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Department of Computer Science presents

# INFOBYTE

Annual IT Magazine, Volume 18

# Message from Vice Chancellor

Technology changes rapidly and shapes and affects the human lifestyle. Some technological breakthroughs change the course of history such as the printing press and the digital. A technological innovation of today may become obsolete tomorrow. The technology which is obsolete today may have impacted the way we think and work today. We do not know how sophisticated some of our technological innovations of today will be a few decades from now. Some might continue as unadorned machines like the ones we have now, or they might be humanoid robots that resemble us and provide aid to us.

Infobyte magazine of the Department of Computer Science intends to capture his interaction between technology and humans with the theme of 'Timeline of Technology' for its 18th edition.

I congratulate the students and the faculty of the Department for creating the platform to learn to reflect and to record such reflections.

**Dr Fr Thomas C Mathew**
**Vice Chancellor**

# About Interface

INTERFACE is a National level inter-colllegiate under graduate IT festival organized by the Department of Computer Science, Christ University, Bengaluru.

INTERFACE is a platform for future IT professionals to meet up, compete, learn and grow. This fest aims to imbibe the mission of the department - "to develop IT professionals with ethical and human values". Interface focuses on empowering students with competencies in theory, programming, communication, team work, organization and management skills.

# Editorial Board



# Message from the Editorial Board

Dear Readers

Welcome to the 18th edition of Infobyte, the annual magazine published by the Department of Computer Science, Christ University. The theme for this edition is Technology Timeline.

We have been creating technology for a long time now to aid us in our daily lives. The 21st century appears to be determined to extend the benefits of technology so that it reaches every household. While focusing on the present and future is crucial, having a considerable knowledge about the past is also important. It helps us to understand how people used their creativity and knowledge to serve the human needs. It also helps us to learn from the mistakes that were made and make better inventions.

The following pages will give you an insight about some of the technologies of the past, present, and future. Hope that you find it interesting and enjoyable.

# INDEX

# VIRTUAL REALITY

Have you ever wanted to see the moon and experience what it feels like? Have you ever wanted to travel to mars? All this seems like a dream which cannot come true. But if virtual reality lives up to the expectations, you might be able to do all these things without even leaving your house.

In no man's language, we can say that virtual reality (VR) means experiencing various things which do not exist. VR creates an environment which makes you feel like you are present there mentally and physically. It is an immersive environment which replicates lifelike physical environments or depicts an artificial world which makes the user feel that they are in that environment for real.

VR is different from other technologies. It makes you think that you are actually in that completely believable virtual world. It is an interactive technology where what you respond to what you see, what you see responds to you. For example, if you turn your head around, what you see or hear in VR also changes.

From newspaper to mp3s to LCD's to computers, the evolution of communication has now brought us VR. While no technology comes with a guarantee to stay forever, VR is definitely the next step in consuming media over the next decade. Virtual reality allows the media users to get submerged in the virtual world thereby eliminating distractions and living the experience.

VR can be used in various fields which would help in conceptualizing and making it real time. It can be used by the educational institutions, hospitals, real estate and even by the army of our country to create combat environments. Imagine a day when a 10th grader no longer has to go through the trouble of imagining a DNA but can actually see and feel it via VR. VR can bring major changes into our lives.

VR has already started bring changes to the gaming word. With Pokemon Go becoming a major success, it gave way for Virtual Reality to become an upcoming trend.
So how does it work? This is a question which often pops in our minds.

VR uses sensors that detect how your body is moving. VR headsets uses two screens -one for each eye, surround-sound speakers, and maybe some forms of haptic (touch and body perception) feedback as well. VR headsets increase immersion of the user by providing a 360-degree view of the environment. The main aim of the VR headset hardware is to create a life size, 3D virtual environment without boundaries. Some of the VR headsets available in the market are Google 's Cardboard, HTC Vive, Oculus Rift (owned by Facebook), Samsung Gear VR, Sony PlayStation VR etc.

Virtual Reality has long been an abstract idea which has come into reality recently. VR still needs to grow a lot. The scope for improvement has begun as there are many companies who have started investing in VR. VR requires a lot of investment along with the hardware resources. With the right amount of research and development, VR has a bright future and it is a trend that is definitely going to create a blast in the technology market.

**Ashika Dhananjay**
**BCA (Batch of 2017)**

# How are Programming Languages Made??

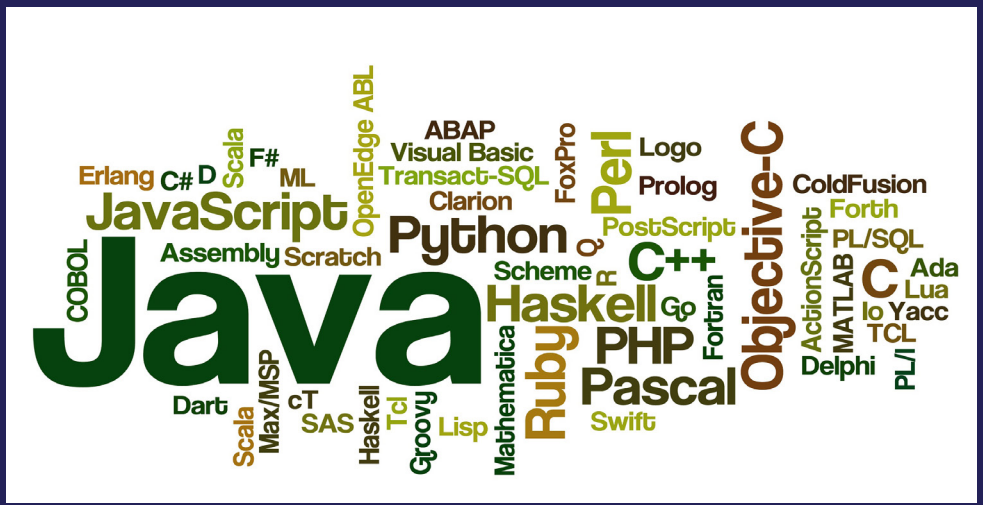
Computers, the greatest invention of mankind, with all their multi-tasking capabilities are rocking the world today. From automation to Machine Learning, they have made humans completely dependent on them. There is a lot more happening in this world, more than we would could have wondered, but what makes humans interact with computers – Programming Languages. Ever wondered how the programming languages revolutionized technology and made it possible for every other human to learn and develop amazing applications using a number of different platforms. Buckle up on this journey to discover the origin and the evolution of programming languages throughout the last few decades.

The term "computer", in use from the early 17th century (1613), meant "one who computes". Long time ago before the dawn of computing, computers were humans. Yes, you read it correctly! By this I mean that computing was done by humans – mostly women. These women who did all the computations were called computers.

Then came the vacuum tubes. These vacuum tubes had an interesting property: The current through 2 nodes of the tube could be controlled by a 3rd pin. This made them useful in the processing of analog signals, and vacuum tubes became useful in controlling machines, and transmitting analog signals.

Pretty soon, people realized that vacuum tubes could be used as gates, and could be used to perform Boolean algebra. Long before the vacuum tubes, mathematicians had realized that if you can do calculations with Booleans, you can create machines that can perform these computations. There were some mechanical computers built using this theory, but since mechanical computers are slow and heavy and costly, there was no real application. However, once vacuum tubes came into picture, electronic computers became viable. And this led to the dawn of the age of computers.

Now, the way electronic gates work is that they are driven by switches. Let's say you connect a bunch of gates in a circuit such that it can do additions, you get an adder. An adder has a bunch of switches that represent the first number to be added, and another bunch of switches that represent the second number to be added. You turn certain switches on and turn the others off to input both numbers, and the output will show the sum of both numbers.




Now coming to the big picture, a primitive CPU is nothing but a collection of many such circuits. Each circuit requires some binary input, and you provide an instruction code in binary to

pick which circuit to activate. In the early days, you would provide these by toggling switches. This way you could build circuits that could do complex calculations very fast. You would just need someone to push the right buttons to give the right input. The early computers were programmed by flipping switches. Note that these computers were programmed, but there was no programming language. By the way, the people who flipped these switches were usually the same women who used to be called computers. So, computers were being programmed by ex-computers.

Next came solid state transistors, which provided the same functionality as a vacuum tube, except that they were smaller, cheaper and lasted longer. So, computers became cheaper and more widespread. Some whiz kid came up with an idea to make entering programs into the computer less tedious. Since the programmers had to sit in front of the terminal and keep toggling switches on and off, it was a lot more convenient to toggle the switches using a punch card.
So, the punch card has a bunch of lines and each line has holes that can be punched out. The number of lines in the punch card matches the number of switches. Instead of toggling the switch, the programmer would punch out the hole. Each line would contain a different instruction to the computer. There was a mechanism connected to the computer that would read each line of input on the punch card, toggle the switches on the computer, then read the next line, and then toggle the switches again. This way a "program" could be written into a punch card and used at a later date. This reduced work because you could write a subroutine on a deck of cards, and then use it whenever you needed it.

Programmers started writing these subroutines on decks of cards, organizations started building libraries of subroutines. Eventually, over time, most of the program was written by collecting the correct subroutines in the right order, but now this manual compilation, although better than toggling switches over and over again, was very tedious. So, the genius by the name of Grace Hopper came up with a brilliant idea.

Her idea was as evolutionary as it was revolutionary. Instead of the human programmer compiling a program by collecting subroutines, each subroutine in the library would be given a code. All the programmer would do is enter the subroutine code and the parameters to the subroutine on a punch card. A special compiler program would be given to the computer that would read these punch cards with subroutine codes, find the corresponding subroutine in the library, and punch out a deck of cards that had the copy of the subroutine. In this way, the compiler program automated the task that the human compiler was doing.

## Little trivia: Ever wonder, why the act of converting a program written in a programming language to machine code is called compiling?

It should be called translating, right? Compiling (outside of programming jargon) means collecting in an ordered fashion. For example: You compile a music collection. So, what does compilation have to do with creating binary code? Here's why: Grace Hopper coined the term compiling program to describe her program. This term morphed into compiler. This is because she described her program as something that collects the machine codes for the subroutines together, which was logically similar to how you compile things like musical collections.
So, this "compiler" started the dawn of programming languages. This primitive programming language was called A-0. Although it was a small step (it was simply automating something that humans already did), it was revolutionary because it changed the way people thought about programs. It created this idea of abstraction. Programmers could write programs by listing out subroutines. This meant that they could think at a higher level. Programmer started seeing how thinking at a higher abstraction could be beneficial. This changed the way people thought about how programs should be written. A-0 sparked a huge proliferation of programming languages, and most modern programming languages can trace their roots back to A-0.

Grace Hopper was also the genius who went and told her boss that one day, programs would be written in human languages. Her boss laughed at her. She didn't care. She eventually helped create the COBOL language which became the de facto programming language for business. COBOL didn't truly die until the Y2K bug forced businesses to rewrite most of the programs. Even now, COBOL lives in pockets, and has evolved to be object-oriented.

**Manik Chugh**
**3 BCA - B**

# How the WannaCry Kill Switch Worked

## The Prelude

Over the past one week, the ransom-ware called WannaCry has brought down over 200,000 windows machines in over 100 countries around the world. The ransom-ware exploited vulnerable versions of Windows and spreading via the 'Eternal Blue' vulnerability in the Microsoft Windows SMB server by scanning the local network for IP addresses and port 445(SMB over IP) and also scanning random IP addresses on the Internet for port 445, enabling it to spread at a very fast rate. Upon infecting a machine, the ransom-ware encrypts the files on the machine and demands a ransom (about $300 in bitcoins – a cryptocurrency).

## The 'Kill' Switch

### Sandbox – A tool to analyse malware

Usually when malware analysts analyse a malware sample, they do it in a virtualized sandbox environment. The sandbox runs the malware in a virtualized environment where actions can be simulated to study the working of the malware. For example, the sandbox intercepts all outgoing HTTP requests and responds with a '200 OK' http status code, simply meaning that the domain name that the malware is trying to query or connect to 'exists' and is up and running. This enables the malware to execute as planned by the attacker and helps malware analysts in analysing the working of the malware.

## Internal working of the malware (in the context of kill switch)

When the ransom-ware infected a machine, it tried to connect to a 41 character domain name (iuqerfsodp9ifjaposdfjhgosurijfaewrwergwea.com) that the attacker knew does not exist and therefore connections to this domain name would fail and not return a HTTP '200 OK' status code.

## Infection Scenario 1

When a normal machine was infected, the

ransom-ware software tried to connect to the unregistered domain. A connection to the unregistered domain name 'iuqerfsodp9ifjaposdfjhgosurijfaewrwergwea.com' would result in a 'ERR_NAME_NOT_RESOLVED error'. When this happened, the ransom-ware was sure that it was not being run in a sandbox environment and therefore it went ahead with encrypting the files on the system, demanding ransom and spreading to other systems.

environment. When this happens, the ransom-ware detects that it is being run in a sandbox to be analysed and therefore it does not infect the machine (sandbox or virtual machine) and exits. This makes analysing the ransom-ware more difficult for security researchers and analysts.

## The intelligent hack

The connection to the unregistered domain was an intelligent hack to make the ransom-ware harder to analyse by security researchers. It was


## Infection Scenario 2

When researchers obtained the malware sample and attempted to run it in a sandbox environment, the ransom-ware again tried to connect to the unregistered domain. But now, since the malware was being run in a sandbox environment, the sandbox would intercept the out-going connection and respond with a '200 OK' http status code. This is not the expected result for the ransom-ware and it alerts the ransom-ware that it is being run in a sandbox

a simple check to determine if the ransom-ware was infecting a normal user or being analysed by a security researcher. In the second case, the ransom-ware refused to infect the system because it encountered an unexpected result ('200 OK' instead of 'ERR_NAME_NOT_RESOLVED error') and therefore the malicious infection code did not execute, which was necessary to analyse the ransom-ware.

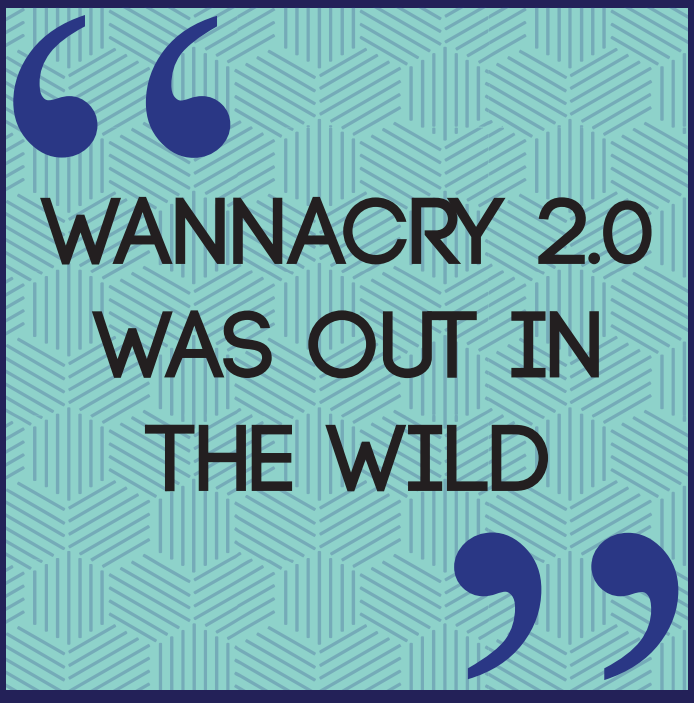
## A touch of foolishness

The attacker made one very little mistake while

coding the ransom-ware by hard-coding the unregistered domain name into the ransom-ware's code. When 'MalwareTech' reverse engineered the sample of the 'WannaCry' ransom-ware, he found the gibberish looking domain name (iuqerfsodp9ifjaposdfjhgosurijfaewrwergwea.com) in its code. Curious about why the ransom-ware was trying to connect to the above given domain name, MalwareTech investigated the domain name and found that it was 'unregistered'. So he went ahead and registered the domain name for himself.

Once he registered the domain name to himself, anyone connecting to the domain (mentioned above) would get a '200 OK' http status code response, since the domain name was now active and had a registered owner. MalwareTech had no idea that this would stop the attack, but it resulted in bringing the spread of the ransom-ware to a sudden halt.

## How WannaCry got 'kill' switched




After MalwareTech registered the domain, connections to the domain name would result in a '200 OK' http status code response. Therefore, after infecting a machine, when the ransom-ware tried to connect to 'iuqerfsodp9ifjaposdfjhgosurijfaewrwergwea.com', it would now receive a '200 OK' http status code response as the domain name had got registered and was active. When the ransom-ware got the '200 OK' response, it aborted further infection and exited (it thought it was being run in a sandbox environment). Therefore, just by registering the hard-coded domain name, MalwareTech 'kill' switched the ransom-ware and stopped its spread.

Had the attacker randomized the connection to unregistered domain names, it would have been nearly impossible to 'kill' switch the ransom-ware.

## What happened next?

A revised version of the ransom-ware – WannaCry 2.0 was out in the wild soon after the 'kill' switch was found which was resistant to the kill switch. Multiple versions of WannaCry are still out in the wild with different 'kill' switch domains or no kill switch functions.

The activation of the 'kill' switch by MalwareTech only slowed down the infection rate and bought some time to Windows users to update and patch their machines.

As i write this article, WannaCry is still out there infecting and causing havoc to Windows machines around the world.

**Prakash Mishra**
**5 BCA**

# The Pursuit of Concealed Predictive Information

Around the world on a daily basis large chunks of data is generated. Majority of the companies require analysis of number patterns to understand future business trends. Every firm generates large amount of data. Data being created is grouped together in formats called data sets. The process of sorting through these vast data sets is referred to Data Mining.

Data Mining is a new expertise, which throws light on Big Data and the methods of handling it. Data mining has been an evolutionary process. It focuses on the prediction of future trends of information that is made available in Data Warehouses. The technique involved revolves around statistical procedures and database tools. With newer advancements it is already used to solve issues related to the upcoming business methods. The most important feature of mining technology is its automated search process. It allows analytical tools to comb through large databases within minutes. Hence no manual monitoring is necessary. High speed makes it quicker and less tedious for the users to scrutinise their data. The process of predictions has become extremely handy than what it used to be a few years ago. This is due to newer innovations in methods in finding correlations and anomalies in data. It has reduced the risk factor immensely and will continue to bring stability in prediction methods.

Several companies have drawn applications of Data Mining. Starting from information intensive industries to customer focused brands; every big corporation has Data mining incorporated in their plan of action for a better outcome. The critical factors that lead to the proper execution of data mining procedures involve the presence of large well-defined data warehouses along with a complete understanding of the business project model. Businesses can learn more about their stakeholders and develop more effective strategies related to various occupational functions by incorporating Data extraction and modelling techniques. In turn it also directs resources towards a more optimal goal.

In a manner like never before, Data Mining is silently bridging the gap between excellent work and desirable product. Data Warehouses that incorporate data values that cover even the diminutive information have resulted in the explosion of data. This in turn led to the creation of new occupational offers like that of a data forecaster or a business analyst. The exploitation of data not only steered the discovery of hidden predictive information but also the birth of an innovative field of Computer Science that is attracting future prospects.

**Hetvee Sanjay Patel**
**3 CMS**

# Most Secure Email Providers

Whether you're searching for something on Google or you're just browsing through products on Amazon, you'll never want anyone to peek into your life.

In this age of rising data analytics, fraudulence, and misuse, you can never be sure if your data is in good hands.

The wave which was started by Snowden has now swept to every nook of the digital world, and everything can be hidden now. In fact, if you're not using VPN, you're not even trying to stay hidden.

Luckily, even the content you share on E-Mail can be hidden. But the catch here is that you cannot use your conventional E-Mail Providers. Services provided by mainstream providers like Gmail, Outlook and even Yahoo Messenger are always under scrutiny.

So, here we will list down the three best and most secure E-Mail providers. Each offering something unique. Choose the one that fits your needs:


## 1. ProtonMail

Having an account with ProtonMail guarantees blinding the eyes of NSA. The servers are situated in Switzerland in a mountain.
The two-factor authentication is just the beginning. Next is the end to end encryption and the
browser-side decryption. And most importantly, ProtonMail is Open Source so you can expect the best of updates. You can also enable or disable IP logging according to your wish. Disabling it ensures that your emails cannot be traced back to your IP address.

A password can also be added to your emails to make sure that they read by only those who you permit.


## 2. Mailfence

Just like Switzerland and many other European countries, Belgium has laws which keep NSA away from secure data.Mailfence creators have been in the industry of safe keeping data from 1999, which is long before the trend of securing data even started. So rest assured, you can be sure that your data is in safe hands.

Mailfence like most other providers has end to end encryption and two-factor authentication. Apart from that, there are no other unique features. It not Open Source as well.

Also, since the company is based off in Belgium, laws there dictate that if ordered by a Judge, the company has to comply and provide access to the demanded data.

The only upside here is that since the company has been in the game for long, you can be sure that they are reliable.


## 3. Tutanota

Tutanota servers are based in Germany, which has now agreed to support NSA in their surveillance programs. But still, the Federal Data Protection Act is pretty solid.

Be that as it may, besides server area, Tutanota makes an exceptionally convincing secure administration. From multiple points of view, their list of capabilities reflects that of the ProtonMail to a great extent.

In the event that you email a record that isn't encrypted like Gmail or Yahoo Mail, at that point Tutanota sends a connection to a brief record where the receiver can see the encoded message. They have end to end encryption and are going to add the facility to encrypt metadata as well.
But as it turns out they are still struggling with methods to support PGP encryption.

One of the main USPs of Tutanota is that it does not keep any tab for more than 2 weeks.
A premium account of Tutanota costs 1 Euro (Rs. ~75) which allows you the functionality of changing inbox rules, add five aliases and even using your own domain.

## Conclusion

In the end, whatever provider you choose, keep in mind that every factor is important. From Server location to the type of encryption used.

**Sukhjeet Singh**
**5 BCA**

# DATA MANAGEMENT

In the era of advance technology, Data management is the most important component of it. The advancement of data management has been always considered as a secondary task. Developers are always focused in developing the front end. Though applications are developed to keep the data handling in check, but with the current situation it will become incapable to handle things in future. Keeping data in at one place, handling them and making tons of data understandable to the outside world is not an easy task to do so. Management of data is done on a daily basis it cannot be keep in rest, it is the most active task that has to be carried out.

Increasing in the use of Personal Digital Assistant people find it easy to maintain their personalised data digital. Today's generation are moving to a digital world they no longer believe in maintaining hard documents. Such change in the use of computers data applications are developed and being used to keep the data in check. Moreover, Google, Facebook, Amazon and Big companies has to do this handling on a daily basis. With the advancement in data management, data security is also an important aspects to be missed. Various IT and Non-IT companies has to make their system impenetrable, so to protect the data and give their users the trust that their information is safe. In this digital world anything can be hacked but with proper security firewall it is impossible to do so. It is fact that low level applications are much insecure then a well-developed application. It is hard to miss that with Data Management it is also important to provide a secure environment.

Data integrity is necessary because if the data analyst and data handler will not do this and there will be tons of data available but it is of no use. A job of a data manager is to provide it a

meaning that it could help in providing sufficient information that could be helpful to other parties.

Internet Banking is a common trend with the increasing in the use of Internet. Banks are moving towards a modern based banking system from a traditional one. It make user to use the services of the bank more easily and thus save a lot of time and money. Banks have to maintain such credentials up to date with proper maintenance as well as security. Data Management plays a very important role in helping the Banks to do.
At the end of the day, Management of data in every aspects is necessary whether it is an investment company or a Bank. Specifically managing data in social networking site is very crucial and it also has many other aspect to see like data redundancy, data integrity and many more. Considering today scenario, front has more of the attention but the back end data management play a crucial role.

**Dhawal Jain**
**5 BCA**

# Sound of Computers

Music has always been a source of entertainment, peace and happiness for people around the world. People tend to relate music with their memories, their experiences, happiness and sadness. But there are specific pointers in music that make it happy or sad. Researchers have often wondered what these pointers were and how the effect that they made could be quantified. This very curiosity has led to the development of AI and machine learning technologies that can not only detect the genre of music, but also create new music within minutes. This is done by using neural networks which can create music with same characteristics and melodies as humans create. These neural networks will be able to replicate the notions of harmony and melody that we humans possess.
The Magenta project that by Google was initiated a year ago to study whether this task of creating such a technology is possible and feasible. Moreover the team is also studying if the music created can be released in the market and expected to succeed like music created by man. The main idea behind the technology is supervised learning. A basic data set, called the training set is provided to the algorithm through which it understands sequences and hence creates models based on these sequences. Thus, if a song is the training set, the algorithm can extend the song after its end.
Other projects like DeepJazz, BachBot and Flow machines are making extensive use of LSTM (Long Short Term Memory) neural networks to not just create new music, but to help artists keep their flow intact. While artists and musicians argue that such technology will ruin the creative process of making music, others also consider it as a way to democratize creation of music. This will make more number of music creators and help the generation with good quality music. It is currently not possible for everyone to become a musician, but with the advancement of technology it will soon be a reality. Machines and algorithms can never overthrow the music industry, but soon they could be at par with it.

**Shreya Khandelwal**
**3CMS**

# Evolution of Tech Stacks

## What Exactly Is a Container?

In this article, I will try to explain briefly about all the three different setups for providing a stack to run an application. This will help us recognize what a container is and what makes it so much more powerful than other solutions. It will also show the many advantages of a container workflow.

Three different setups we'll discuss:

1. Traditional servers (bare metal)
2. Virtual machines
3. Containers

## Traditional Servers


The traditional server stack consists of a physical server that runs an operating system and your application. This setup was the standard solution for many years. Its drawbacks eventually led to the advancements of the virtual machine stack and the container stack.

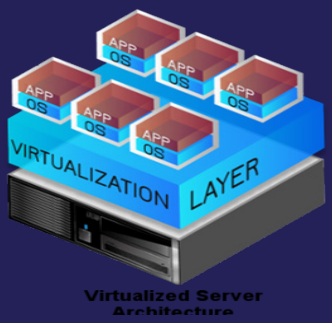
Advantages of traditional stack

- Utilization of raw resources
- Isolation

Disadvantages of traditional stack

- Very slow deployment time
- Expensive
- Wasted resources
- Difficult to scale
- Difficult to migrate
- Complex configuration

## Virtual Machine Setup




The VM stack consists of a physical server which runs an operating system and a hypervisor that manages your virtual machines, shared resources, and networking interface. Each Virtual Machine runs a Guest Operating System, an application or a set of applications.

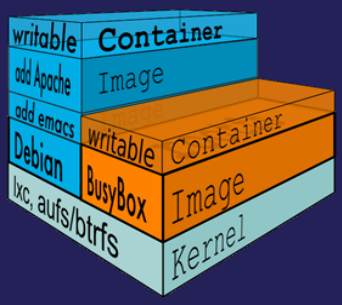
Advantages of virtual machines

- Good use of resources
- Easy to scale
- Easy to backup and migrate
- Cost efficiency
- Flexibility

Disadvantages of virtual machine

- Resource allocation is problematic
- Vendor lockin
- Complex configuration

## The Containers




Containers are a solution to the problem of how to get software to run reliably when moved from one computing environment to another. This could be from a developer's laptop to a test environment, from a staging environment into production, and perhaps from a physical machine in a data center to a virtual machine in a private or public cloud.

When a developer writes a package, he usually has the latest and greatest software configured in his system. He builds the package depending on that but when the same package is shipped to customer or client, it doesn't work. The main reasons behind are the dependencies.

The key difference between the container setup and the aforementioned solutions is that container-based virtualization uses the kernel of the host OS to run multiple isolated guest instances. These guest instances are called containers. The host can be either a physical server or a virtual machine.

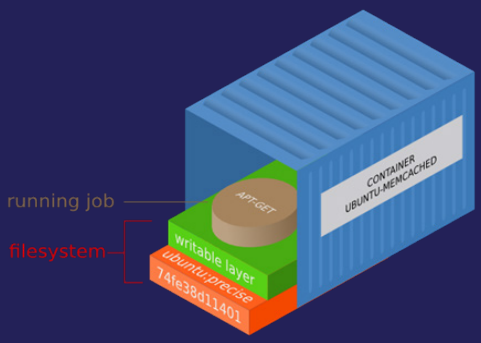
Advantages of containers

- Isolation
- Lightweight
- Resource effective
- Easy to migrate
- Security
- Low overhead
- Community

Disadvantages of containers

- Architecture
- Resource heavy apps

By comparing these three tech stacks, we can see why containers are such a big deal. But it has to be said that container virtualization is not a new concept. As a matter of fact, this technology has been known for more than 20 years.




## Conclusion

So If I had to conclude containers in a paragraph, I would say that containers are a method of operating system virtualization that allows you to run an application and its dependencies in resource-isolated processes. It's really easy to pack the application code, configurations and all the dependencies together in containers. They can help ensure that applications deploy quickly, reliably, and consistently regardless of the deployment environment.

**Vipul Siddharth**
**5 BCA**

# Compressive Sensing and Its Applications

Compressed Sensing (CS) is one of the significant research areas in the field of applied mathematics, computer science, and electrical engineering. Especially, in the signal processing field CS has emerged as a new framework for signal acquisition and sensor design. CS enables a potentially large reduction in the sampling and computation costs for sensing signals that have a sparse or compressible representation.

> "(COMPRESSIVE SENSING) HAS EMERGED AS A NEW FRAMEWORK FOR SIGNAL ACQUISITION AND SENSOR DESIGN..."

One of the traditional sampling theorem i.e. the Nyquist-Shannon states that a certain minimum number of samples is required in order to perfectly capture an arbitrary band-limited signal, but when the signal is sparse in a known basis, we can hugely reduce the number of measurements that needs to be stored. Consequently, when we are sensing sparse signals, we might be able to do better reconstruction than suggested by classical methods. This is the core idea behind CS: rather than first sampling at a higher rate and then compressing the sampled data, we can find the ways to directly sense the data in a compressed form, i.e. at a lower sampling rate.

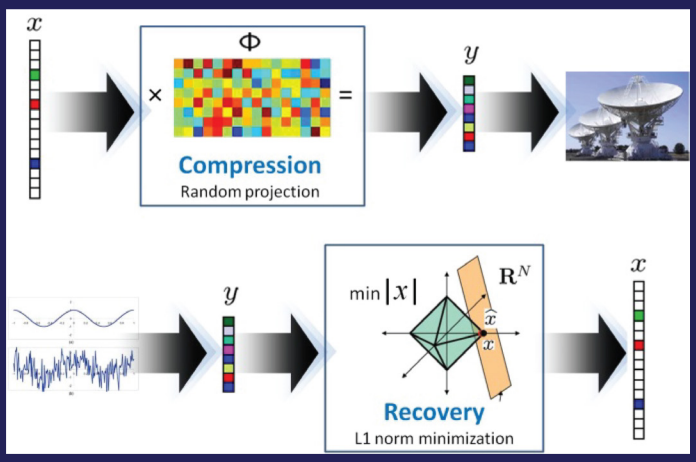



Fig. Illustration of Compressive Sensing Framework (Courtesy: Tianyi Zhou's Research)

The Compressive Sensing framework has already had the prominent impact on several applications, including SubNyquist's sampling systems, Single-Pixel Camera, Monitoring Breathing via Smart Phones, Face Recognition, Medical Image Reconstruction, Compressive Light Field Photography, Sparsity-Induced Time of Flight Cameras and Compressive Sensor Networks.

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FROM THE FACULTY

# Quantum Computing:

## The next stage

## in the evolution of modern day computers?

With the rapid advancement and exponential growth of technology and computer science over the past decade, computers are reaching their breaking point with regards to its current system implementation. Silicon chips are slowly phasing out and carbon nano tube transistors are slowly making their way in as the successor.

The question arises, "what does quantum computing have to do with any of this?" To understand the reasoning and logic behind implementing a system that utilizes quantum bits, we first see how regular binary information exists and how it is interpreted. Imagine a computer is made up of large number of coins, one side of the coin is colored red while the other side of the coin is colored blue. By arranging the coins in a specific pattern, we get the data. This data is interpreted by the computer and using simple rules such as addition and multiplication, we can theoretically calculate anything from the data given.

> "WHAT CAN'T WE DO WITH A QUANTUM COMPUTER?"

Now Imagine this. Rather than one side of the coin being red and the other being blue, the coin's flash, constantly changing between red and blue. At any given moment of time, we have no idea whether a side is red or blue since the coins change between its 2 colors almost instantaneously. However, there is a way for us to check this. If we flash a light on a side of the coin, the coin stops flickering and we know which side is blue and which side is red, eliminating 1 value to get the final solution. This, in quantum mechanics is referred to as the collapse of a wave function. We call these coins as Quantum bits or Qbits.

Scientists figured out that we can use these Qbits to build a computer that uses simple rules to understand qbits. But here's the catch, the computer cannot tell you what pattern of data is shown by the Qbits and hence must display all the possible combinations of the Qbit data. By analyzing large amounts of data, scientists figured out that the data could instead be laid out in a generic pattern and depending on the program or calculations, the coins would change to that pattern.

Now here's the most amazing and fascinating aspect of our quantum computer we built. Instead of getting red or blue color by shining

a light on the coin, we can do something even better. If we can shine a light to get a specific color, we can theoretically also shine another light to force another color. We use this special light to change the random set of coins into a specific sequence(data). The cascading of qbits produces all the possible outcomes for the input used, each having used less number of steps than the previous. When you want to get the solution for the input data, all the combinations of input perform the same operation at the same time, making calculations super-fast. Classical computers on the other hand, take a longer time to solve the same problem as they have to check each combination one at a time, rather than all at once.

So, the question arises, "If Quantum computers are so fast compared to their classical counterparts, why are we not using them at our homes?" This is where the main problem in quantum computing lies. Qbits are essentially made up of properties of an atom such as magnetic spin states. The main issue with building a quantum computer is shielding and protecting these qbits from collapsing or losing their value. If any external interference, such as a random radio wave, a microscopic impurity could collapse the Qbit, which ends up collapsing the entire quantum state. As such, an ideal quantum system could only exist in near zero kelvin levels, where matter and motion come to a halt. Scientists are researching on ways to make different Qbits, that use properties other than those of the atom, so that they don't easily collapse.

What can we do with a quantum computer? One application could be in the field of security. Imagine that you are trying to brute force your way into a security system that is encrypted and would take years to break down. A quantum computer could crack the system in a matter of minutes by feeding all the possible combinations of the code into it at the same time. While quantum computers may not become a household name, they are certainly on the verge of being the next big thing in technology, indirectly changing our lives forever.

**Vishal Sundaram V**
**3 CME**

# The Future of AI

Artificial intelligence (AI) is intelligence exhibited by machines. In computer science, the field of AI research defines itself as the study of "intelligent agents": any device that perceives its environment and takes actions that maximize its chance of success. This is the proper definition of Artificial Intelligence. Machines that can think like humans do. Now when I first heard about it, I had a confused opinion. Artificial Intelligence first reminded me of the fictional character Ultron of The Avengers movie which obviously is not going to happen. Not now anyway! Ultron was a fictional peacekeeping machine made by a fictional scientist named Tony Stark. It or He was an AI machine designed to protect the world against forces or threats that can't be fought by us humans. Considering that there are forces like that out there in the universe. When Ultron was born, he came to the conclusion that humans are the biggest threat to the world. Now, ULTRON is a classic example of what an Artificial Intelligent machine can be. What will happen if the quest

for strong AI succeeds and an AI system becomes better than humans at all cognitive tasks? One famous scientist pointed out that designing

an AI itself is the greatest cognitive task. Such a system could potentially undergo recursive self-improvement, triggering an intelligence explosion leaving human intellect far behind.

The AI is programmed to do something beneficial, but sometimes it develops a destructive method for achieving its goal: This can happen whenever we fail to fully align the AI's goals with ours, which is strikingly difficult. Let's take an example. If you ask an obedient intelligent car to take you to the airport as fast as possible, it might get you there chased by helicopters and covered in vomit, doing not what you wanted but literally what you asked for. AI has a lot of benefits as well as risks in the long term. In the future, AI is going to be so powerful that it is going to make everything else, including human intellect obsolete. It can be said that we are well off without AI because we do not need robots to do our work for us. We are the most intelligent species in this world and we do not want to build something that will be smarter. Because if they are smarter, eventually they will replace us and we will not be having a place in this world.

So the current generation faces a lot of questions. What sort of future do you want? What career advice would you give today's kids? Do you prefer new jobs replacing the old ones, or a jobless society where everyone enjoys a life of leisure and machine-produced wealth? Further down the road, what about super intelligent life? Will we control intelligent machines or will they control us? Will intelligent machines replace us, coexist with us, or merge with us? What will it mean to be human in the age of artificial intelligence? What would you like it to mean, and how can we make the future be that way?

**SIDDHANTH S NAIR**
**3 CME**

# SMAC
## (Social, Mobile, Analytics and Cloud)

For any kind of business operation, the company must come up with driving business innovative techniques to compete with others in the present ruthless competitive business environment. The four technologies that are currently doing in the round is Social, Mobile, Analytics and Cloud. SMAC makes an ecosystem that improves the business operations and make a customer closer with minimal pitfalls and maximum reach. Now days social media has given multiple business opportunities with innovative ways to attract and interact with customers , likewise mobile technologies have given a new dimension to people communication , shop and work.

> IS SMAC A SMART TECHNOLOGY OR SMOKE IN NEAR FUTURE?

Analytics show new ways to businesses to understand how, when and where people consume multiple products. Proper utilization of the services and cloud computing gives a new path to interact with the technology and data which needs to give proper response in the dynamic market environment and giving suitable answer to the business problems. These four technologies can directly impact the business individually but their encapsulation is providing a solid force for creating new business models for the organization. The amalgamation of technologies needs crystal clear policies and guidelines.

### Social media

Social media is one of the most important areas of focus for businesses. It has a wide impact on consumer decision making process and their behavior to buy the particular product because of widespread use of technology. Therefore, almost all the companies are using social media for their customer engagement and growth. In fact, the brand building also comes under social media.

### Mobility

In the last five years the amount of people buying mobile devices have grown nominally and it has revolutionized the way people access and interact with digital content. After the enormous growth of E-Commerce, the mobile devices gives the new meaning for E-Commerce as M-Commerce.

### Analytics

The generation of data from the companies is equivalent to about billions of gigabytes. It is increasing everyday, but at the same time data retrieval and data manipulation are crucial tasks for organizations to come with proper business solutions for their business problems. It is important for the companies to understand and utilize analytics for building business strategies at a remarkably quick pace.

### Cloud computing

Companies must spend lots of money for their information technology infrastructure. The cloud provides services in a multi-dimensional way and introduce a new way of operations.
Finally, any new technology can survive for some years based on the features, utilization, durability and especially technological enhancement. But let us wait and see whether SMAC makes smart walk for long time or evaporates in the near future.

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# WITH OR WITHOUT?

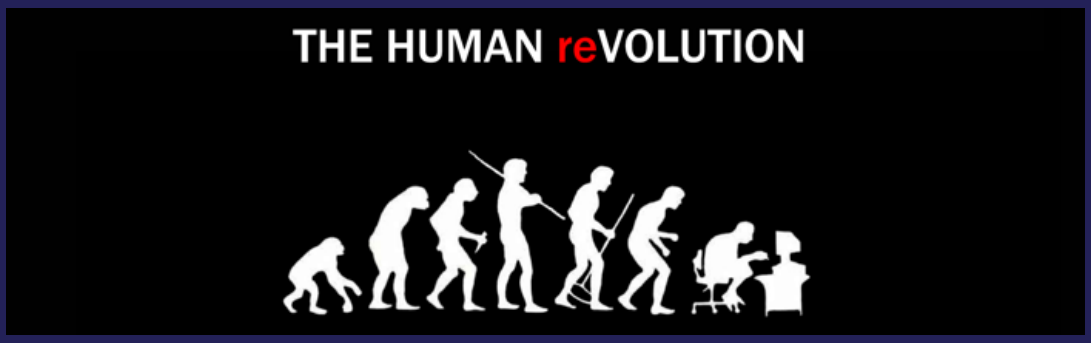
After a long and sleepless week of preparing for the midterm exams and stressing myself to do my best, the day my exams got over I finally came back and "tried" to attain the long cherished slumber in the comfort of my quilt with the fan at its highest speed! I still don't understand why I do that but I'm sure that there are many out there ,just like me, who just love that feeling. The days preparing for the exams were a big task, especially for someone like me who loves to sleep! (you can confirm that with any of my friends as you'll always see me rushing back to sleep in the hostel every free hour we get)... As soon as I opened the books to study, within a few minutes I would find myself dozing off... As if I were under the influence of a drowsy cough medication. 2-3 cups of strong coffee was one of the things that kept me going during the week.The week I can say...made me smarter academically (usual as I study during the exams and I'm clueless the rest of the semester) but the other thing that the week made me, was tired. Oh God! I can't express how tired I was and only wished and hoped to have a good long sleep!

And yaa... Finally that beautiful day arrived after a week long tiresome wait! I finally found my oasis after a long walk through the desert.... But wait it was just a mirage! After hitting my bed, armed with my favourite quilt, against the bullets of strong winds emerging from the fan, I realised to my utmost despair,that I COULDN'T SLEEP! This was a nightmare! After what I can call, hours of tossing and turning in my bed, I can say that I might have slept for a bit. The next thing I remember is waking up suddenly, feeling warm. The first thing I did was search for my phone which I usually kept on the table next to my bed, in order to check the time, but I couldn't find it. I thought I might have kept it elsewhere. I sat up straight, rubbed my eyes wondering why it was warm and looked up towards the ceiling which once had a fan but now was bare. I thought that my vision was playing tricks on me, so I rubbed my eyes yet again, but nothing changed. I didn't give it much thought as my mind was preoccupied with my phone being missing. I couldn't find my phone anywhere and the thought that my friends would have it, crossed my mind. So, I ran out of the room to confront them. They always did such things to annoy me and I assumed that they had done it once again. But on coming out of the building the guard didn't let me go further as I was in my PJ's which wasn't allowed on campus; so, I was asked to go change and then step out to which I obliged by going back in. I, being a lazy person decided to take the lift to my room on the 2nd floor, but to my astonishment there wasn't one! I asked the girls around where the lift was but the only response I got was expressions that were curious to know what a lift was and that they thought I was crazy.

I rushed to the wardens room to inquire of her as to what was goi, but when I entered her room I wasn't greeted with the usual noise of the malayalam serial from the tv but by her singing and humming some song knitting by her table . There was neither a computer on her desk, nor a card swiping machine to collect the fines but a simple pen and a stack of registers. I was taken aback and concluded that I was just dreaming. I slapped myself to come out of it but to no avail. It seemed that everything that I saw in front of me was reality. I couldn't come to terms with it but decided to just go with the flow and survive. The next day, though I was in a state of shock, I went to attend my classes. The atmosphere was totally different both inside and outside of the class. My classmates were attentive for a change without distractions but there was no practical exchange of knowledge, as there were no computers. The weather outside was better, cooler and greener than the regular weather and I felt good just looking at it.

I saw children running around, talking, laughing, playing, singing, dancing and doing many other activities. They had a special glow on their face which I was seeing for the first time. This was the only good thing I noticed since yesterday apart from the students interacting with each other, rather than being busy with their phones. I was happy at that sight. I went back to my room to take a nap and I woke up to a lot of noise. On getting up I found my room full of gadgets and equipments, ones that I had never seen in

my life! I was amazed and loved the sight of it. I touched, saw and operated the gadgets I never knew would exist and was able to control everything around me with the help of those gadgets. Then I saw something hovering right next to me. I thought to myself what it was and to my amazement it responded to me telling me that it was my personal assistant and would do anything I imagined.




The next few hours were spent in testing it out and yaa... it worked! It could do anything I thought about... Though doing such a task would've been humanly impossible, but for my assistant it was possible. Some of gadgets were so small but did things I could never imagine like clean up the room, regulate the room temperature, prepare food etc. all at the click of a button! The food though alien to me, was the tastiest food I had eaten till date. I learnt that it was some kind of synthetic meat eaten by everyone-a food which you could eat without putting on a single ounce of fat! It was a dream come true for every girl! On venturing outside I found myself in a virtual world where everything was digitised. There were portals like Doraemon's anywhere door to take you to the place you desired to be in, flying cars, robot traffic officials monitoring the skies and not a single bad weather day as everything was controlled by the city management system which I learnt was similar for every place controlling everything about the place, right from natural things to man-made things! To my amazement there were advertisements about holiday trips to Mars, Moon and also advertisements about real estate properties in Mars and on the Moon as well. I was simply awestruck by what mankind had achieved!

But the one thing that struck me as odd, was that I didn't hear the sound of laughter or see anyone running around, talking etc. The whole atmosphere felt dull and boring; though it was very interesting at it's own level. The work, though easier, was not fun. It was just monotonous. After spending the rest of the day figuring out all the latest technology, I retired to my room and just fell asleep. This time, when I woke up, I was where I had left things in the first place, the year 2017 . I think my stressed out brain was the key to time travel into the past and the future. I was so intrigued by the happenings that I started noting down everything I could remember about the visions I had. Comparing the pre technology and post technology boom eras, the missing link in the latter one I concurred was the lack of human interaction. The pre technology era, though difficult to live, was not impossible or boring as it had the human touch. But the post technology boom era though making the human life easier and awesome in every way, made it sad and depressing too, as there was minimal human interaction. Whatever said and done, a robot cannot replace a man. The warmth and happiness the company or the presence a fellow human being brings, cannot be compensated by a robot in any way.

Technology is good. It has made life easier and in some cases fun too. The unimaginable has been achieved and is being achieved every single day, but we must not get so caught up in this revolution, that we eliminate the human factor. Technology was made by man to help man. Life without technology is imaginable... Didn't our forefathers live their lives to their fullest? But is life without a living and breathing man, an imaginable one? I would like to leave you at that thought... An important thought to dwell upon by the future pioneers in the field of technology.

**Rebecca John**
**5 BCA**

# Evolution of Mobile

Mobile Phones today have evolved from their primitive objective of 'the call'. The word 'mobile' is a representation of 'unconfined'. It holds the promise that phones will evolve as time moves along. And they certainly have! We have gone from the antenna, to the touchscreen and have arrived at the technological marvels of today.
The addition of 'mobile data' has done wonders towards connecting society. Service providers never disappoint with new schemes and plans that reach out to all sectors of society.

## 1G
Only voice calls using analog signals which were much more noise sensitive than the landlines. In essence, a cordless phone.

## 2G
The culmination of a generation of texting, not just simple messages but also multi-media and yes, browsing! All through the beauty of the SIM card. Small coverage with pre-determined timeslots when exceeded drop calls. Packet data is very slow when it comes to transmission.

## 3G
Broadband access with GPS and Location based systems.

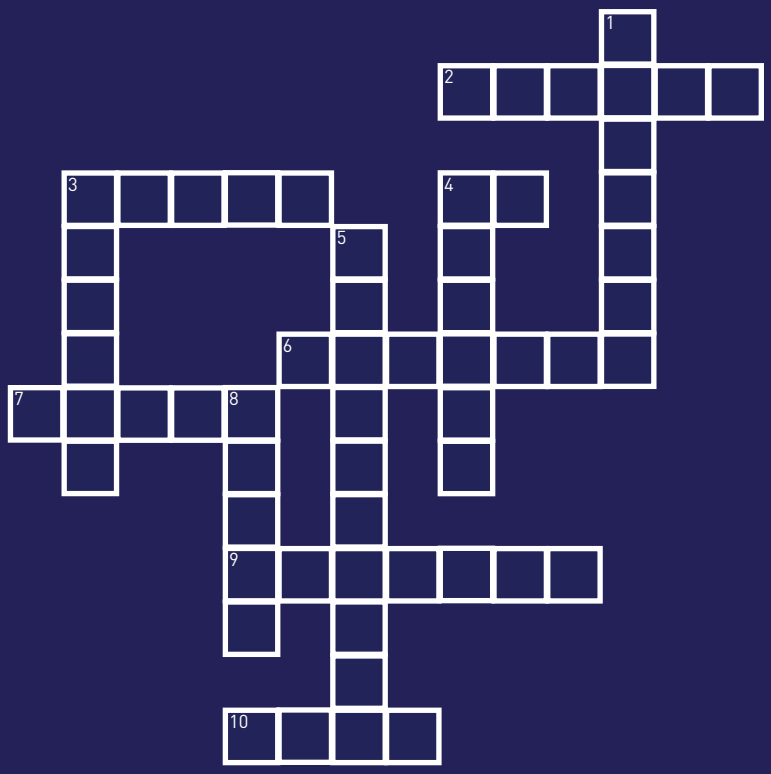
## 4G
Mobile broadband internet access, Video conferencing and Mobile Television, all these things got real. The bandwidth provides high speed as every user has their own specific frequency. It supports a large number of users with high speed, but concurrent use leads to slow connectivity.

## 5G
the future or mobile data. Improved coverage, efficient signalling, lower latency, super reliable and simultaneous connections for wireless sensors with a higher capacity than 4G. With a greater ability to realize the concept of 'internet of things'.

People are dependent on the internet and their phones for their daily routine to function smoothly. We are always on the move and require our technology to keep up. That is why the addition of mobility has been one of the biggest and most important breakthroughs in this field.

**Sarah Andrew**
**3 BCA-A**

# TECH CROSSWORD



## ACROSS

**2.** Acknowledged as the father of fibre optics.

**3.** Coined the term 'robot' in 1921

**4.** Nikola Tesla patented this form of current in 1888.

**6.** A worldwide cryptocurrency invented by an unknown programmer, or a group of programmers, under the name Satoshi Nakamoto.

**7.** An American automaker, energy storage company, and solar panel manufacturer based in Palo Alto, California.

**9.** Pioneered the current Binary System used virtually in computers.

**10.** An Internet standard for electronic mail (email) transmission.

## DOWN

**1.** One of the co-founders of the social networking site that was developed in Harvard University.

**3.** Invented the first handheld cellular mobile phone.

**4.** One of the first calculating tools.

**5.** The world's fastest supercomputer as of November 2016.

**8.** The company whose main headquarters are located at 1 Infinte Loop, Cupertino, California.

TEST YOUR KNOWLEDGE

**Sanjith Hebbar**
**5 BCA**

Across: 2.Kapany 3.Capek 4.AC 6.Bitcoin 7.Tesla 9.Leibniz 10.SMTP Down: 1.Saverin 3.Cooper 4.Abacus 5.Tainhulight 8.Apple

INFOBYTE

# C Brain Teasers

TEST YOUR KNOWLEDGE

**1. Simlify the syntax:**

```
#include<stdio.h>
#include<conio.h>
   main()
{
int a,b,c,d,e,f;
if(a)
      if(b)
           if(c)
           printf("%d",d);
           else;
      else;
else
     if(b)
        if(c)
           printf("%d",e);
           else
        printf("%d",f);
      else;
getch();
}
```

**3. Predict the output:**

```
#include<stdio.h>
#include<conio.h>
   main()
{
int a=3,b=5;
printf("%d" ,printf("%d%d",a,b));
getch();
}
```

**Abhishek Rathi**
**1 BCA-A**

**2. Predict the output:**

```
#include<stdio.h>
#include<conio.h>
   main()
{
int a=2,b=4,c=5;
printf("%d\n%d\n%d", a++ + ++a + c++, b++ + ++b + ++a, ++c + b++ + a++);
getch();
}
```

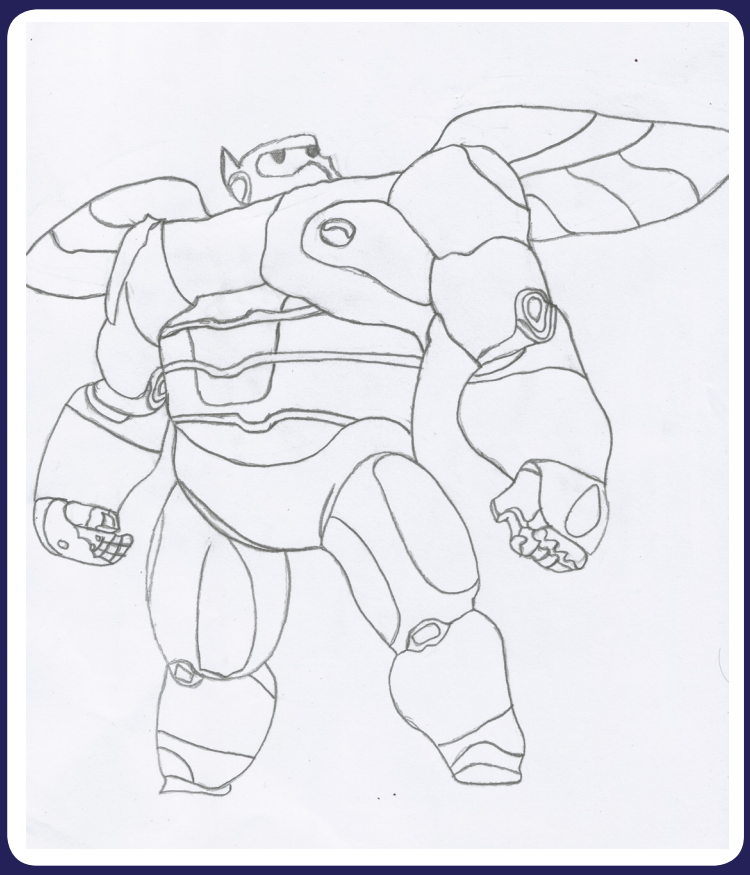
# Tech Trivia

- The Firefox logo is actully a Red Panda and not a fox.

- More than 80% of the emails sent daily are spams.

The Apple II had a hard drive of only 5 megabytes when it was launched.

- November 30 is celebated as the “Computer Security Day”.
- Since 2008, Video Games have outsold DVD’s each year.



Michael Gonsalves
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# INTERFACE 2017


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