon of 3D printing with the launch of the Replicator 2.

Featuring a 100-micron layer resolution, which is about as thin as a sheet of copy paper, the Replicator 2 is the company's highest resolution printer yet. The Replicator 2 boasts a sleek futuristic design with an all-black sheet metal frame.

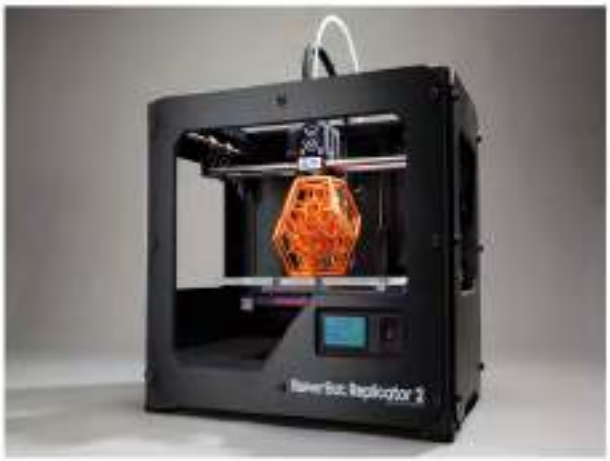
It is a faster and stronger 3D printer, with better products that are built on MakerBot's "PLA material." This renewable material is made from corn and leads to smoother objects that are less prone to cracking.



The Replicator 2 is being marketed as a 3D printer for the "prosumer", the union of the producer and the consumer. The widespread adoption of Replicator 2 by engineers and just hobbyists alike depends on whether MakerBot succeeds in bringing the refinement and capabilities of the newer models into a more-consumer-oriented product in the near future.

The goal for more consumer appeal is apparent in MakerBot's new MakerWare 3D printing software. MakerBot says it has improved the speed at which the software prepares object designs for 3D printing, and in general made it simpler and easier-to-use than the previous version.

It supports Windows XP and 7, Mac OS X, and newer versions of Ubuntu. This proves as a big plus point as it has cross platform support.



The Replicator 2 is ideal for the desktop of a professional engineer, yet easy enough for anybody with an imagination to use.

What was once a very niche, professionals-only venture is becoming ever closer to a consumer-level industry. It makes a future where 3D printers are as common as computers seem not so far away.

Video - http://goo.gl/OSCEi

$2199

- Priyanka Kulkarni (SE IT)

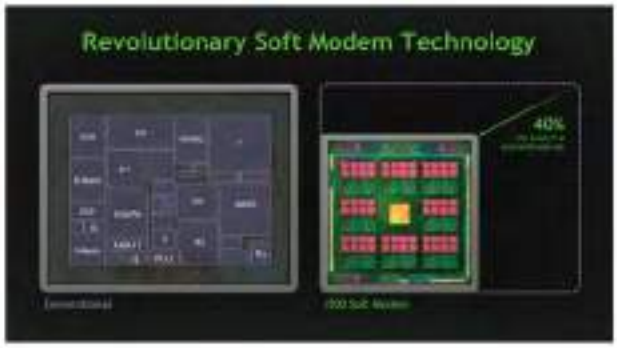
NVIDIA Tegra 4

Nvidia has introduced the world fastest mobile processor i.e. NVIDIA Tegra 4. It is a 28nm chip with record setting performance and battery life to power smartphones, tablets, gaming devices, PCs, navigation systems and auto infotainment.

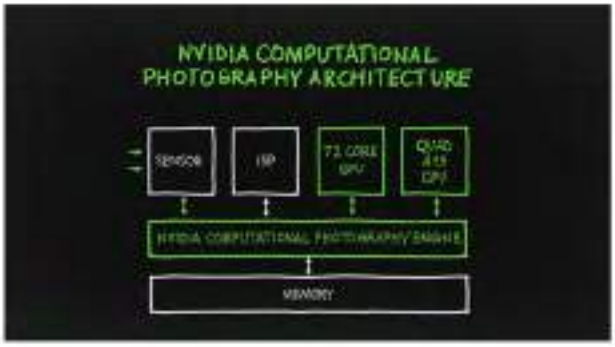
Tegra 4 offers exceptional graphics processing and lightning fast web browsing. It adds on to the capabilities of the camera through computational photography.

Tegra 4 was codenamed as Wayne and features 72 custom NVIDIA GeForce GPU cores which is equivalent to 6 time the horse power of Tegra 3. This brings in realistic gaming experience and support for higher resolution displays as large as 4K. It is also powered by the world's first quad core ARM Cortex A15 CPU architecture.

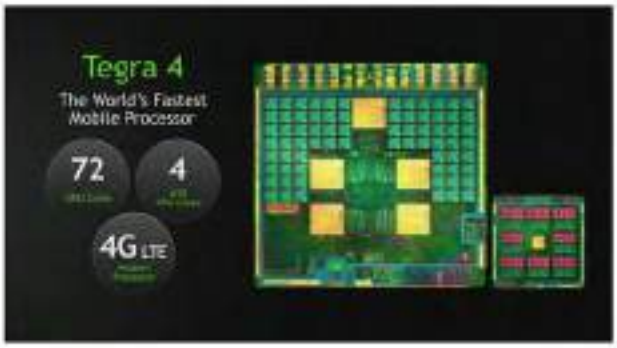
Tegra 4 supports worldwide LTE voice and data through an optional chip named fifth generation NVIDIA Icera i500 processor. It delivers 4 times the processing capability of its predecessor and is just 40% the size of conventional modems.



The Computational Photography Architecture inside the Tegra 4, automatically delivers high dynamic range (HDR) photos and video by fusing the power of GPU, CPU and the camera's image processor. The HDR images taken with and without flash provide higher details in the dark as well as bright areas.



Tegra 4 is packed with lot of things and so it is essential that it has battery saving capabilities. Therefore it also includes the second generation battery saver core for low power consumption and it makes use of PRISM 2 display technology to reduce backlight power while delivering superior quality visuals. Tegra 4 consumes 45% less power than Tegra 3 and enables up to 14 hours of HD video playback on phones.



The NVIDIA Tegra 4 is USB 3.0 compatible and can encode and decode videos of resolution as high as 2560x1440. It includes VP8 acceleration.

We are seeing upgrades coming to content area where every television is getting upgraded to support Ultra High Definition i.e. 4K. Tegra 4 supports 4K and hints that we will soon get 4K ready content for viewing like TV channels. NVIDIA Tegra 4 will give tough competition to Apple's and Samsung's next generation processor.

- Nayan Seth (SE COMPS)

Fusion Drive

Fusion Drive is a hybrid storage which combines high storage capacity of traditional hard drive with high performance flash drive (known to us as SSD). All the disk intensive apps and tasks from booting up to launching apps is faster and more efficient.

All the frequently used items are kept ready on the flash storage of 128 GB while less frequently used items go to the traditional hard drive.

The performance doubles. Apple Mac OS X is very good at handling multiple apps and opening huge bunch of apps on system equipped with Fusion Drive is even faster. Intensive RAM using apps like Adobe softwares, Final Cut Pro X, iPhoto, etc work like a charm. The overall RAM management is also way better than conventional systems. Playing videos of higher resolution will also not bring upon much load to the processor as it used to bring in the old systems.

The read and write speed also improves up to 3.5 times its predecessor. This is an indication that the files get accessed much faster from the main memory as well as the cache memory.

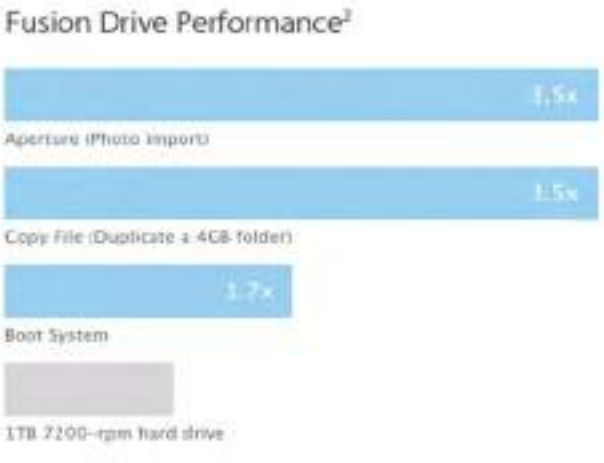
The Fusion Drive comes pre configured. However external drives cannot be used with the Fusion Drive. The hard drive can be partitioned into two drives and the flash storage cannot be partitioned. The additional partition created is not a part of the Fusion Drive.

Apple has this closed approch towards its products and by not allowing the external drives to become an integral part of the Fusion Drive is a big disappointment for developers.

For making partitions the pre installed Disk Utility can only be used. Partitions can be created to load Windows too but it is important to use Boot Camp Assistant for Windows partition.

The Apple Fusion Drive comes in 2 models. One includes 128 GB SSD + 1 TB HDD which is available for Mac Mini and late 2012 iMac 27 inch. The second model includes 128 GB SSD + 3 TB of HDD which is available for only for the late 2012 iMac 27 inch.

The Fusion Drive is currently available only for Mac Mini and iMac which is not good as users of MacBook Pro and MacBook Air have been left out. But it has happened earlier and Apple wants to repeat the history. It seems Apple will bring Fusion Drive as an upgrade for next generation MacBook Pro and MacBook Air. They are expected to arrive mid 2013.



Apple has been trying hard to make read and write speeds faster since the launch of their phone and tablets. The phone and tablet comes with a flash storage but for the desktops, Apple has decided that Fusion Drive is the solution.

SSD's are still quite costly and in the near future when we see its price going down, Apple might want users to switch to Flash Drives completely. Seeing the progress of USB 3.0 at CES 2013, it seems we might have some high speed drives awaiting in near future.

- Nayan Seth (SE COMPS)

Technology's Dark Side

After reading hundreds of stories of phishing, hacking and malware one eventually learns the importance of anti viruses and tries to keep personal data safe. However these are not the only ways your personal data could be accessed. Well you could say these are the most elementary ways! Brace yourself as the following devices will surely leave you wondering if your personal data is really safe!

ATM Skimmers

These are rogue devices which are used to obtain information from your ATM cards. They are programmed to read and record your bank card's magnetic strip and then pass the data on to criminals. They are placed directly over the card slot.

Skimming generally has 2 components. One when the card is placed using electronic devices, the card's magnetic strip is recorded and stored. This alone is however of no use as the ATM's PIN no is also required to access the money in your account. For this, a tiny hidden camera is often used. Most often spy cameras are positioned to get a clear view of the keypad and record all the ATM's PIN action. A pinhole or off-colour piece of plastic could give away the camera's hiding place. Sometimes cameras could even be hidden in brochure rack.

Okay! You would argue that the camera taking images of the pin may be too farfetched. These conmen haven't waited long. They have introduced new ways of getting your PIN. Just like the card skimmers fit over the ATM's true card slot, skimming keypads are designed to mimic the keypad's design and fit over it like a glove. Yes! A keypad over your normal keypad to get PIN! Hence if you notice that the keypad on your ATM seems to protrude oddly from the surface or any such anomalies, beware and report them. Or if you spy an odd colour change between the pad and the rest of the ATM, it could be a fake!!

Radio Frequency Identification

RFID chips are tiny devices that contain information about the object they are attached to, which may range from an ID card containing personal medical information to a car-key fob and also to a credit card! These RFID chips/tags have electronically stored information of the item in which they are embedded. Making communication with them is child's play! Also they don't require any power source as they are powered by the nearest receiver. Hackers claim that RFID information can easily be accessed, erased and over written with ease.

All this process requires is making a scanner and carrying it around the article whose data is required to be accessed. As the scanner approaches the article it sends out some signal to the desired object (the RFID chip) which in turn responds by sending the information it contains. The scanner then records this information and transfers it to the desired laptop using a simple USB cable. There you have it all the information using a simple cloner/scanner which can be made using materials worth $20. Luckily for us the RFID can be encrypted and thus be protected.

However the technology is relatively new and has been found to be used in countries like Malaysia and Australia.

- Prahalad Prabhakar (SE IT)

Tips To Keep Phishing Away

The World Wide Web is just like an encyclopedia which has answers to almost all our questions. You never know when a virus, spyware, or a Trojan might sneak up on you, or when you might fall for one of those personal data-robbing scams.

E-commerce is seeing huge growth and so is cyber crimes. Most of these e-commerce websites are hacked to get our credit card or debit card details. Even internet security technologies like SSL, TSL, Antivirus programs are not enough to keep us secure. New techniques to hack our data come up every day and many of these techniques are related to Phishing. Below are some tips to prevent yourself from getting hacked due to phishing.

Unrealistic Offers On Websites

If you ever see an ad on websites like a FREE gift certificate, Job offers, offers relating to money, then just STOP. These unrealistic offers on websites are meant to compromise your internet security. They're usually surveys promoted by phishers who want you to fill in an online survey with your account credentials and other personal details which includes credit card numbers. In exchange, you'll supposedly receive the promised items. But after you give away your details, the items you were promised will never reach you. Avoid clicking such ads.

Fake Warnings From Bank

Many a times you may receive SMS or email regarding your bank account saying your credit card has expired and urging you to hand over banking details. Most of the times these are scams. To avoid this check the headers in the E-mail and if you received it on SMS then contact your bank to check the status.

Charity Scams

Whenever you hear about a natural disaster and global health issues involving helpless children, you wish you could do something to help out. While there are reputable organizations that gather donations, there are also cyber crooks who want to take advantage of your generosity. They send e-mails or post heartbreaking messages on online forums, asking you to donate money to a reputable charity. More over even educated people share stuff like this knowing that it may be fake. When you click on the link you go to a phishing site where you're tricked into giving away your credit card details. Avoid clicking on these links or try to get some more information on the matter and then click on the link. Even if you click on the link then just check the IP Address of the website and check whether it is linked to a proper well known domain. Also check whether it has SSL security enabled or not.

Fake Softwares

Many a times we see advertisements which say clean all the viruses on your PC for free or some other software related advertisements. Most of the time they are fake and we end up downloading the software which turns out to be a malware or a virus. Avoid downloading these softwares or do a background check of the app before downloading. Try Adblock plugin on your browser.

- Jash Ajmera (SE IT)

Phone Backup

Most mobile subscribers store important personal data on their handsets. In the evant that a phone is either lost or stolen this often means the loss of valuable data for the subscriber and a lot of time and frustration spent on re-entering contact data. As for the photos, there is no way to retrieve these precious memories. A lost or stolen phone also has an adverse impact on the mobile operator, if the subscriber no longer has its phone, no calls will be made and no text messages sent and as such no revenue will be generated for the mobile operator. This inability to transfer valuable data on to a new phone poses as a big barrier to phone replacement.

Voxmobili has developed Phone Backup, a complete and comprehensive end-to-end solution to these issues. It enables the mobile operators to increase ARPU, reduce churn and promote phone replacement.

Phone Backup provides a simple way to securely save mobile data including; contacts, events, tasks, text messages, photos, music and videos. The transfer of data to the network storage is achieved by using data connections such as GPRS, 3G or WiFi. Phone Backup not only supports handset data but also SIM contacts thanks to the partnerships Voxmobili has formed with leading SIM vendors. In addition, Phone Backup also supports roaming detection and sends notifications to the subscriber whilst they are abroad.

In case of loss, theft, damage, mistakes or handset upgrade, data that has been backed up can be restored onto any supported device based on the handset data capabilities. Phone Backup features a phone swap mechanism that allows end-users to retrieve their personal data using their SIM card with a friend's handset. Phone Backup is supported by a large range of handsets such as Nokia series 40, Sony Ericsson series W or K, Samsung and Motorola as well as Blackberry, iPhone and Android phones.

Phone Backup comes with a fully customizable white label web user interface. Built on the latest Web technologies (AJAX, FLEX etc), the interface allows the end-user to manage their valuable data online. Voxmobili platform integrates directly with the mobile operator portal allowing a single sign-on experience.

Voxmobili provides tools and wizards to ease self-care and remote service activation: OMA Client Provisioning (CP), OMA Device Management (DM), SyncML OTA settings, WAP Push for client download and automatic application update. Phone Backup can be updated (account, clientâ€¦) from OSS/BSS and Web interfaces.

The anti-theft feature of Phone Backup allows the end-user to lock their phone remotely. The phone is capable of locking itself when the SIM card has been removed or replaced with another SIM. When the phone has been locked and a different SIM card is inserted it will start beeping. The phone location is published on the Internet and sent to the end-users' key contacts enabling the end-user to locate its handset. In the case of confidential and personal data being stored on the phone, the end-user can delete all its personal data from the phone remotely via the Internet or by SMS.

Overall the app provides very essential features and the biggest plus point is that it is available on various platforms.

- Ishita Shah (SE IT)

Windows 8 Tips & Tricks

So, you upgraded into Windows 8! That's great. But you probably feel a bit lost without the Start button. It takes awhile getting used to the not-so-new environment and getting over the loss of the classic start button, a trademark Windows feature. Here are a few quick tips amd shortcuts to get you started :

Keyboard Shortcuts

Windows key = Start screen.
Windows key + M = Minimize all the windows on the desktop.
Windows key + E = Open Explorer.
Windows key + D = Go to the desktop (if you are in the start screen).
Windows key + Tab = Open a list of currently running programs.
Windows key + Q = Global search menu. Search anything.
Windows key + F = File and folder search.
Windows key + Pause = System Properties Page (To see your PC's specs).
Windows key + "," = Make all windows transparent and see the desktop.
Windows key + "." = Rearrange a window to the left side or to the right side.
Windows key + R = Run command (Open system tools directly. E.g.- msconfig).
Windows key + X = Quick Access Menu (includes Command Prompt, Disk Management, File Explorer, Run, and more).
Windows key + I = Settings menu.

Startup

Earlier the startup settings were in the msconfig tool but they have now shifted to the Task Manager. You can allow or Disable startup programs as you wish right from the Task Manager itself. Moreover, it also shows the level of impact on the startup time so that you can disable unwanted startup items.

Start Menu

If you have downloaded a lot of apps from the Windows Store and get tired of scrolling all the way to open the app, here is a way. Drag apps of similar type/genre (e.g.- games, productivity, work etc.) to the right side of the start screen so that they form clusters. Hold down control key and scroll up on your mouse or trackpad (in other words, zoom out) . This will make the tiles on the start screen smaller and you can get a bird's eye view of all your apps. Next right click on a cluster. You will see a "Name Group" option on the lower left corner. Name the group. You're done! Now all your games and music apps and news apps can be organised in different groups!

Kill Apps

Closing/killing an app was easier in the older Windows PCs. They all had a big red button with a cross. But you won't find them in your Windows 8 Start Screen apps. But you still have many other ways to kill these apps.

Method 1: Take your cursor to the top of the screen. Your cursor will change into a 'hand' cursor. Click and hold there and drag down to the bottom of the screen. It will kill the app and you will return to the Start Screen.
Method 2: Take your cursor to the top-left corner of the screen. You will see a list of open apps in the pane that appears. Right-click on an app and click on 'Close'.
Method 3: This is old-school, really. If you haven't guessed it yet it is Alt+F4.

Native Desktop

Open Task Schedule tool. Open "Task Scheduler Library" on the left pane and select "Create Task". Give it any name. In the Triggers tab select New and select "At Log on" from the drop-down menu. In the Actions tab select New and write Explorer in the Program/Script field.

- Ishita Shah (SE IT)

Responsive Web Design

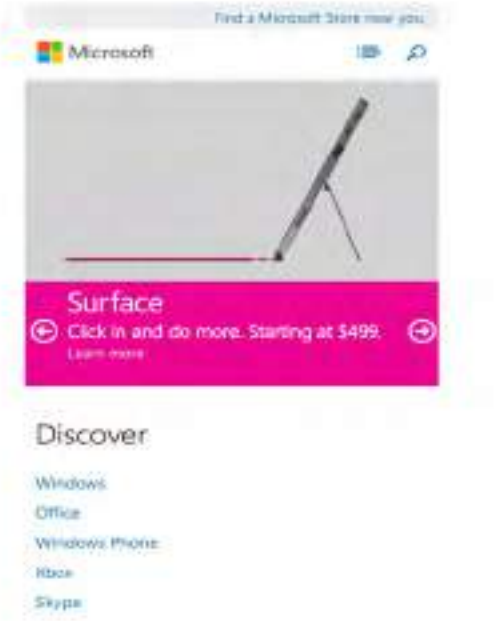
We cannot live without internet. We daily visit thousands of websites but we fail to notice something. When we visit website on different screens like a desktop, tablet or a mobile, we get a different layout. And the url is also redirected to m.something.com, etc.

But thats old technology. Today we have seen great improvements in the web development due to CSS3. With CSS3 websites can automatically resize themselves according to the display. This is known as the Responsive web design. Media queries in CSS3 make it possible for websites to resize.

In such type of design there is no need of an additional sub domain. Various web browsers have their own engine. Like Chrome & Safari use webkit.

Mozilla Firefox has a different HTML5 engine i.e. gecko. So every time a website is designed an extra line of code is added for Mozilla Firefox. For easier coding there are CSS grids which users can use to make their website responsive if they have no clue on to do that. One of the most famous responsive grid system is Bootstrap by Twitter.

The major advantage of this design is that all the displays will give similar desktop like feel. The website which is responsive goes through a lot of coding as it has to be made optimal for tablets and mobile displays as well. So additional code is added for these displays.



The above website is of Microsoft which when viewed on mobile gives similar desktop like feel. The major disadvantage of Responsive Web Design is that advertisements cannot be resized.

eg: http://www.engadget.com
http://www.microsoft.com
http://twitter.github.com/bootstrap/

- Nayan Seth (SE COMPS)

H.265

We stream a number of videos everyday and we always try to stick to DVD quality i.e. 480p. But that will soon change. ITU has accepted new standard i.e. H.265. H.264 was its predecessor which did a good job but was not that great for UHD videos. With new compression techniques built in with H.265, 1080p videos will require half the data it required earlier.

This means that networks with slow speeds will be able to deliver content online in higher quality. Definitely it won't be implemented immediately. Many softwares will come up for encoding videos with the H.265 standard. The UHD televisions which will come in the future will have full support for H.265.'

- Nayan Seth (SE COMPS)

Ultra High Definition

Ultra High Definition is the next level of high definition. High Definition includes 720p and 1080p. With Ultra High Definition we have 4K and 8K. These are the digital formats approved by ITU (International Telecommunication Union).

4K is 2160p and has a resolution of 3840x2160. It is equivalent to 8.3 megapixels and is 4 times more than 1080p i.e. Full HD. 8K is 4320p and has a resolution of 7680x4320. It is equivalent to 33.2 megapixels and is 16 times more than 1080p i.e. Full HD.

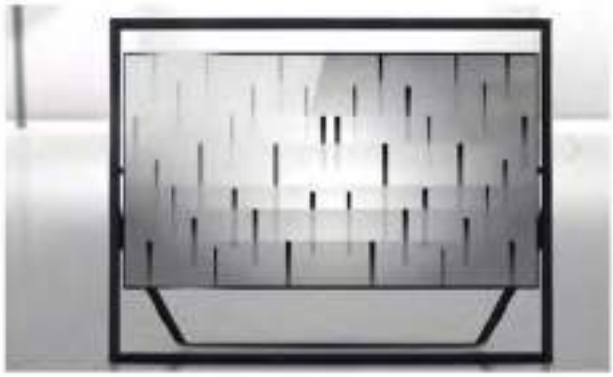
The Full HD trend began recently in India and every Set Top Box provider tried to attract users with the number of HD channels they have but in reality most of the channels are up scaled i.e. they are converted to 1080p and are not actually 1080p. We will be observe similar thing in future where many channels will be upscaled to 4K or 8K.

Currently Sony, LG, Samsung have come up with 4K displays but the problem is there is no channel which is shooted at 4K or 8K. Movies like Transformers have been shot at 4K. The quality of UHD and HD can not be distinguished when viewed at a distance of 20 to 30 feet. Therefore 4K and 8K will be of great use in Cinemas.

With 4K and 8K we will see big improvement in color saturation. The blacks will appear more black. We will see displays which will sport high speed support for wires in order to deliver 4K or 8K content. The motion rate of displays will also be very high. This will be great for gamers. The displays will also support high frame rates.

We have seen Full HD displays on smartphones and retina displays on Laptops and desktops. Expect these screen resolution to improve in near future. We will also have websites of higher resolutions. The current standard size is 1024x768. Gaming consoles will come with support for UHD and games will be enriched with graphics.

Many 4K televisions were demonstrated at CES 2012 and the tradition continues. However this time at CES 2013 the televisions as large as 110 inch have been demonstrated. This proves out to be very good for displays at public areas.



Next year we can expect the televisions to bring in 8K. Currently no laptop and desktop apart from Apple Macbook Pro and iMac have surpassed full HD resolution.

Sony is the only company currently offering 4K content which includes movies.

We will see a lot of upgrades in screens in the near future. UHD definitely has a lot to offer us in the near future.

- Nayan Seth (SE COMPS)

Amazon Elastic Compute Cloud

Amazon, the company which is closely related to online E-commerce site is one influential company in the world not only by its online site but its web services which provides resizable compute capacity on the cloud. It is designed to make web-scale computing easier for developers. It controls web's enormous traffic in world.

Amazon Elastic Compute Cloud (EC2) is a central part of Amazon's cloud computing platform, Amazon Web Service (AWS). EC2 allows users to rent virtual computers to run their own computer application. It is a web service that provides resizable computing capacity in the cloud. It is designed to make web-scale computing easier for developers. It was found that one-third of the several million users visit a website that uses Amazon's Elastic Compute Cloud each day!!

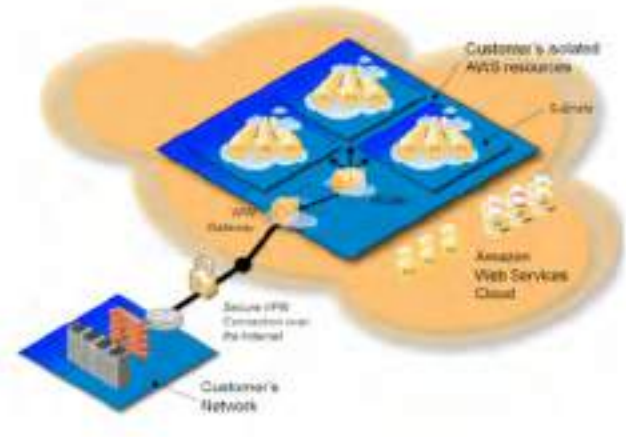
With EC2 we can use all that computing power to run just about any software application including a website such as Instagram or Pinterest or a banking application that simulates credit risk or a research tool. Rather than loading your software on physical computer servers you've set up in a data centre, you can load it onto virtual servers you've set up in your web browser. And whenever you need more virtual servers you can have them.

Applications of EC2

1. Use as you want – you need 50 servers today? No problem. You need 3000 tomorrow? That's not a problem either. And the day after tomorrow you want only 1000? Just do whatever you want. EC2 servers come in T-shirt sizes – small, medium, large and extra large – and have certain number of compute performance and certain amount virtual main memory as measured by Amazon as an Elastic Compute Unit or ECU. No need to plan ahead of how much computing power you will need. Just build the infrastructure that can grow. So with the help of EC2 you can eliminate the process of planning of computing power. Instead just build the infrastructure which can grow.

2. One product Amazon Web Service (AWS) offers is called 'Elastic Load Balancing' as part of its Elastic Compute Cloud (EC2) service. This service helps you to set up EC2 service in multiple areas. When service in a particular availability area is disrupted because of a huge storm, traffic is automatically rerouted to another, healthier availability area. Then load balancing is restored once all availability areas are healthy again.

3. Everything is Application Programming Interface (API) based which makes easier for the developer to implement a scalable infrastructure over EC2.

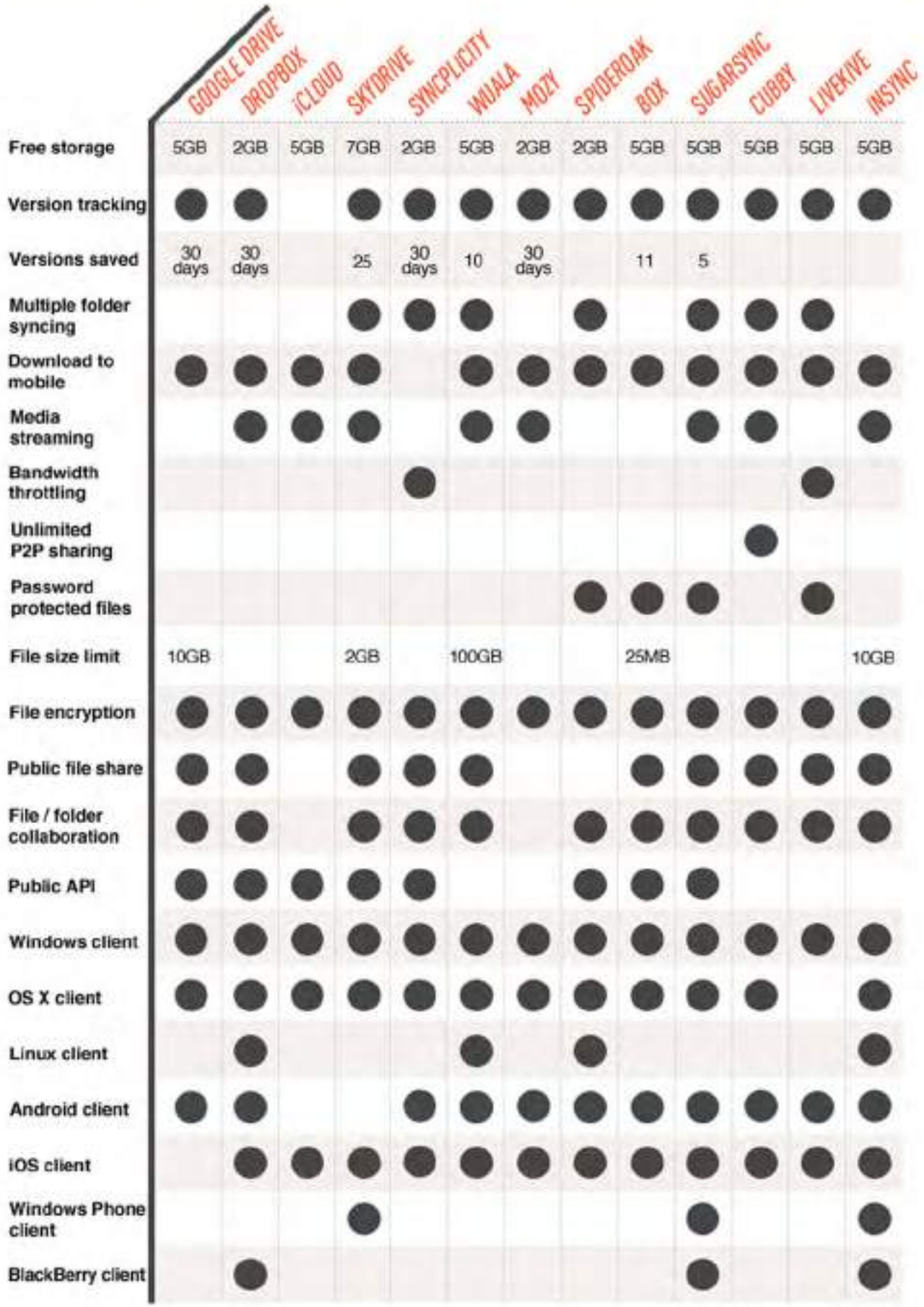


Mobile web browsing is slow because of the fact that the average website pulls content from 13 different places on the Internet. On a mobile device, even with a good Wi-Fi connection, each round trip is typically 100 milliseconds or more. Some of that can be done in parallel, but it takes as many as eight or more round trips that each takes 100 milliseconds. That adds up. But EC2 breaks apart this process. So if computation is moved to Amazon's Cloud platform, then a huge computational resource is received. What takes 100 milliseconds on Wi-Fi takes less than 5 milliseconds on Amazon's Elastic Compute Cloud.

Instagram uses of Amazon's Elastic Cloud Compute.

- Devansh Doshi (SE IT)

Cloud Storage Comparison



	GOOGLE DRIVE	DROPBOX	iCLOUD	SKYDRIVE	SYNCPLICITY	WUALA	MOZY	SPIDEROAK	BOX	SUGARSYNC	CUBBY	LIVEKIVE	INSYNC
Free storage	5GB	2GB	5GB	7GB	2GB	5GB	2GB	2GB	5GB	5GB	5GB	5GB	5GB
Version tracking	●	●		●	●	●	●	●	●	●	●	●	●
Versions saved	30 days	30 days		25	30 days	10	30 days		11	5			
Multiple folder syncing				●	●	●		●		●	●	●	
Download to mobile	●	●	●	●		●	●	●	●	●	●	●	●
Media streaming		●	●	●		●	●			●	●		●
Bandwidth throttling					●							●	
Unlimited P2P sharing											●		
Password protected files								●	●	●		●	
File size limit	10GB			2GB		100GB			25MB				10GB
File encryption	●	●	●	●	●	●	●	●	●	●	●	●	●
Public file share	●	●		●	●	●			●	●	●	●	●
File / folder collaboration	●	●		●	●	●		●	●	●	●	●	●
Public API	●	●	●	●	●			●	●	●			
Windows client	●	●	●	●	●	●	●	●	●	●	●	●	●
OS X client	●	●	●	●	●	●	●	●	●	●	●		●
Linux client		●				●		●					●
Android client	●	●			●	●	●	●	●	●	●	●	●
iOS client		●	●	●	●	●	●	●	●	●	●	●	●
Windows Phone client				●						●			●
BlackBerry client		●								●			●

CUDA: A Programming Model For GPU

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Abstract - GPU (Graphics Processing Unit) computing is becoming very popular because when GPU combined with CPU, they accelerate the general purpose scientific and engineering applications. The Nvidia's creation CUDA provides a simple C and C++ extensions that enable fine and coarse grained data and task parallelism. A object oriented programmer can utilize this parallelism with languages such as C and C++.

Keywords - GPU, CUDA, Kernel, CGMA ratio, CUDA API Basics, Kernel, Local Memory, Shared Memory Global Memory, Constant Memory, Texture Memory

I. INTRODUCTION

CPU (central processing unit) is an element of the computer that carries out the instructions of the software loaded on to the computer. It's the main decision-making body for the entire machine. It notifies all the parts of the computer what to do – according to the program code of the software, and, also according to the system user. Today, most of the computers have multi-core CPUs and some computers even have multiple CPUs. GPU (graphics processing unit) is a part of the video rendering system of a computer. The usual purpose of a GPU is to assist with the rendering of 3D graphics and visual effects, which the CPU doesn't have to. Servers usually have very limited or no GPU facilities as they are needed for text-based remote interface. Powerful GPUs are frequently required for graphic intensive tasks such as gaming or video editing. For example, the translucent windows in Windows 7, which powers the Aqua desktop and its beautiful, water-like graphical effects and animations such as bulging the Dock in a smooth animation when the mouse is moved to the lower edge of the screen or "sucking" windows into the Dock when they are minimized - these are powered by GPUs. GPU is similar to CPU, but they do have important internal differences that make them specialized for particular task. A CPU core can execute 4 32-bit instructions per clock (using a 128-bit SSE instruction), whereas a GPU like the Radeon HD 5970 can execute 3200 32-bit instructions per clock (using its 3200 ALUs or shaders). A CPU can perform all kinds of calculations, due to the presence of one or more "Arithmetic/Logic Units" (ALU's). A bulk of structures inside a CPU is concerned with making sure that the CPU is ready to switch to a different task when needed. A GPU can perform calculations, and can also decision making tasks. However, GPU's have been designed so they are very good at doing video processing, and less executive work i.e. a lot of repetitive work. GPU's have large numbers of ALU's, than CPU's. As a result, they can do large amounts of bulky mathematical labour in a greater quantity than CPU's. The structures that make CPUs good at what they do take up lots of space. When those structures are removed, there's plenty of room for many "dumb" ALU's, which individually are very small. The ALUs of a GPU are divided into groups, and each group of ALUs shares management, so members of the group are made to work on similar tasks. They can either all work on nearly identical variations of one single task, in perfect sync with one another, or nothing at all. [1] Different programming

models are used to accomplish its functionality. For example, in order to work on a computer, there's a need of an Operating System, similarly, GPU too needs a powerful programming model. The various programming models used for GPU are OpenCL, Accelerator, CUDA, DirectCompute and many more. In spite of the large usage of Object Oriented Programming Languages like Java, C++ etc., programmers are not very keen in knowing GPU programming models. This paper gives a brief outline of CUDA: NVIDIA's GPU Programming Model. Section II discusses the architecture of CUDA and Section III gives a gist about its Programming concepts. Section IV talks about compilation procedure

II. CUDA PROGRAMMING

The GPU is seen as a computing device to execute a portion of an application that has to be executed several times, can be isolated as a function and works independently on different data. Such a function can be compiled to run on the device. The resulting program is called a Kernel. The batch of threads that executes a kernel is organized as a grid of thread blocks.

Following are steps in CUDA code
Step 1: Initialize the device (GPU)
Step 2: Allocate memory on the device
Step 3: Copy the data from host array to device array
Step 4: Execute kernel on device
Step 5: Copy data from device (GPU) to host
Step 6: Free allocated memories on the device and host

Kernel Code (xx_kernel.cu): A kernel is a function callable from the host and executed on the CUDA device -- simultaneously by many threads in parallel. Calling a kernel involves specifying the name of the kernel plus an execution configuration.

The Memory Model

Each CUDA device has several memories as shown in Figure 3. These memories can be used by programmers to achieve high CGMA (Compute to Global Memory Access) ratio and thus high execution speed in their kernels. CGMA ratio is the number of floating point calculations performed for each access to the global memory within a region of a CUDA program. Variables that reside in shared memories and registers can be accessed at very high speed in a parallel manner. Each thread can only access registers that are allocated to them. A kernel function uses registers to store frequently accessed variables. These variables are private to each thread. Shared memories are allocated to thread blocks. All threads in a block can access variables in the shared memory locations of the block. Threads can share their results via Shared memories. The global memory can be accessed by all the threads at any time of program execution. The constant memory allows faster and more parallel data access paths for CUDA kernel execution than the global memory. Texture memory is read from kernels using device functions called texture fetches. The first parameter of a texture fetch specifies an object called a texture reference. A texture reference defines which part of texture memory is fetched.

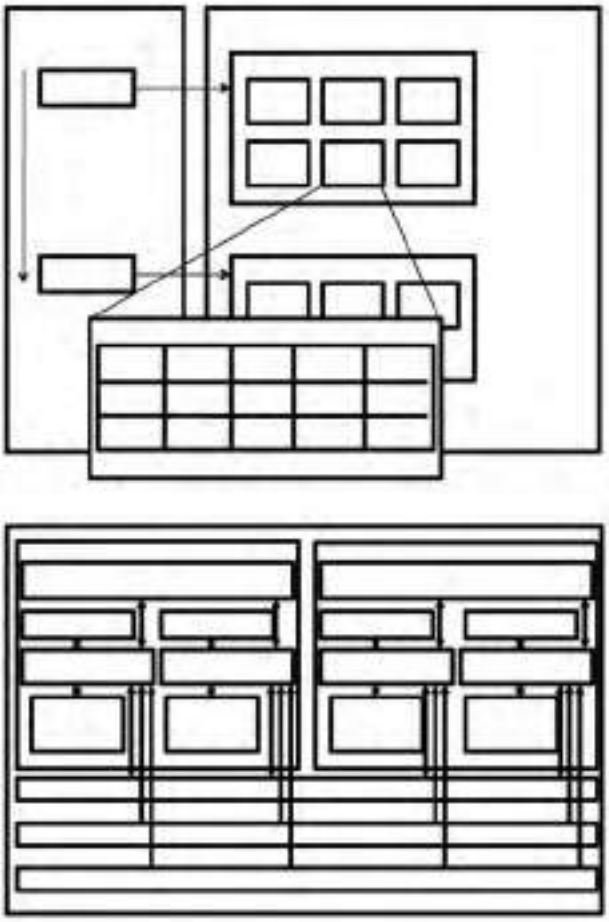

Figure 1: CUDA Memory Model

CUDA defines registers, shared memory, and constant memory that can be accessed at higher speed and in a more parallel manner than the global memory. Using these memories effectively will likely require re-design of the algorithm. It is important for CUDA programmers to be aware of the limited sizes of these special memories. Their capacities are implementation dependent. Once their capacities are exceeded, they become limiting factors for the number of threads that can be assigned to each SM [2].The properties of different types CUDA memory is shown Table 1.

Table 1 Different types of CUDA Memory

Memory	Location	Cached	Access	Who
Local	Off-chip	No	Read/Write	One Thread
Shared	On-chip	N/A	Read/write	All threads in a block

Global	Off-chip	No	Read/write	All threads + CPU
Constant	Off-chip	Yes	Read	All threads + CPU
Texture	Off-chip	Yes	Read	All threads + CPU

III. CUDA PROGRAMMING MODEL

CUDA Programming Model consists of CUDA API basics and a Sample Program

CUDA API Basics:

There are three basic APIs in CUDA namely, Function type qualifiers, Variable type qualifiers and Built-in variables. Function type qualifiers are used to specify execution on host or device. Variable type qualifiers are used to specify the memory location on the device. Four built-in variables are used to specify the grid and block dimensions and the block and thread indices. The Table 2 shows the various function type qualifiers and Table 3 shows the various variable type qualifiers and Table 4 shows the various built in variables that CUDA supports.

1) Function Type Qualifiers

Table 2 Function type Qualifier

Function Type Qualifier	Executed on	Callable from
__device__	Device	Device
__global__	Device	Host
__host__	Host	Host

2) Variable Type Qualifiers

Table 3 Variable Type Qualifier

Variable Type Qualifier	Location	Lifetime	Accessible from
__device__	Global memory space	lifetime of an application	all the threads within the grid and from the host through the runtime library
__constant__	Constant memory space	lifetime of an application	all the threads within the grid and from the host through the runtime library (optionally used together with __device__)
__shared__	Shared memory space	lifetime of an block	all the threads within the block (optionally used together with __device__)

3) Built in Variables

Table 4 Built in Variables

Built in variables	Type	Explanation
gridDim	dim3	dimensions of the grid
blockIdx	uint3	block index within the grid
blockDim	dim3	dimensions of the block
threadIdx	uint3	thread index within the block

4) *Execution Configuration (EC):*

EC must be specified for any call to a __global__ function. Defines the dimension of the grid and blocks specified by inserting an expression between function name and argument list:

Function Declaration:

```
__global__ void function_name(float* parameter)
```

Function Call:

function_name <<< Dg, Db, Ns >>> (parameter)

Where Dg, Db, Ns are: Dg is of type dim3, dimension and size of the grid Dg.x * Dg.y = number of blocks being launched; Db is of type dim3, dimension and size of each block Db.x * Db.y * Db.z = number of threads per block [2].

A Sample CUDA program

The following program calculates and prints the square root of first 1000 integers.

```
#include <stdio.h>          // (1)
#include <cuda.h>
#include <conio.h>
__global__ void sq_rt(float*a,int N)    // (2)
{
  int idx=blockIdx.x*blockDim.x+threadIdx.x;
  if(idx<N)
    a[idx]=sqrt(a[idx]);
}
int main(void)              // (3)
{
  float*arr_host,*arr_dev;          // (4)
```

```
   const int C=100;            // (5)
   size_t length=C*sizeof(float);
   arr_host= (float*)malloc(length);      // (6)
   cudaMalloc((void**)&arr_dev,length); // (7)
   for(int i=0;i<C;i++)
      arr_host[i]=(float)i;
   cudaMemcpy(arr_dev,arr_host,
length,cudaMemcpyHostToDevice); // (8)
int blk_size=4;           // (9)
int n_blk=C/blk_size+(C%blk_size==0);
sq_rt<<<n_blk,blk_size>>>(arr_dev,C);
cudaMemcpy(arr_host,arr_dev,length,cudaMemcpyDevi
ceToHost);          // (10)
for (int i=0;i<C;i++)       //(11)
printf("%d\t%f\n",i,arr_host[i]);
free (arr_host);          // (12)
cudaFree(arr_dev);
getch();
}
```

The numbered program lines are explained below.

1. Include header files
2. Kernel function that executes on the CUDA device
3. main ( ) routine, that the CPU must find
4. Defines pointers to host and device arrays
5. Defines other variables used in the program, size_t is an unsigned integer type of at least 16 bit
6. Allocate array on the host
7. Allocate array on device (DRAM of the GPU)
8. Copy the data from host array to device array.
9. Kernel Call, Execution Configuration
10. Retrieve result from device to host in the host memory
11. Print result
12. Free allocated memories on the device and host

IV CUDA COMPILATION PROCEDURE

CUDA is a high level language which stands for Compute Unified Device Architecture. It is a parallel computing platform and programming model created by NVIDIA. The CUDA platform is accessible to software developers through CUDA-accelerated libraries, compiler directives and extensions to industry-standard programming languages, including C, C++ and FORTRAN. Programmers use 'C/C++' with CUDA extensions to express parallelism, data locality, and thread cooperation, which is compiled with "nvcc", NVIDIA's LLVM-based C/C++ compiler, to code algorithms for execution on the GPU.CUDA enables heterogeneous systems(i.e., CPU+GPU). CPU & GPU are separate devices with separate DRAMs Scale to 100's of cores, 1000's of parallel threads. CUDA is an Extension to the C Programming Language [3]. The Figure 2 illustrates the process of CUDA compilation.

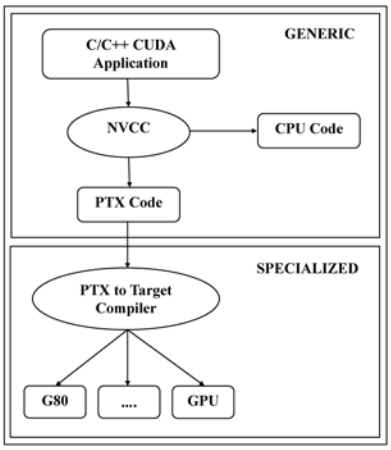

Figure 2: Compilation Procedure of CUDA

Assuming number of blocks to be 16 and 4 threads running in parallel manner in each block, the Figure 3 shows the above square root computation of first 64 integers [2].

V CONCLUSION

CPU though being very efficient still cannot alone meet up the ever increasing demands of the Information Technology. A GPU aids the CPU by performing the laborious repetitive tasks in parallel manner. In this paper, we have talked about one of frequently used GPU programming model CUDA, which was originated by NVIDA. The above mentioned programming model helps to perform Parallel Processing of various tasks assigned to them. Due to the presence of these programming models and many more models, the gaming applications have become more lively and creative. Not only that, GPU is very much needed in sectors like Finance, Medical imaging and Cloud Computing There are many more Programming Models like Accelerator, DirectCompute, OpenCL popularly used for GPU.

REFERENCES

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Interview Continued...

master's after a year of experience because he can choose courses which he or she is good at. In my case I was confused which courses I wanted. And the people with me had three to four years of experience. They were quite matured in terms of their perspective but eventually I was able to cope up with them. Experience is essentially important in my opinion but in some good companies where you get to understand technology.

What according to you makes a good company?

The difference between a good company and average company is the quality of work you do. In consultant companies like TCS the work you do is related to specific technologies so when it comes to switching jobs it's not easy. On the other hand if you work in companies like Google, Oracle or even smaller companies like Directi or Eclinicalworks you get more exposure compared to other companies.

Given the opportunity would you work in small company or Start-up rather than a big company?

I would rather work in company with 10 engineers than a company of 5000 engineers because the amount of work you get there and responsibilities are enormous. So as an engineer you grow more compared to a big company. This was one of the reasons why I joined LinkedIn; a company with 700 engineers and huge potential to grow.

Share your experiences at LinkedIn?

It was a dream to work at LinkedIn. The culture you are into over there is simply great! UCLA also helped me a lot. During my internship I introduced a new machine learning which went live on the site. I was working on ranking model on the home page of the site. The advantage I got by working in a small company is that I got great exposure.

- Devansh Doshi (SE IT)

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