

*Technology Works Wonders*

# TELETRONIX

• Vol. 2 • TCET's Technical Magazine for Departments of ETRX • Issue 2



## Department's Vision & Mission

### ETRX Department

#### **Vision:**

Electronics Department of Thakur College of Engineering and Technology (TCET) will thrive to achieve academic excellence in Electronics and Electronics related Technical Education in Mumbai University to develop internationally competent professionals with a sense of responsibility and social sensitivity.

#### **Mission:**

Electronics department's mission is to achieve academic excellence by creating the right academic ambience, nurturing, enhancing personal and professional skills enabling the students to compete globally.

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## Principal's Message

I would like to begin by congratulating the faculty and students of the editorial team for their efforts in bringing out the second issue of the annual departmental technical magazine 'Teletronix'. Their hard work and toil is reflected across the pages.



This magazine is a step towards technical awareness which in turn will develop communication skills and is designed exclusively for churning out the technical writing skills among students. Since challenges and opportunities are the two sides of the same coin, this magazine challenges students to bring latest technical topics and opportunity to share their knowledge in technical field.

This magazine motivates students to grab more knowledge about current trends in field of Electronics & Telecommunication Engineering thereby preparing them for global employment.

Dr. B. K. Mishra

## EDITORIAL MESSAGE

As a mentor Dean, I would like to share few things:

Firstly something from Upanishads, this has always fascinated me. There is a beautiful prayer at the beginning of many Vedic Upanishads.

ॐ पूर्णमदः पूर्णमिदं पूर्णात्पूर्णमुदच्यते  
पूर्णश्य पूर्णमादाय पूर्णमेवावशिष्यते ॥  
ॐ शान्तिः शान्तिः शान्तिः ॥

“That is perfect, This is perfect  
Perfect comes from Perfect  
Take perfect from perfect  
The remainder is perfect”

The central point is you are perfect-Happiness equated with God whose inherent nature is happiness –Bliss.

Every living creature longs for happiness in whatever stage he is standing. Happiness is the outcome of knowing our real nature. So the purpose of human Life is to know self and be happy.

But the fact is we went wrong and started doing shadow hunting. In fact we turn our back towards sun the real source and we create a self shadow/ selfie and start moving towards treating the shadow as self and start nourishing it.

In this witch hunt we achieved a name and fame in the society at the cost of increasing stress and related health issues.

Life's main purpose is peace of mind a product of simple living and high thinking. Happiness can only be achieved by turning our face towards the source.

I also want to use this opportunity to appeal to all my young friends to maintain cleanliness. Cleanliness is next to godliness. We should take an oath to keep ourselves, our surroundings and our institute clean as our Institute is our second home.

Friends, only a little attention on these two points will go in a long way in our personal life and nation building.

Stay Blessed!



**-Dr. Lochan Jolly**

Professor & Dean (Staff & Student Welfare)

# Extra Curricular Activities

**Scope** : To promote cultural, games & sports and social connect programme.

**Objective** : To develop the overall personality with the focus on confidence building, developing self esteemed factor, team spirit, social connectivity, moral value and ethics.

**Outcome** : Overall personality with leadership and managerial skill

Sr. No	Extra-curricular	Scope	Schedule
1	NSS Activities	Awareness Campaign in Villages for social understanding and connectivity.	Throughout Academic Year
2	Alumni Meet	Interaction with alumni students to understand the current trends and challenges.	December
3	T-Spark	Intra Sports Event of Student Council-TCET.	January
4	Convocation (UOM)	Degree Certificate Distribution Ceremony.	February
5	Enertia	Intercollegiate Sports Festival.	March
6	Sojourn	Annual Day Celebration.	March



## 1.1 NSS

National Service Scheme (NSS) which has student members organizes social activities of public concern. The institute also boasts of an active student council which manages the conduct of all major sports and cultural activities.

Procedure for selecting NSS-TCET Volunteers:

- Notice for NSS Volunteer recruitment is displayed in August
- Issuing forms in August for nominees for committee members recruitment
- Collection of forms from interested candidates
- Project is given to the candidates in groups
- Project is verified by student council member .
- Selected student list is displayed after discussion of student council member with faculty

The details about the programmes conducted by NSS in and around Mumbai & Thane regions are given in Table below:

Sr. No.	Project Name	Date	No of NSS Volunteers	Project Description
1	BMC School Teaching	12/07/14	40	Volunteers visited the Samata Nagar BMC School for teaching the children. The project included fun games, quiz, antakshari, dance and test based on their syllabus.
2	University Rally	14/07/14	20	The university had organised a Anti-Addiction rally from Azad Maidan to Gateway of India. The volunteers carried the posters and tried to spread awareness about the ill effects of addiction.
3	University Workshop	14/07/14	10	The volunteers attended university workshop and learned about the ill effects of addiction, what we could do on our part to support the anti-addiction drive.
4	Rakhi Selling	5/8/14 6/8/14 7/8/14	93	The volunteers sold rakhis in and around the college campus made by blind children bought from the Nation Association for the Blind, Goregaon.
5	Flag Selling	14/8/14	52	The volunteers sold sticker flags before the Independence day at a low cost and also asked them to dispose the used flags properly.
6	Independence Day	15/8/14	91	The volunteers participated in the NSS March in the college followed by the flag hoisting.
7	Medical Camp	17/8/14	62	A medical camp with the facility of free check-up was organised at the Bajaj School and the volunteers assisted the doctors and patients.
8	Malaria Seminar	23/8/14	56	A seminar on Malaria was organised in college to spread awareness about it.

Sr. No.	Project Name	Date	No of NSS Volunteers	Project Description
9	Ganesh Visarjan	30/8/14 2/9/14 8/9/14	71 29 44	The volunteers were a part of the helping team at the Artificial Pond, and helped the devotees to perform their ritual of Visarjan and helped in traffic control.
10	Sankalp	11/9/14	18	The volunteers participated in a competition organised by the NM College of Commerce and the girls of the team presented streetplay.
11	Tree Plantation	13/9/14	72	The volunteers planted 52 saplings in the Fareed Estate area of Thakur Village.
12	Traffic Control	24/9/14	113	To celebrate the traffic control week, the volunteers along with rotary club made posters and campaigned on the roads and signal near the Mahindra Junction.
13	Organ Donation Campaign	19/9/14 to 6/10/14	55	The unit participated in the organ donation campaign to spread awareness amongst people about the increase in need of organ donors and unavailability of them.
14	Anti-Addiction Rally	1/10/14	86	The team participated in a rally from Azad Maidan to Gateway of India based on the topic of Anti-Addiction.
15	Swachatta Abhiyaan	2/10/14	36	Swachatta abhiyaan was carried out under guidance of the Principal by NSS Unit to clean the College campus and the surrounding areas.
16	Know Your Neta	10/10/14	53	A campaign to make the citizens aware of the detail of the candidates before the elections was taken up by the volunteers
17	Marathon Practice	8/1/15 to 17/1/15	68	Practice for the flash mob dance to be performed at the Mumbai Marathon.
18	Mumbai Marathon	18/1/15	102	A flash mob was performed by the volunteers at the Mumbai Marathon in association with the Smile Foundation NGO, working for woman.
19	Constitution Café	17/1/15	138	A group discussion was organised on the Indian Constitution and what changes would they suggest to make it applicable for the current scenario of our country.
20	Poster Making	17/1/15	112	Posters were made by the volunteers on the topic 1916, the city saviour to spread awareness of this system amongst the people through posters.
21	Youth Foundation	12/1/15	112	Youth Foundation Day celebration was organised by the university
22	Republic Day	26/1/15	59	Team participated in the NSS March followed by the flag hoisting.
23	Thakur Convocation	2/2/15	21	The volunteers were a part of the convocation ceremony and helped at college where the senior students were felicitated.
24	Swachatta Abhiyaan	8/2/15	30	The volunteers participated in the clean Mumbai drive in association with the Hindustan Times to clean Dardar market.
25	Manori Clean Up Drive	19/2/15	87	As a part of the on going Swachatta Abhiyaan, the volunteers cleaned the Manori beach and the Ashram.

Sr. No.	Project Name	Date	No of NSS Volunteers	Project Description
26	Aadhar Oldage Home Visit	26/2/15	53	The volunteers visited the Aadhar old age home where they interacted with the residents, played indoor games, sang and danced with them. As a token of remembrance, a handmade tree with leaves made of paper to write the names of each resident was given to the residents.
27	Ncfw Seminar	20/2/15	65	The seminar was organised in collaboration with the No Country For Women team with the help of Ms. Anushka Jhadhav based on the discrimination between boys and girls and how we could change it.
28	Multicon	27/2/15 28/2/15	42	It is a multiple conference event organised in college where people from all over the country participate in various technical conferences and collaboration with the corporate sector. The volunteers helped to conduct it.
29	Bdc	17/7/14, 18/7/14 and 28/2/15	142	The Blood donation camp in the month of July for two days where three hospitals namely, Tata Memorial, Saifee and Red Cross participated was organised in association with the Lion's club and collected a total of 362 units of blood. The second blood donation camp was organised by the Lion's club again where 201 units of blood was collected in a day.
30	Bajaj School Computer	24/1/15 & 7/2/15	142	A selected batch of volunteers visited the Bajaj BMC School on Saturdays to teach the students basics of computer.
31	Save Electricity	Yearlong project	12	Volunteers were asked to maintain the record of the electricity units used of minimum 5 families and give suggestions on how to reduce the use of electricity and prevent its wastage.
32	Equal Streets	22/2/15	146	The TOI initiative of Equal streets at Bandra was to promote a free and save environment for kids to play by preparing a street play on the topic "Technology as a barrier for children".
33	BRM	Yearlong project	144	The TCET unit in association with the Blue Ribbon Movement conducted many fieldwork and poster making project in order to spread awareness for 1916 CMS. The fieldwork also included filing genuine complaints and following it up to make sure they're being paid attention to. The BRM project ended with a rally on 31st January 2015 at Azad Maidan .



# Sports & Cultural Activities

The Institute has open sports ground and different courts are available for playing outdoor games such as football, volley ball, basket ball, throw ball, etc. and also one central cricket ground. Sports activities are conducted under two events;

a) Intra sports-T'Spark: This event is conducted in the last week of January of every academic year for 8-10 days. It is conducted within the college at the department level. There are outdoor and indoor games. Indoor games such as carom, chess, table tennis etc are organized on the fifth floor boys and girls recreation room.

**Objective :** To provide the platform for a large number of students from the technical field to



show their sporting aptitude and it promises to be bigger and better with every coming year..

**Outcome :** Increased competitiveness, taking initiative and have made us proud by winning prizes in various inter collegiate sports tournaments in events like Volleyball, Football, Table tennis, Throw ball, Cricket and Basketball.



b) Inter college sports-ENERTIA: The Institute organizes a inter collegiate competition called Enertia every academic year in the month of March and is has approval from the University of Mumbai. Indoor and outdoor games are organized after college hours. To enable continuation of the competition and games after sunset and after college hours, halogen lights have been provided on the grounds. This year marks three years completion of the availability of halogen lights.

**Objective:** To develop leadership skills, teamwork skills, and inculcating the sports culture.

**Outcome:** Winning attitude developed along with leadership and teambuilding skills.



# Sports Achievements in 2015-16

## Sport: Chess

Sr no	Name of captain	Name of event	Duration of event	Achievement (winner,runner -up, 2 <sup>nd</sup> runner-up)	Remark
1.	Yashvardhan Rathi	All India Open FIDE Rating Chess Tournament, Nashik, M.S.	25/7/15 to 29/7/15	20 <sup>th</sup> Place	Scored 6 points out of 9 points
2.	Yashvardhan Rathi	All Maharashtra Open FIDE Blitz Rating Chess Tournament, Mumbai, M.S.	15/8/15 to 16/8/15	16 <sup>th</sup> Place	

## Sport Tournament: BOSM'15, BITS, Pilani, Rajasthan

Sr no	Name of captain	Name of event	Name of Tournament	Duration of event	Achievement (winner,runner -up, 2 <sup>nd</sup> runner-up)	Remark
1.	Rohan Kakati	Athelitcs (200 mtrs)	BOSM-15, BITS-PILANI, Rajasthan	18/9/15 to 22/9/15	Winner	Won Gold Medal
2.	Rohan Kakati	Athelitcs (100 mtrs)	BOSM-15, BITS-PILANI, Rajasthan	18/9/15 to 22/9/15	3 <sup>rd</sup> Position	Won Bronze Medal
3.	Rohan Kakati	Athelitcs (4*400 mtrs)	BOSM-15, BITS-PILANI, Rajasthan	18/9/15 to 22/9/15	3 <sup>rd</sup> Position	Won Bronze Medal
4.	Vikas Tripathi	Athelitcs (4*400 mtrs)	BOSM-15, BITS-PILANI, Rajasthan	18/9/15 to 22/9/15	3 <sup>rd</sup> Position	Won Bronze Medal
5.	Abhishek Pandey	Athelitcs (4*100 mtrs)	BOSM-15, BITS-PILANI, Rajasthan	18/9/15 to 22/9/15	3 <sup>rd</sup> Position	Won Bronze Medal
6.	Atul Singh	Athelitcs (4*100 mtrs)	BOSM-15, BITS-PILANI, Rajasthan	18/9/15 to 22/9/15	3 <sup>rd</sup> Position	Won Bronze Medal
7.	Harsh Singh	Athelitcs (4*100 mtrs)	BOSM-15, BITS-PILANI, Rajasthan	18/9/15 to 22/9/15	3 <sup>rd</sup> Position	Won Bronze Medal
8.	Abhishek Pandey	Athelitcs (4*400 mtrs)	BOSM-15, BITS-PILANI, Rajasthan	18/9/15 to 22/9/15	3 <sup>rd</sup> Position	Won Bronze Medal
9.	Atul Singh	Athelitcs (4*400 mtrs)	BOSM-15, BITS-PILANI, Rajasthan	18/9/15 to 22/9/15	3 <sup>rd</sup> Position	Won Bronze Medal
10.	Rohan Kakati	Athelitcs (4*100 mtrs)	BOSM-15, BITS-PILANI, Rajasthan	18/9/15 to 22/9/15	3 <sup>rd</sup> Position	Won Bronze Medal

## Sport: Volley ball

Sr no	Name of captain	Name of event	Duration of event	Achievement (winner,runner -up, 2 <sup>nd</sup> runner-up)	Remark
1.	Abhishek Pandey	Intercollegiate tournament, FRCRCE	9/10/15 to 10/10/15	Winner	

## Sport: Boxing

Sr no	Name of captain	Name of event	Duration of event	Achievement (winner,runner -up, 2 <sup>nd</sup> runner-up)	Remark
1.	Jaivind Yadav	Intercollegiate tournament, Mumbai University	1/11/15 onwards		Lost in Quarter finals

## Sojourn-Cultural Festival

**Objective:** Sojourn is a thoroughfare along which the engineering students are able to unveil their talent on the much isolated turf of performing arts

**Outcome:** The campus ablaze with the enthusiasm exhibited by students in an array of events

like Fashion show, Nach Baliye, Drama, Laughter Challenge, Debates, GDs, Ad mad show & Antakshari, which improves creative and imaginative thinking along with lateral thinking. Developed self confidence within those who perform first time on professional level.





# Importance of Co-Simulation in Semiconductor Devices design

Compiled By- Dr Sandhya Save.

## Abstract:

The design complexity of the semiconductor devices is increasing with fast rate, requiring more accurate simulations. With fast growing VLSI technology, accurate simulation capability is a necessity for designing larger chips. Designing nanoscale semiconductor devices also presents a number of unique challenges. As the scale of the individual semiconductor devices decreases, the complexity of the physical structure increases and the nature of the device characteristics depart from those obtained from many of the classically held modelling concepts. Furthermore, the difficulty encountered in performing measurements on these devices means that greater emphasis must be put on results obtained from theoretical characteristics. Modelling also allows new device structures to be rigorously investigated prior to fabrication.

The approximations that are generally made when dealing with larger devices break down as feature sizes decrease. This added complexity leads to more demanding calculations, stressing better device design approach and driving research to overcome these limitations. During the past 15 years, the fundamental techniques of theory, modeling, and simulation have undergone a revolution that parallels the extraordinary experimental advances on which the new field of nanoscience is based. The semiconductor devices are undergoing continuous modifications in the structure. As

the design being complex and more number of devices are coming on a single chip, the device structure cannot be designed with simple geometrical approach given in the designing tool in various simulation software.

## Introduction

Integrated Circuits (ICs) are increasing in size and complexity since the late 1950's. This complexity continues to rise as a result of Moore's law which states that number of transistors per chip would grow exponentially (doubles every 18 months). Over the past five years, complexity of IC's has surged from 200,000 to 500,000 gates to well over 10 million to 25 million gates. This is an increase of up to 50 times and it is the principal reason for evolution of various semiconductor devices. As device features shrink, the computational demands of the simulations necessary to accurately model them increase significantly. This is a result of not only the increasing level of detail in the device design itself, but also the need to use more accurate models. The approximations that are generally made when dealing with larger devices break down as feature sizes decrease. The act of creating models is called modelling. A model is an abstract description of the reality of a putative system. The model maps the behavior of the device to be fabricated in advance to the actual behavior.

Simulation of semiconductor device has the potential to be extremely useful when developing and improving semiconductor technolo-

gy by reducing the amount of experimentation and fabrication required to design complex devices. Modeling 3D devices is challenging as the length scales that must be resolved, combined with the nonlinear nature of semiconductor physics phenomena, often require computationally expensive simulations. Creating 3D model and simulating it can help in understanding the device behavior prior to fabrication. Device simulation can also play a role as an input to semiconductor process simulation.

Modern VLSI chips are designed at seemingly ever increasing levels of complexity. Current chip design contains tens of millions of transistors. The design of such complex chip requires a wide range of simulation and designing tools. When we want to model a semiconductor device, we use any simulating software which mainly focuses on analysis part and designing part is less focused. The objective is to use the co-simulation to remove this problem. We use the modern software for CAD which focuses on designing aspect more. It makes the designing easy, fast and equally efficient in 3D model as well.

### **The problem faced :-**

The Moore's law and modified Moore's law have been introduced and various scaling methods have also come to support the better performance in term of low power consumption and lower losses. But the device design method has not come equally to that extent to support them.

As the device is scaled down, short channel effects are prevailing, which can be reduced if better and accurate design method is available. Hence, it is required to have an advanced

designing tool which can be used at the simulating software platform as well.

We use different software such as COMSOL Multiphysics and TCAD for simulation of semiconductor devices. When we want to model in 3D, we have to adopt two approaches. Either we have to use complex Python based complex programs or we have to use the designing tool available in that simulation software itself.

When it comes to python based programming (mostly in TCAD) it requires very good knowledge of programming techniques. It is very time consuming process to write a program for complex designs. When it comes to use the designing tools present in the simulation software (In COMSOL), we can design 2D and 3D models both. But designing of complex 3D diagrams require 2D layout on a work plane and then it is rotated to get the 3D model.

For complex structured devices, it is not possible to generate 2D layout and hence it creates a limitation of the simulating software.

### **The solution: -**

In co-simulation the different subsystems which form a coupled problem are modelled and simulated in a distributed manner. Hence, the modelling is done on the subsystem level without having the coupled problem in mind. Furthermore, the coupled simulation is carried out by running the subsystems in a black-box manner. During the simulation the subsystems will exchange data.

In simple words, related to the work carried out here, it can be defined as the "integration of best features of designing software and best features of simulating software at a time."

For this work, SolidWorks proves to be a better platform. It has various capabilities and offers potential solutions for designing complex structures in mechanical and civil engineering. We can use this software for designing the complex 3D model of the semiconductor devices even at nanoscale level.

The SolidWorks provide the following potential capabilities and solutions:

**Table showing Featured Capabilities by SolidWorks**

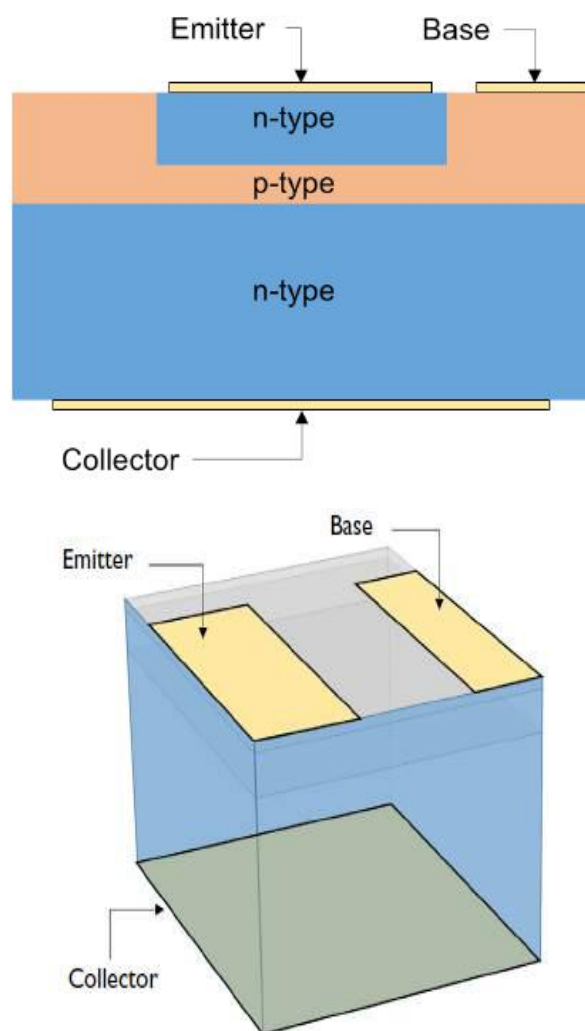
SOLIDWORKS 3D CAD Create sophisticated part and assembly designs quickly and efficiently using powerful, easy-to-use software.	Part and Assembly Modeling Flexible 3D modeling tools cover the full range of design tasks to quickly develop your product concepts.	2D Drawings Create production-ready 2D drawings that communicate how your design should be manufactured and assembled.
Design Reuse and Automation Easily find and leverage existing engineering data to create new designs and speed up product development.	CAD Library Save frequently used parts, features, and templates with easy access from inside the SOLIDWORKS environment.	3D Animations and Photorealistic Renderings Quickly and easily create powerful images and animations to communicate your design intent and functionality.
Interference Check Verify that components can be assembled properly before going into production.	Design Analysis Verify operation and performance while creating your design with fully integrated simulation and analysis tools.	Design for Cost: Manufacturing Cost Estimation and Quoting Continuously check your designs against cost targets with integrated automated manufacturing cost estimation tools.

**Table showing Featured Capabilities by SolidWorks**

3D Solid Modeling Accelerate your design, increase productivity, and reduce cost with 3D solid modeling with lifelike visualization and virtual testing before manufacturing.	Assembly Design (Large) Simplify design of large assemblies with easy-to-use tools to create, manage, and visualize large and complex designs that can contain more than 100,000 parts.	Sheet Metal Design Quickly and cost-effectively create a wide range of sheet metal part designs using a wide range of flexible tools to meet your specific needs.
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Weldments Quickly create designs that have extrusions and easily generate cut lists and bills of materials to streamline design and manufacturing of welded structures, frames, and bases.	Plastic and Cast Part Design Quickly develop plastic parts designs that meet your requirements for aesthetics, product performance, and manufacturability.	Mold Design Simplify mold design with fully integrated product design, mold design, and validation that updates all part files automatically to enable changes right up to final manufacturing.
Electrical Cable Harness and Conduit Design Easily add cable/harness/conduit systems for your design, including path planning and complete BOMs.	CAD Import/Export Easily convert CAD data into a format that meets your design requirements.	CAD Import/Export Easily convert CAD data into a format that meets your design requirements.

**Designing the BJT in SolidWorks:-**



**Fig showing 3D-model of BJT**

After opening the SolidWorks, we follow the steps as mentioned under:-



**Step1:-Select the plane of work and draw the appropriate base layout.**

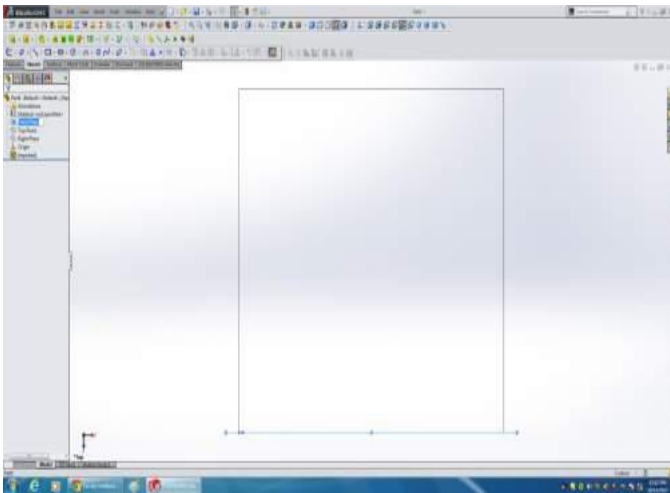


Figure showing selection of the plane

**Step2:-Specify the dimension and extrude the model by specifying the height.**

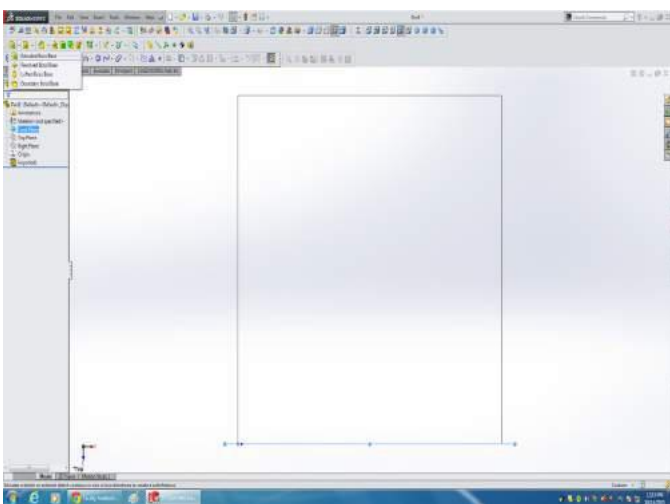


Figure showing specification of the dimension and extruding the model

**Step3:-After extruding and specifying dimensions, press Enter to get the first layer.**

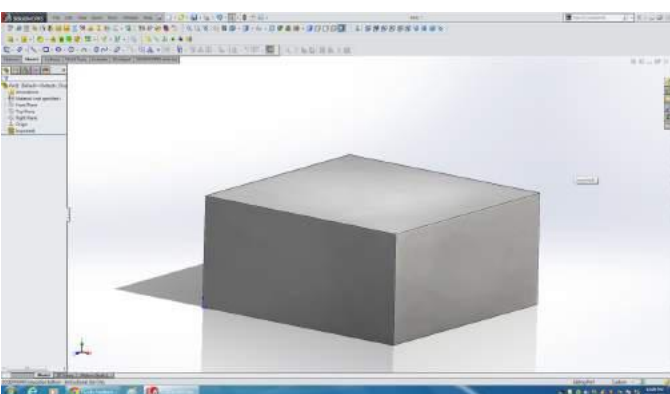


Figure showing Drawing of the first Layer

**Step4:-Select the upper surface and extrude it again.**

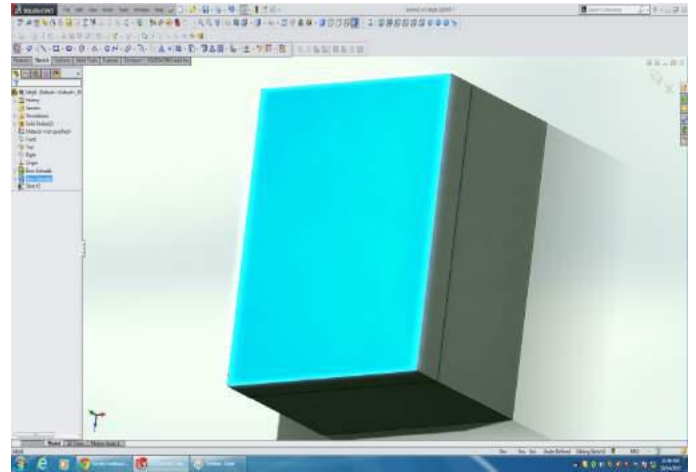


Figure showing extruding the second layer

**Step5:-After extruding and specifying dimensions, press Enter to get the structure with two layers.**

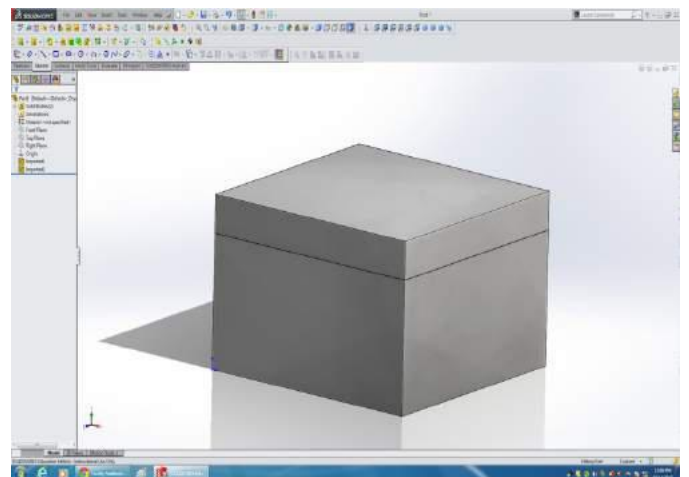


Figure showing Structure after Extruding with two layers

**Step6:-Select the T-region on the upper surface.**

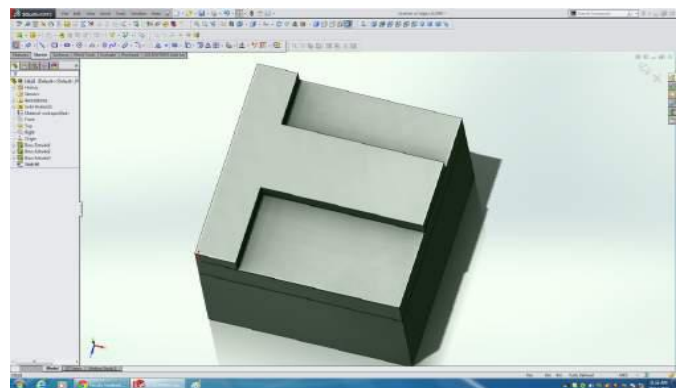


Figure showing selecting the T region

**Step7:-Specify the dimension of the T- region.**

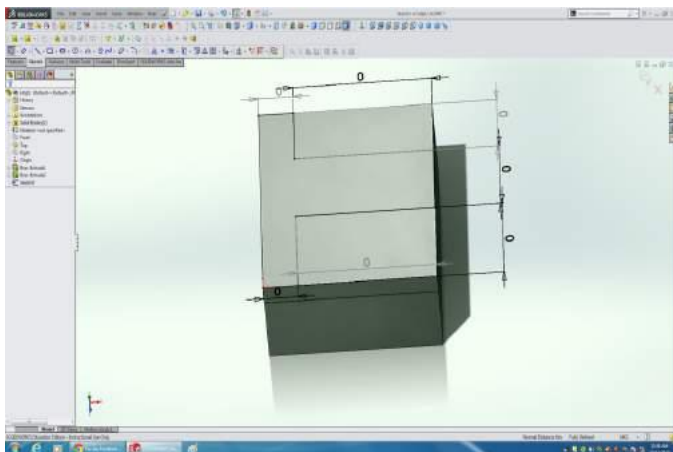


Figure showing specifying the dimensions for T region

**Step8:-Select the T-surface and extrude it again with proper dimensions.**

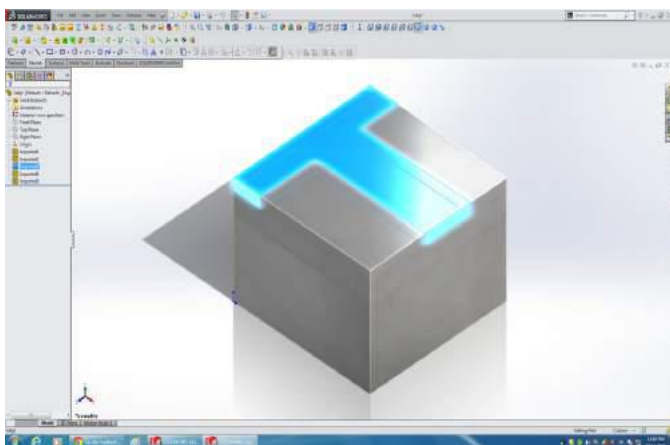


Figure showing Extruding of the T structure

**Step9:- After extruding and specifying dimensions, press Enter to get the structure with T layer with two layers.**

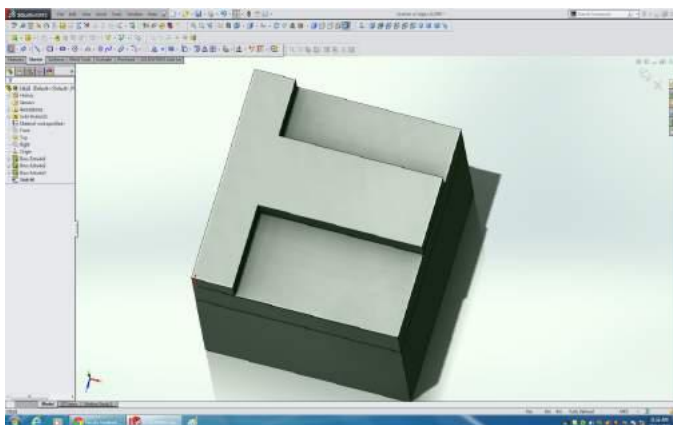


Figure showing structure with T-Layer and two layers

**Step10:-Select the region next to the T-surface on upper layer one by one and extrude it.**

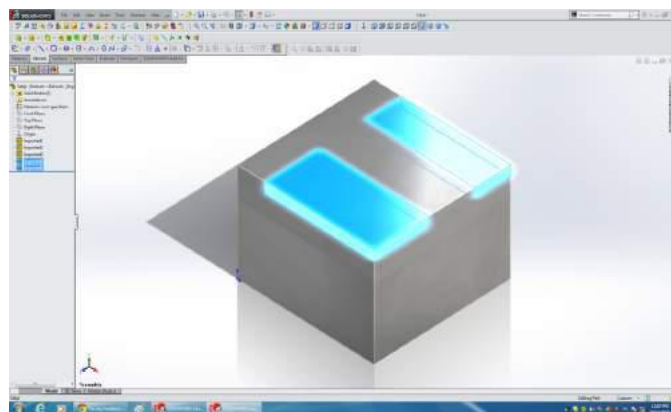


Figure shows selecting and extruding the remaining after T- region

**Step11:- After extruding and specifying dimensions, press Enter to get the structure finally.**

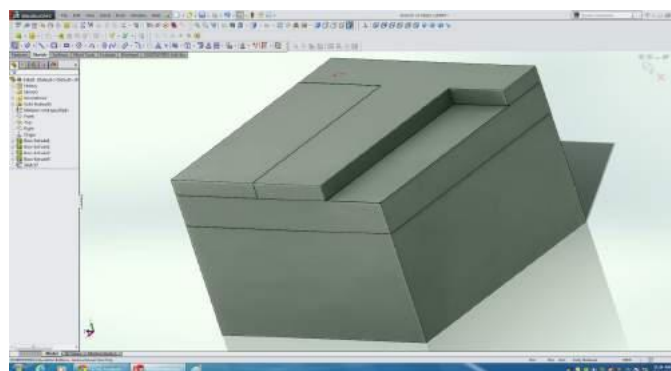


Figure shows extruding the remaining region

**Step12:- Save this file with .IGS extension. Here, we have saved the file with the name 3dbjt.IGS**

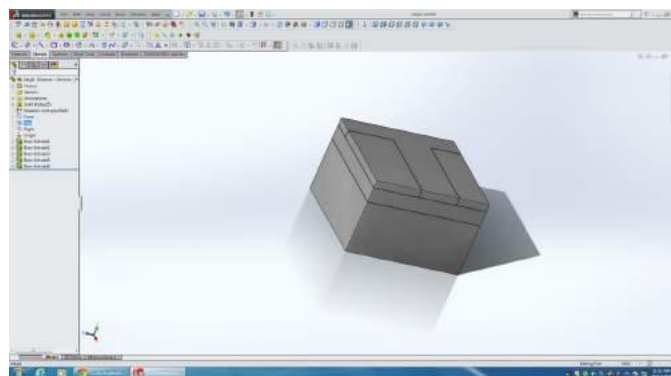


Figure showing final BJT Structure

## Importing the BJT in COMSOL Multiphysics

**Step1:-** Open COMSOL Multiphysics, select 3D model and then specify the physics as Semiconductor (Semi) and then choose the study as Stationary. Then import the IGS file saved in SolidWorks. Then click on Build all button.

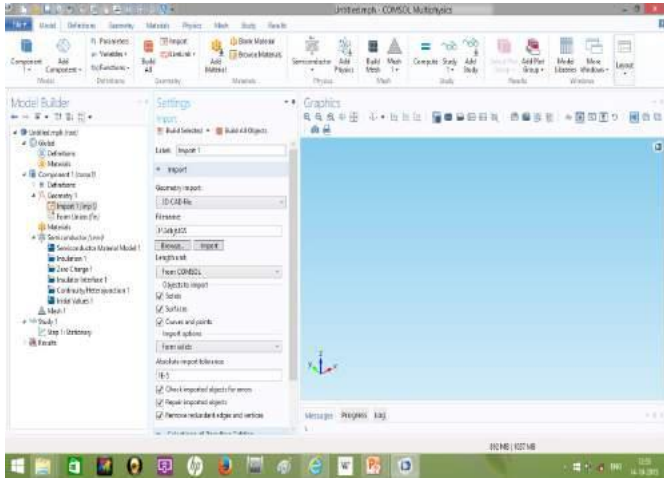


Figure shows import of the IGS File to COMSOL

**Step2:-** After Clicking on Build all we get the structure in the graphics window as shown in the figure below.

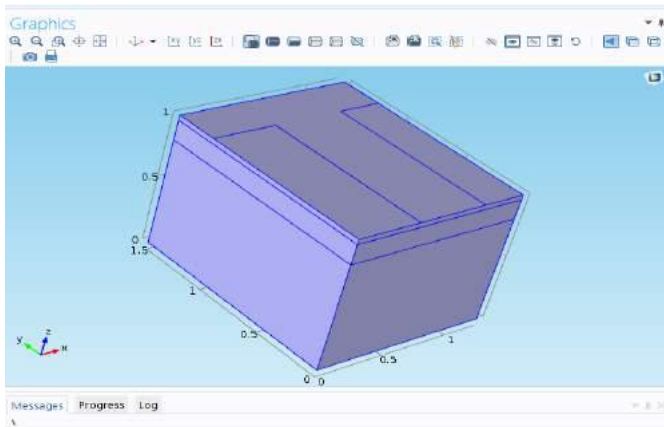


Figure shows designed BJT in COMSOL

**Step3:-** Now we apply all the physics laws and apply materials by following the same procedure to the structure directly designed in COMSOL. We get the following properties shown under:-

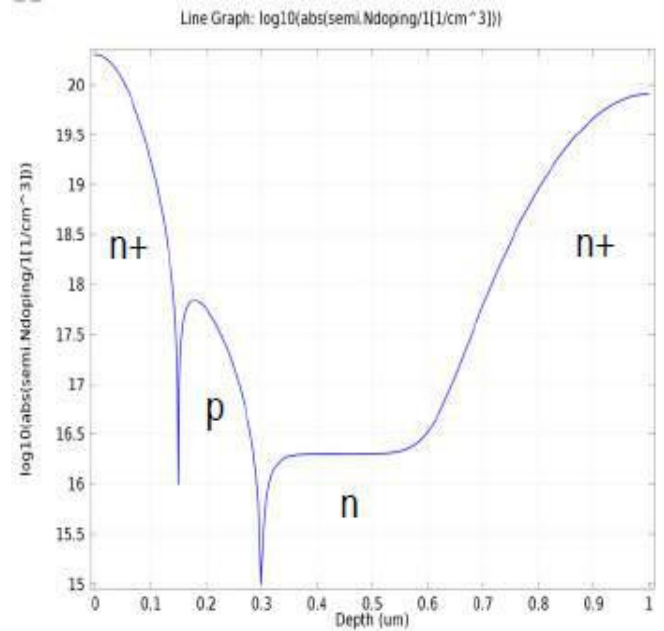


Figure shows the Dopant distribution for the Bipolar transistor device. The p-type base region can be seen in this plot.

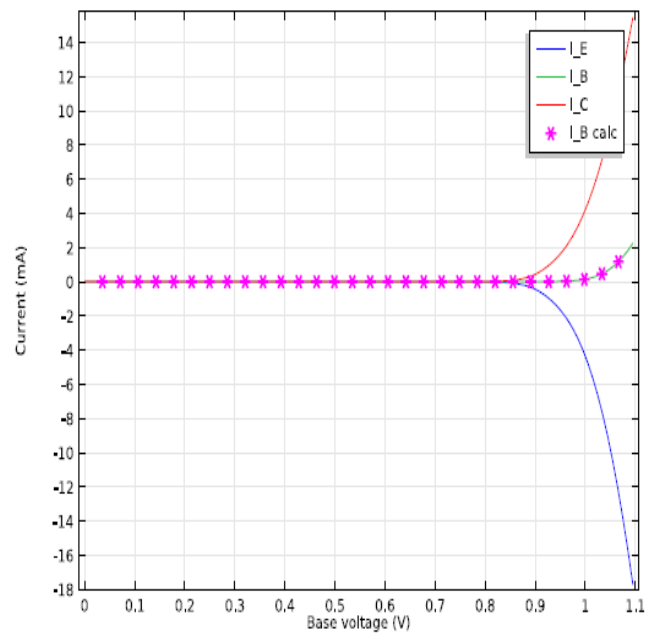
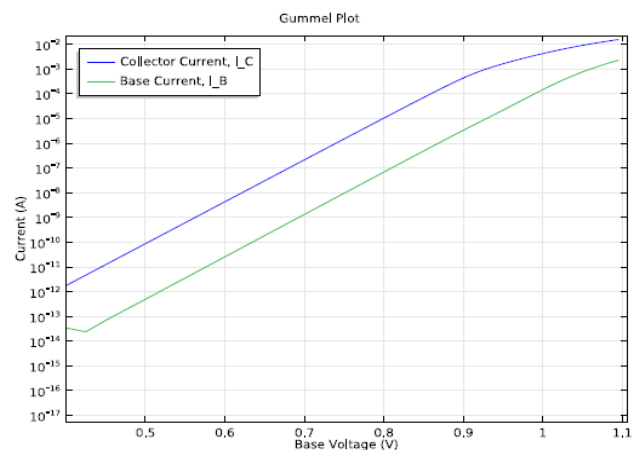


Figure shows Terminal currents as a function of the base-emitter voltage (VBE) for a fixed Collector-Emitter voltage (VCE = 0.5 V).





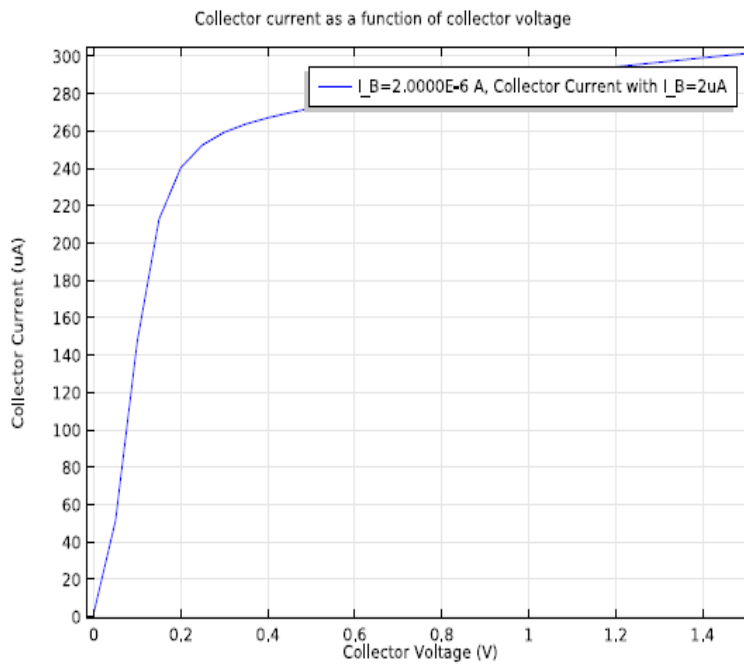


Figure shows the Gummel plot as the magnitude of the collector and base currents, plotted on a logarithmic scale, as a function of the base voltage. Figure shows Plot of Collector current vs. Collector voltage for different  $I_B$

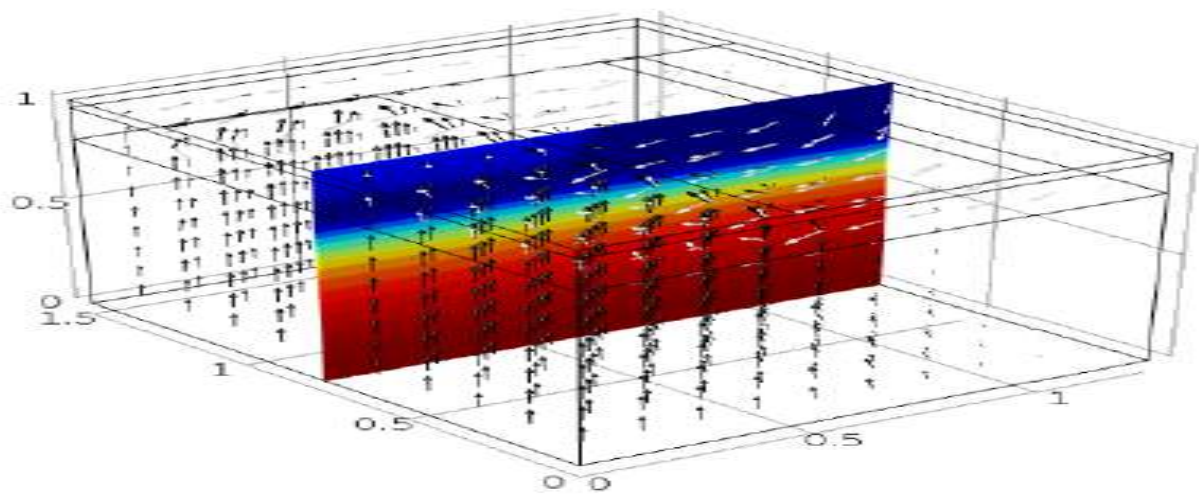


Figure shows the voltage and carrier current densities throughout the device

# Four challenges to carrier-grade network functions virtualization

Compiled By- Dr S C Patil

**N**etwork functions virtualization (NFV) represents a core structural change in telecommunication infrastructure deployment. This in turn means significant changes in the delivery of applications to service providers. NFV will bring cost efficiencies, time-to-market improvements, and innovation to the telecommunication industry.

Specifically, NFV promises four important benefits:

- 1. Flexibility:** Service providers looking to quickly deploy new services require a much more flexible and adaptable network -- one that can be easily and quickly installed and provisioned.
- 2. Cost:** Cost is a top consideration for any operator or service provider these days, even more so now that they see Google and others deploying massive data centers using off-the-shelf merchant silicon (commoditized hardware) as a way to drive down cost. Cost is also reflected in opex- how easy it is to deploy and maintain services in the network.
- 3. Scalability:** To adapt quickly to users' changing needs and provide new services, operators must be able to scale their net-

work architecture across multiple servers, rather than being limited by what a single box can do.

- 4. Security:** Security has been, and continues to be, a major challenge in networking. Operators want to be able to provision and manage the network while allowing their customers to run their own virtual space and firewall securely within the network.

These benefits will be enabled only if the industry's traditional approach to applications delivery changes from a closed, proprietary, and tightly integrated stack model into an open, layered model, where applications are hosted on a shared, common infrastructure base. Telecom vendors are currently developing proofs-of-concept for moving existing network functions to virtualized infrastructure to aid this transition.

Many aspects come into play when the different network functions are deployed in virtualized infrastructure. Just as there are four main benefits to NFV, there are four significant challenges operators can expect to encounter during the implementation and deployment phase.

Figure 1: ETSI NFV architecture.

## 1. Meeting carrier-grade availability requirements

Present day carrier network infrastructure provides reliable service and meets the availability requirement of five 9s. Existing high-capacity servers are designed for IT services and enterprise class of application, with availability on the order of two or three 9s. NFV infrastructure based on standard off-the-shelf servers will not be able to meet carrier-grade availability expectations.

In the traditional high-availability architecture, while platform redundancy is used to avoid a single point of failure, all the hardware and software components are hardened to prevent failures. Application-specific state replication is implemented to ensure continuity of operations.

NFV architecture enables resolving the high availability challenge by an alternative technological approach. Agile life cycle management allows just-in-time creation of virtual machines (VMs) to host the virtual network functions (VNFs) in the event of software or hardware failure. The NFV availability approach relies on spawning new instances on existing or additional servers. This is quite different than the traditional high-availability architecture used in telecom systems but nevertheless provides a robust and effective solution for the carrier-grade availability gap.

## 2. Limitations of existing network applications

Most legacy systems are designed with an assumption that the network application has exclusive access to the hardware resources (CPU, NIC, disk). Resources such as BSP and hardware accelerators are directly controlled by the application.

Examples of possible issues:

- Internal task interaction of real-time applications assumes direct control of hardware resources. Sharing of the hardware platform with other applications would cause some performance degradation.
- Existing network applications would mostly be scalable; however the architecture may not support dynamic scaling in response to traffic changes. The load distribution algorithm would typically be static and assume all the installed physical servers are available for use, resulting in under-utilization of each of the servers.

To resolve this gap, NFV systems should implement improvements in the virtualization layer itself and in the applications running on top of it:

- The virtualization hypervisor should provide a good level of isolation between different virtual machines and perform smart load balancing of hardware resources between the applications running on top of the virtualization layer.
- Applications should be re-engineered to allow dynamic use of the virtual infrastructure to reach full utilization of hardware resources.

## 3. Management of virtualized infrastructure and network applications

The management system of traditional networks typically consists of multiple element managers that report to a network management system (NMS). Each network element is associated with at least one element manager. Existing element managers assume tight coupling between the network element and the platform itself.



Existing management systems consider the operational state of the underlying platform the same as that of the network function. The topological view shows different network elements and network functions in their physical form in the form of hierarchy of hardware modules, rather than showing the network functions as being overlaid over the physical infrastructure

To resolve this gap, NFV management systems should enable provisioning and monitoring of the physical platform and the virtual machines running on top of the virtualization layer. The topology view of network elements should be focused on presenting logical network functions rather than physical hardware status.

#### **4. Integration and testing challenges**

Traditionally different network applications were deployed as distinctly visible entities with well-defined interface reference points. Integration tools such as protocol analyzers and data probes are based on such controllable and observable reference points. Most of the integration tools assume easy access to these interface reference points.

However, in the NFV model one or more network functions related to an end-to-end service may be assigned to some high-end hardware resource and the access to the reference point would be restricted.

Another challenge is the system performance and stability testing in the lab. It is impossible to create an environment equivalent to the actual deployment, as other applications sharing the

same physical hardware are either unknown or cannot be instantiated.

To resolve this gap, it is possible to configure the virtual switch in the virtualization layer to forward all the traffic to the physical NIC to facilitate the tapping of the interface reference point. In addition, to resolve the system performance challenge, test engineers should develop new test techniques to emulate the impact of third-party applications running in parallel to the vendor application.

#### **Summary**

In the last few years network virtualization has captured the attention of carriers worldwide. NFV has been making waves as it represents the evolution of networking, promising to virtualize physical network infrastructure and create an environment that's more adaptable than the legacy systems currently in use. Despite all challenges and issues, NFV is here to stay.

Avi Dorfman is vice president, R&D at Telco Systems. He has more than 20 years of experience in the development and delivery of telecommunications systems. Avi was the vice president, R&D and CTO for ASIS, which develops ATCA systems; vice president, R&D of Zlango, a startup that developed an innovative mobile messaging service; and vice president, R&D of Radvision/Avaya Technology Business Unit, specializing in voice and video over IP technologies. Prior to these roles, Avi worked for many years as the VoIP project development director in Comverse and system architect in several organizations.

# Wireless Charger

Compiled By- Ms. Poorva Waingankar ,Associate Professor,ETRX Department

A wireless charger that's compatible with different consumer electronics from different brands is one step closer to becoming a reality thanks to research by electrical engineers at the University of California, San Diego.

The prototype of the dual frequency charger is a thin, rectangular box (12.5 centimeters × 8.9 centimeters) that contains two transmitter coils: an inner coil optimized to operate at a frequency of 200 kHz (orange), and an outer coil optimized to operate at 6.78 MHz (red). The prototype setup is pictured with the two receiver coils off the charging platform (top) and side by side on the platform (bottom). The transmitter coils and receiver coils are attached to green circuit boards.

## **Credit: UC San Diego Jacobs School of Engineering**

Researchers have developed a dual frequency wireless charging platform that could be used to charge multiple devices, such as smartphones, smartwatches, laptops and tablets, at the same time -- regardless of which wireless standard, or frequency, each device supports.

"To our knowledge, this is the only multi-standard wireless power transmitter that's been shown to operate simultaneously at two different frequencies with high efficiency," said Patrick Mercier, a professor in the Department of Electrical and Computer Engineering at UC San Diego who led the study published in the journal IEEE Transactions on Power Electronics.

The new proof of concept study not only presents a "universal wireless charger" that can deliver power to multiple devices concurrently, it addresses an issue that afflicts existing wireless technology: incompatibility between the three competing wireless standards in today's market (known as Qi, Powermat and Rezence). Each wireless charger so far supports either the Qi, Powermat, or Rezence standard and will only work with devices that support the same standard.

As a result, wireless charging technology is ripe for a battle similar to the one that took place between Blu-ray and HD DVD. A battle between incompatible wireless standards could cripple the field until a winner emerges.

"To help avoid such a situation, we developed a wireless technology that is universal and supports all of these standards so it won't matter which standard your device supports," said Mercier, who is affiliated with the Center for Wireless Communications and is the co-director of the Center for Wearable Sensors, both at UC San Diego.

These three standards operate under different frequencies: Qi and Powermat operate at around 200 kHz while Rezence operates at 6.78 MHz. So herein lies the challenge. In order for a single charging device to support multiple standards, it needs to operate across these very different frequencies.

A wireless charger's ability to operate at a par-

ticular frequency depends on its transmitter coil. Wireless charging generally requires the charger's transmitter coil to send a high-power signal out to a compatible receiver coil in the device-to-be-charged. Existing wireless chargers are typically built with a transmitter coil that's optimized to work at one frequency. But as a consequence, the chargers are extremely inefficient at other frequencies.

To address this problem, Mercier and his team built a charging platform capable of simultaneously operating across the frequencies supported by all three wireless power standards. The prototype that they built is a thin, rectangular box (12.5 centimeters × 8.9 centimeters) that contains two transmitter coils: an inner coil optimized to operate at a frequency of 200 kHz, and an outer coil optimized to operate at 6.78 MHz. One of the features of this design is that the coils lie in the same plane, allowing for a compact size. The platform is just big enough to fit two smartphones side by side. Another important feature of the prototype is a filtering circuit that the researchers designed to prevent

the coils from interacting with each other and causing efficiency losses.

The researchers then tested the charging platform using two receiver coils (one optimized for 200 kHz operation and the other for 6.78 MHz), which served as models for two different smartphones. Engineers demonstrated that the charging platform was able to deliver power to both receiver coils at the same time at efficiencies ranging from 70 to 80 percent. The receiver coils were also able to receive power regardless of where they were placed on the charging platform.

"This means that multi-device and multi-standard wireless charging don't have to come at a significant efficiency penalty," said Mercier.

The researchers have filed patents on this technology and are looking for commercial partners to help bring the universal wireless charger into the market. The work was supported by gift funds from Korean Electronics Technology Institute (KETI). The team acknowledges collaboration with H-Technology Inc.



# Mixed Mode Simulation of Novel Semiconductor Devices using CAD tools

Compiled by-Dr. Sandhya Save

## Abstract:

Today, micro- and nano-electronic devices are becoming more complex and advanced as the dimensions are shrinking. It is therefore a very challenging task to develop new device technologies with performance that can be predicted. This report presents a mixed mode device and circuit simulation of Mesfet implementation using both scripting language and GUI in CAD software. This paper also highlights the different types of commercial TCAD software.

## Introduction:

Technology files and design rules are essential building blocks of the integrated circuit design process. Their accuracy and robustness over process technology, its variability and the operating conditions of the IC environmental, parasitic interactions and testing, including adverse conditions such as electro-static discharge are critical in determining performance, yield and reliability. Development of these technology and design rule files involves an iterative process that crosses boundaries of technology and device development, product design and quality assurance. Modelling and simulation play a critical role in support of many aspects of this evolution process.

The goals of TCAD start from the physical description of integrated circuit devices, considering both the physical configuration and

related device properties, and build the links between the broad range of physics and electrical behaviour models that support circuit design. Physics-based modelling of devices, in distributed and lumped forms, is an essential part of the IC process development. It seeks to quantify the underlying understanding of the technology and abstract that knowledge to the device design level, including extraction of the key parameters that support circuit design and statistical metrology. Although the emphasis here is on Metal Oxide Semiconductor (MOS) transistors the workhorse of the IC industry it is useful to briefly overview the development history of the modelling tools and methodology that has set the stage for the present state-of-the-art.

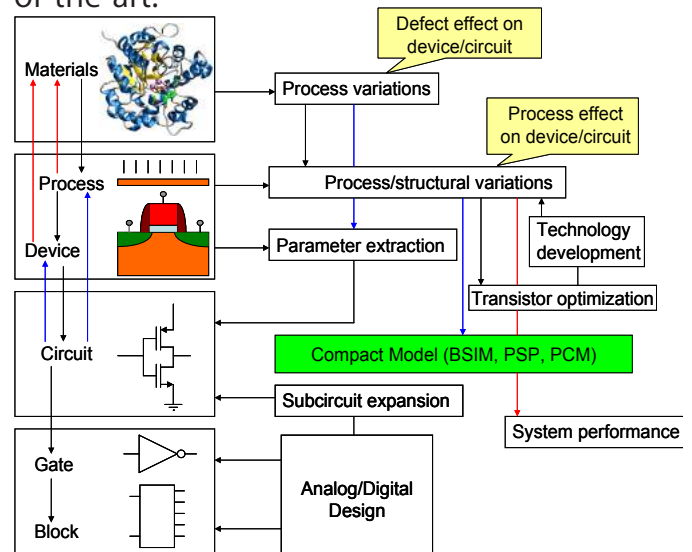


Figure 1-1 TCAD Flow

Technology CAD (or Technology Computer Aided Design, or TCAD) is a branch of electronic design automation that models semiconductor

fabrication and semiconductor device operation. The modelling of the fabrication is termed Process TCAD, while the modelling of the device operation is termed Device TCAD. Included are the modelling of process steps (such as diffusion and ion implantation), and modelling of the behaviour of the electrical devices based on fundamental physics, such as the doping profiles of the devices. TCAD may also include the creation of compact models (such as the well-known SPICE transistor models), which try to capture the electrical behaviour of such devices but do not generally derive them from the underlying physics (However, the SPICE simulator itself is usually considered as part of ECAD rather than TCAD).

**Problem faced:**

The purpose of the mixed-mode simulation work is to provide a mechanism to include complex devices or complex physical events in a SPICE circuit simulation. Compact models may be inadequate or difficult to obtain for devices such as GaAs MESFET's, heterostructure devices, short channel MOSFET's, and optical devices. On the other hand, mixed-mode allows for a quick analysis with a circuit simulation especially during the device design stages. In addition, device physical events, such as an alpha particle strike, can be incorporated in a circuit simulation environment.

Hence, unlike the current mixed-mode sim-

**Different commercial TCAD software:-**

TCAD	Platform	characteristics	Application	Simulation
Synopsys	Windows (x64), Linux, SOLARIS	Compound semiconductor technology, opto-electronics	IGBTs, CCDs, power devices, Radiation effects on device.	Process , Device and Circuit simulation
Silvaco	Windows, Linux, SUN(2010 and previous version)	Non-isothermal Device Simulator, Thermal Packaging Simulator	VCSEL, TFT, SOI, LASER, optoelectronics etc	Process , Device and Circuit simulation
Crosslight	Windows, Linux	Hot carrier transport, heterojunction and quantum well models	Photodetectors, HBT, Quantum-MOS, power devices	Process , Device and Circuit simulation
Cogenda	Windows, Linux	GDS provides parallel computation	Processing and mixed mode simulation	Process , Device and Circuit simulation
Global TCAD solution	Windows, Linux	Self-heating simulation, BSIM4 compact model	Finfet Analysis, CMOS Logic, Single Event Analysis	Process , Device and Circuit simulation
GSS	Linux	Open source, field mobility, impact ionization, band-band tunnelling model	electromagnetic solver (using FEM) to simulate optical device	Process , Device and Circuit simulation
NanoTCAD	Windows, Linux	3D,transient and steady state.	Si CMOS, HBTs, HEMT, Solar cells etc.	Device Simulation

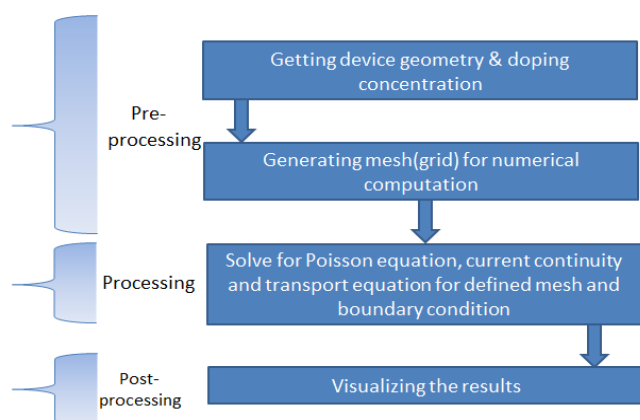
ulators on the market, Stanford has taken the approach of a loosely coupled algorithm. As a result, any device simulator may be added into the mixed-mode environment with the addition of a few routines and a couple of small changes to the device simulator. In addition, each numerical device in the circuit may be simulated with a different simulator. This ability leads to more robust solutions since the most accurate simulator for the specific device may be used. Hence, the main advantage of the loosely coupled algorithm is the modularity; however, some computational cost is incurred.

This report is to simulate the Mesfet device using CAD tool and import it in the circuit for mixed mode simulation. This paper also gives the brief theory of Technology CAD software followed by process simulation, device simulation and mixed mode simulation. Different types of commercial TCAD software are also described with their specific area of application. VisualTCAD based Mesfet device is simulated and used in circuit that is Mixed mode simulation is performed.

**What is the solution:**

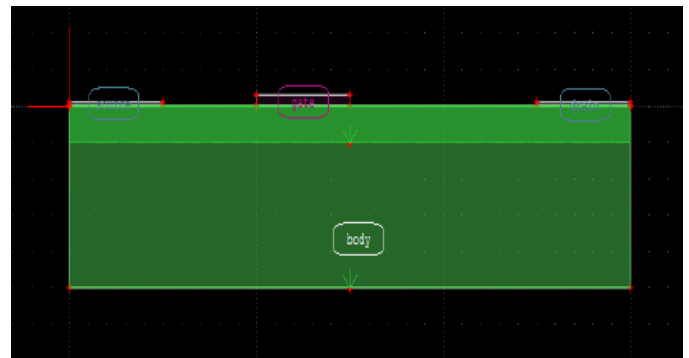
The Mesfet device is simulated with device simulation procedure as shown below. This device is taken as a component to make inverter circuit.

**Fig. Design Flow**



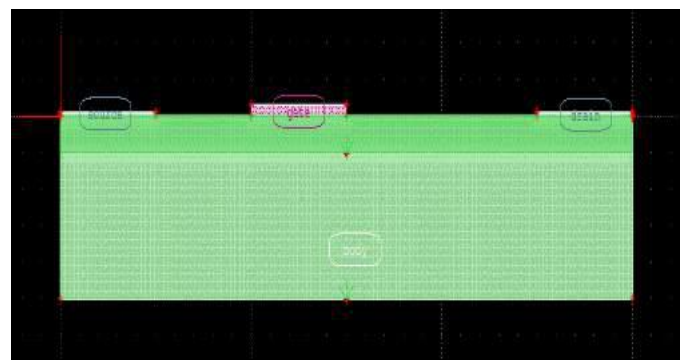
**step 1 Creating device geometry**

Device geometry is made by using different drawing tools. After that regions are defined according to device specification with different meshing size. Doping is done with given doping concentration and characteristic length.



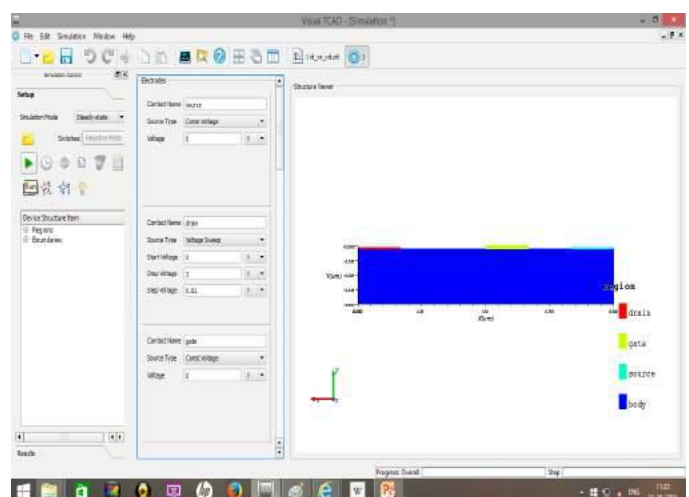
**step 2 Building and refining mesh**

Build mesh and refine it to optimum order so as to achieve best results calculated based on equations on mesh points.



**step 3 Setting boundary condition**

After defining the device, simulation is carried out by giving the boundaryCondition (external





voltages, type of contact, work function etc). Different Properties of device can be seen such as hole and donor concentration, Potential, Na and Nd density, impact ionization, Ec&Ev etc.

#### step 4 Defining symbol for device

Symbol for device can be used as an element in circuit simulation. By defining pins for contacts and choosing appropriate symbol, the device element can be defined.

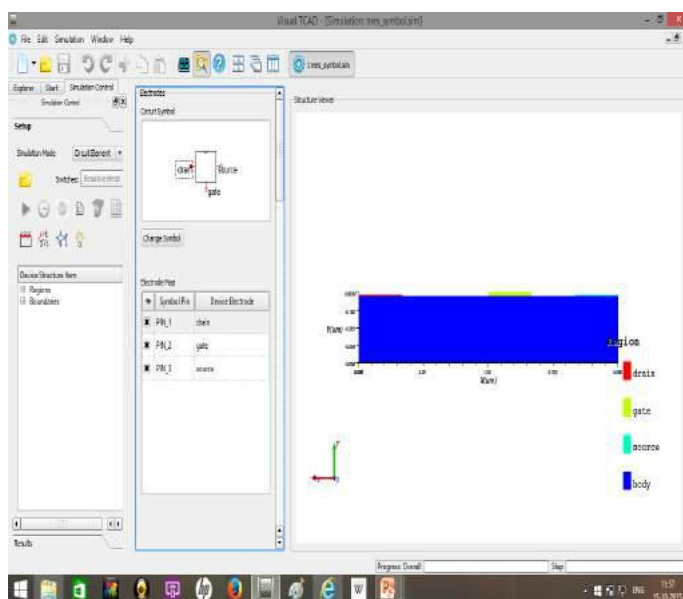


Fig. Defining symbol for device

#### step 5 Circuit schematic by importing device element

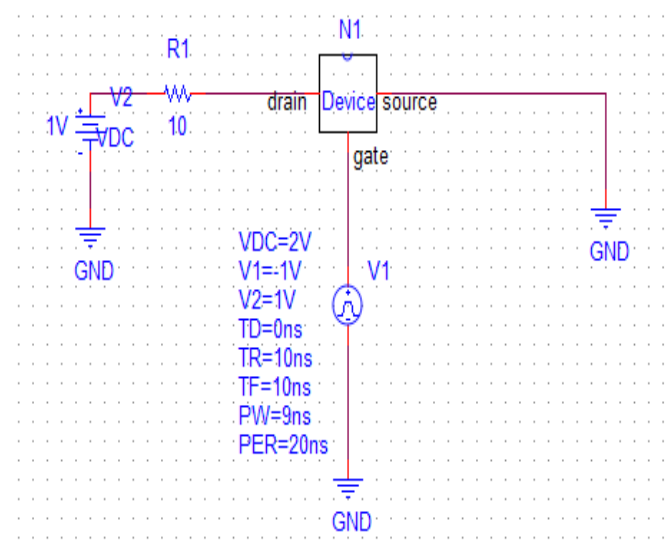


Fig. Circuit schematic by importing device element

Simulated device can be used as a circuit element and with predefined library for other component.

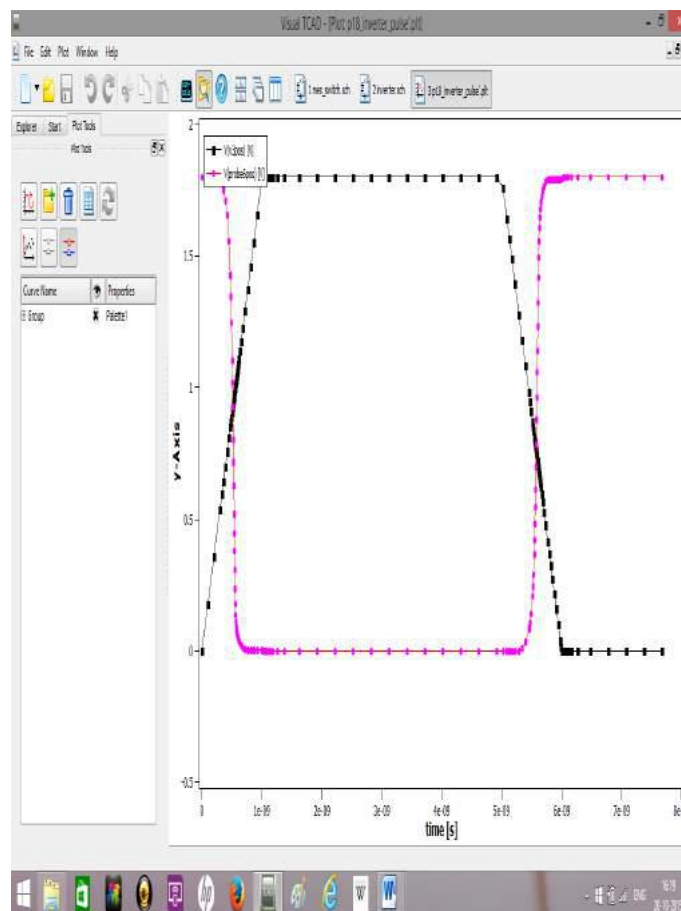


Fig. output of circuit simulation

Without mixed mode simulation, the model of simulated device is used for the circuit simulation which is tedious work. Hence mixed mode simulation is used which is time efficient and easy to use. By using Mixed mode simulation, device characteristics is enhanced and verify circuit simulation by trial and error method instead of finding numerical model of the device.

# First steps to create biodegradable displays for electronics

Compiled by: Ms. Poorva Waingankar, Associate Professor, ETRX Department

Current mobile phones and electronics are not biodegradable and create significant waste when they're disposed," said Suchismita Guha, professor in the Department of Physics and Astronomy at the MU College of Arts and Science. "This discovery creates the first biodegradable active layer in organic electronics, meaning--in principle--we can eventually achieve full biodegradability."

Guha, along with graduate student Soma Khanra, collaborated with a team from the Federal University of ABC (UFABC) in Brazil to develop organic structures that could be used to light handheld device screens. Using peptides, or proteins, researchers were able to demonstrate that these tiny structures, when combined with a blue light-emitting polymer, could successfully be used in displays.

"These peptides can self-assemble into beautiful nanostructures or nanotubes, and, for us, the main goal has been to use these nanotubes as templates for other materials," Guha said. "By combining organic semiconductors with nanomaterials, we were able to create the blue light needed for a display. However, in order to make a workable screen for your mobile phone or other displays, we'll need to show similar success with red and green light-emitting polymers."

The scientists also discovered that by using peptide nanostructures they were able to use less of the polymer. Using less to create the same blue light means that the nanocomposites achieve almost 85 percent biodegradability.

"By using peptide nanostructures, which are 100 percent biodegradable, to create the template for the active layer for the polymers, we are able to understand how electronics themselves can be more biodegradable," Guha said. "This research is the first step and the first demonstration of using such biology to improve electronics."

The study "Self-Assembled Peptide-Polyfluorene Nanocomposites for Biodegradable Organic Electronics" recently was published as the inside cover article in *Advanced Materials Interfaces*. The work was supported by the National Science Foundation (Grant IIA-1339011) and CNPq (400239/2014-0). The content is solely the responsibility of the authors and does not necessarily represent the official views of the funding agencies.

Tommi White, assistant research professor of biochemistry, and Thomas Lam, both with the Microscopy Core Research Facility at MU, contributed to the study. Other collaborators include Wendel A. Alves and Thiago Cipriano, professors of supramolecular chemistry at UFABC; Eudes E. Fileti, a professor of physics at the Federal University of São Paulo, Brazil.

## Journal Reference:

Soma Khanra, Thiago Cipriano, Thomas Lam, Tommi A. White, Eudes E. Fileti, Wendel A. Alves, Suchismita Guha. Self-Assembled Peptide-Polyfluorene Nanocomposites for Biodegradable Organic Electronics. *Advanced Materials Interfaces*, 2015; 2 (14) DOI:10.1002/admi.201500265

# Optics and communications

Compiled By-Omkar Rane, BE (ETRX)

## Abstract

The general structure of telecommunications networks and describes the fundamental role that optical technologies play in these networks. This chapter also positions the TM-Series packet-optical transport system in this context.

## Telecommunications networks, now and in the future

Our century is undoubtedly a century where telecommunications have become a central element of life, both in a private and a professional sense. The continuing, relentless need for more network capacity is one of the clearest technical trends, whether you are a network operator in Sweden or in Bangladesh. Where telecommunications once meant using the telephone network, today the Internet, TV and various computer networks make up the vast majority of information transported over the electronic web, spanning the globe.

Bandwidth demand is fueled by the tremendous growth of the Internet, both in terms of number of users and by the amount of data they transfer. Although hard to measure, the total bandwidth consumed by Internet traffic alone is estimated to grow some 50% annually during the next decade. Meanwhile, residential broadband access technologies with data rates of 1 – 100 Mbit/s have been widely deployed. With access technologies supporting 1 Mbit/s per user and more, traditional broadcasted TV

become challenged by video on-demand, delivered to our homes over the telecommunications network .

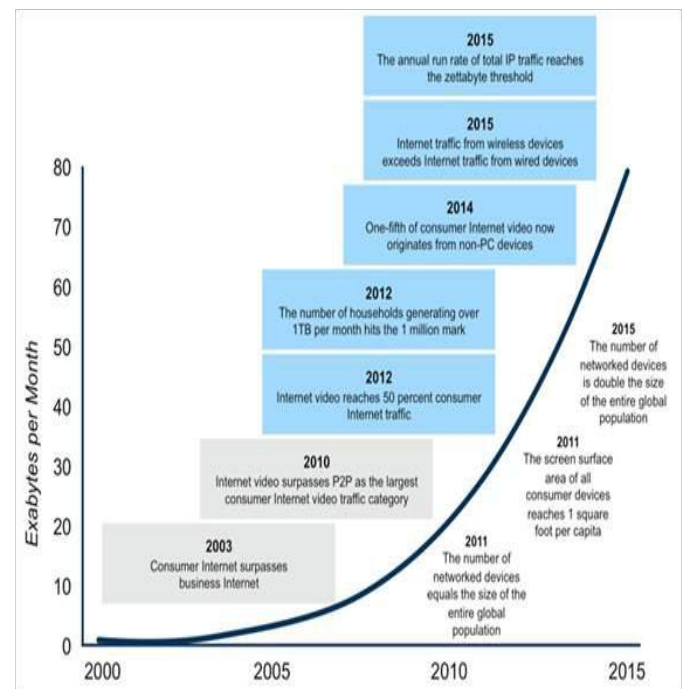


Figure 1. Internet traffic 2000 – 2015. Source: Cisco 2011. (1 exabyte = 10<sup>18</sup> byte)

At the same time, business operations today rely upon high speed data networks, interconnecting sites, companies, suppliers and customers. Where once large companies were satisfied by using leased telephone lines with a capacity of some Mbit/s between their sites, the current demand is to interconnect offices with Gbit/s or 10 Gbit/s and use data centric protocols such as Ethernet, rather than transport formats that were originally optimized for carrying voice traffic from telephone calls. Furthermore, technological innovation, mass production and cost rationalization have gradually reduced the cost of components used in telecommunications, thereby reducing the cost of



bandwidth. A lower bandwidth cost spurs innovation of more bandwidth hungry applications – think of Spotify and YouTube – creating demand for still more bandwidth. The shift towards higher capacity telecommunications networks is in a positive feedback loop, and will roll on for many years to come.

All these factors drive the development of high capacity telecoms networks, and optical transmission techniques have become the standard technology to use. Optical fiber can carry much more bandwidth than copper wires and is less susceptible to electromagnetic interference and signal attenuation. Consequently, from a technical perspective optical fiber is the preferred medium for transmission of data at anything more than a few Mbit/s over any distance more than a kilometer. It is also the preferred medium for shorter interconnections requiring ultra-high capacity within computer systems, e.g. in Storage Area Networks (SAN).

The evolution of new, innovative techniques to carry data over optical fibers is a core technology in building up our current and future telecommunications networks. Transmode is at the forefront of this development seeking to help operators, wholesale carriers and private companies to make the most efficient use of their optical fiber assets, may they be fully owned or leased. Transmode is leveraging the latest technologies in carrier class products, creating flexible and future proof optical networks worldwide.

### Telecommunications network architecture

The larger telecommunications networks are public networks, run by service providers and network operators which sell capacity and re-

lated services to their customers. Service providers typically specialize in the provisioning and marketing of end user services such as mobile telephony to consumers and enterprises. Network operators normally own their own infrastructure, i.e. the ducts, fibers, microwave links, switches etc. of the telecommunications network, and provide transport capacity and more specialized services based on those assets. Network operators and other carriers often resell their transport capacity in bulk to service providers, other smaller operators and enterprises. Private networks, i.e. telecommunications networks built and used by an enterprise or governmental agency for internal purposes, are typically smaller, but organized in similar structures as the public networks. These private networks frequently rely upon capacity (fiber, Ethernet services etc.) rented from the network operators.

The following figure shows an architectural overview of a typical public, national fiber network structure. (Figure 2)

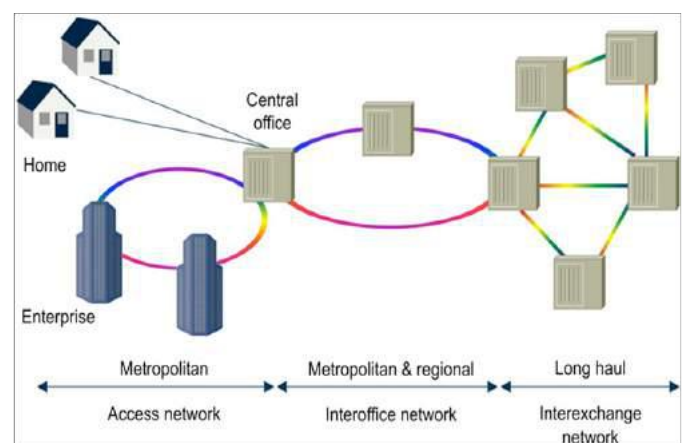


Figure 2. Overview of a national fiber network structure.

In reality, a public fiber network is very extensive and its structure more complex than depicted, often with different carriers owning and operating different parts of the network. The

nodes of the network are central offices (telephone exchanges) or other locations where the respective carrier has a point of presence (POP) and can create a hub where fibers can be interconnected. The links between the nodes in the network consist of a single optical fiber, a fiber pair, or multiple fiber pairs, typically deployed in an underground duct, but for example, sometimes spun around the wire of a high voltage electrical distribution system on poles.

### **Long haul, metro and access**

When discussing optical networks, the separation of the network in a long haul (sometimes called core) part, a metropolitan (metro or regional) part and an access part is useful, since these networks have somewhat different technical and operational requirements.

The long haul network interconnects different regions and countries, often covering distances of 1000's of kilometers. Such long distances between nodes require amplification and regeneration of the transmitted optical signals at intermediate points. A long haul network may serve one or more network operators, each having millions of users and many services; hence the requirement on availability (up time) for the connections between the nodes becomes extremely high. Long haul networks therefore have alternative paths between nodes and some scheme for protection switching that can re-route traffic on an alternative link with minimal delay. From a topology perspective, the long haul network is normally designed as a mesh of alternative links between important cities/hubs, each link being implemented with multiple fiber pairs using highest quality, single mode optical fiber.

The metro network consists of interconnections between central office locations in a large city or cities in a region (metro-core), but normally it also comprises the links to mobile cell sites, large enterprise users, industrial campuses and groups of residential homes (metro access). The metro-core network spans anything from 10 to 1500 kilometers and the metro access network, which accumulates traffic towards the central parts of the structure, typically spans a few kilometers. Protection switching is normally required from a reliability point of view, so metro networks are sometimes meshed but more often built as rings to save on fiber deployment costs. The ring allows an alternative route towards the central office node "in the other direction", should the fiber accidentally be cut. A ring is also an efficient way of collecting traffic from many sites and therefore sometimes referred to as a collector ring. Metro networks are normally built with one or more pairs of single mode optical fiber, but structures using a single fiber also exist.

The access network, finally, refers to the "last mile" (i.e. km) from a node in the metro network out to the individual user of a telecom service. The access network comprises a significant part of the overall fiber mileage especially in residential area fiber deployments, where a fiber is pulled to each individual home (Fiber to the Home, FTTH) or multi dwelling building with apartments (Fiber to the Building, FTTB). Since this part of the optical network is costly to deploy, several schemes where a single fiber or a single fiber pair are used to pass multiple homes have been conceived, for example several types of Passive Optical Networks (PON), which can use various means of sharing the available bandwidth.

## Deploying the fiber

Fiber is deployed physically in many different ways today – fiber cables are buried underground in ducts, strung on overhead poles and buried along railroad lines – all with different deployment cost characteristics. Typically more than 60% of the investment in a new optical network relates to the civil works (excavation, ducts etc.) needed. Hence, the links between nodes are normally created by installing fiber cables, each cable containing many fibers (10 – 20) and sometimes also copper wires for power supply of intermediate amplifiers. Initially only a few fibers are used (or lit), and the rest are available for possible future expansion needs or lease to other users as dark fibers. (Figure 3)

Fiber deployment costs – examples	
Heavy trenching	10 €/m
Micro trenching	40 €/m
Aerial deployment	20 €/m
Reuse of existing ducts	10 €/m
Drop costs	300 €/m
Vertical build	200 €/m

Figure 3. Examples of fiber deployment costs. Source: Ericsson 2010.

The efficient utilization of already deployed fibers becomes of utmost importance for the economy of any carrier, given the large investments done when originally deploying ducts and installing the fiber. Not only does adding additional fiber pairs cost money, digging up street requires right-of-way privileges, planning and permits. It is very obvious that the optical fiber infrastructure must be given a long life, and should be kept unaltered as long as possible, despite growing capacity demand, new protection schemes and changing usage patterns.

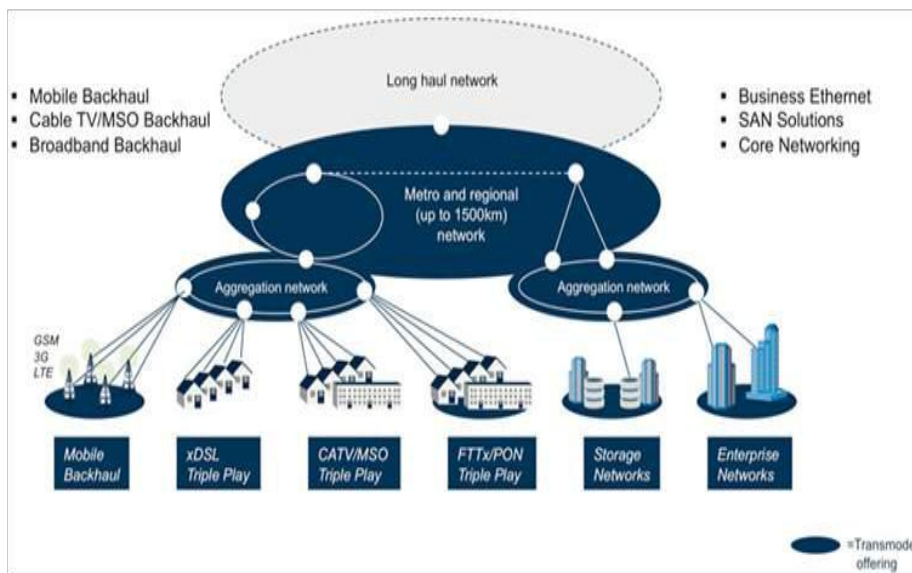
Today's advanced optical technologies provide the means to increase the capacity of the deployed or leased fiber, make that capacity available to multiple services in a secure and manageable way, and cater for further capacity upgrades. Furthermore capacity can be added in a "pay as you grow" manner without fork lift upgrades of already installed switches and routers. Thus, optical networking becomes the universal solution to the need for more capacity at any network operator.

## The Transmode TM-Series

Transmode specializes in optical transport products giving network planners the maximum freedom in leveraging already deployed

and new fibers when designing their telecommunications network. The TM-Series family of WDM based packet-optical products are optimized for building the most cost efficient and flexible metro interoffice and metro access

networks possible. And as the optical technologies evolve, the TM-Series becomes increasingly attractive also for networks previously requiring specialized long haul equipment. In the access, the TM-Series provides solutions for the "2nd mile" connections, i.e. the transport of data from fiber access points in housing areas, enterprises, cell sites and local exchanges, and leverages advances in standardized WDM technology to serve enterprises and residential subscribers. (Figure 4)



**Figure 4. The Transmode target network (blue).**

Key to the TM-Series is its flexibility and how passive and active units may be combined to adapt to the requirements at hand. For example, the TM-Series is applicable for use on single fibers, fiber pairs and multiple fiber pairs in mesh, ring and point-to-point topologies, enabling protection switching where necessary. Cost efficient, simple networks with only passive elements are easily designed, while still enabling an incremental, fully compatible upgrade path to the highest capacity DWDM solutions.

The TM-Series supports a very wide range of passive and active units and the total compatibility where any plug in unit can be located freely in any chassis minimizes initial investments while still maintaining the option to accommodate virtually any need. The completeness of the Transmode offering is further strengthened by the accompanying management suite Enlighten™, which includes both network planning and management tools for the Transmode products.

The TM-Series family belongs to a fourth generation of packet-optical products. In the first and second generations optics was essentially only performing signal transmission, upgrading the capacity and performance of previous installed copper wires. All switching and other higher order network functions were done by electronics in external equipment. Examples of

typical first and second generation optical systems are the PDH and SDH networks deployed in Europe and SONET networks deployed in North America during the latter part of the 20th century. Third generation optical products can route and redirect the optical light paths and form an integrated optical networking system, significantly reducing the signal conversions and equipment needed and thus also the network cost.

The TM-Series fourth generation packet-optical networking products take the integration of functionality one step further by including Ethernet aggregation and other packet mode functions optimized for data traffic into the optical network equipment, creating one integral, centrally managed, packet-optical network. The integration of higher layer functionality makes it possible to handle traffic according to predefined levels of quality, security and bandwidth. By eliminating the need for separate switching equipment in the metro and access networks, the TM-Series reduces overall costs and improves efficiency of data traffic transmission for the network operator.



# Fiber Optic - A Preferred Medium of Communication

Compiled By-Evanshi Vasani, BE (ETRX)

**F**inolex Cables is constantly working toward innovative technologies and enhancing technical competencies. The company manufactures superior quality optic fiber at its modern, state-of-the-art manufacturing plant at Urse near Pune. The Finoptic LWPF fiber is designed for transmission systems over the entire wavelength range from 1260 to 1625 nm, and is characterized by attenuation at 1380-1386 nm band, being less than attenuation at 1310 nm. Finoptic LWPF is optimized for use in metropolitan and local access networks due to low attenuation across the entire band and low PMD (polarization mode dispersion). FinOptic LBLF and FinOptic NZDSF are other fiber optic cables from the house of Finolex.

There are a number of benefits of fiber optic cables:

Less signal degradation. Light degrades much slower than electricity does. Hence, there is less transmission loss in fiber optic cable than copper wires. Light signals from one fiber do not meddle with those of other fibers in the same cable. This means clearer phone conversations, TV reception, or faster Internet.

Inexpensive. Hundreds of thousands of miles of fiber optic cable can be made cheaper than the equivalent length of copper wire.

Easy-to-upgrade. There is a constant need to increase performance in all networks. Fiber optics has a combination of considerably larger

distance between network nodes and substations and more unused overhead, which makes upgrades less of a task for network carriers.

An eco-friendly alternative. Data transmission over fiber optics consumes far less energy than metal wires. It requires fewer substations and nodes to replace and upgrade light signals. Also, the fiber optic cable never corrodes and not sensitive to water and chemical damages.

Incombustible & light-weight. Only light signals are passed and not electricity, negating the chance of a fire hazard. The weight of an optic fiber cable is less than a comparable copper wire cable. Installation of fiber optic cables requires less space in the ground.

Secured communication. Compared to electrical wires, optic fiber gives secured communication, which can also be made intrusion proof if situation demands.

Less probable for theft. In absence of metal conductor, optic fiber cable has negligible scrap value, thus less susceptible for any theft.

Enormous bandwidth. Compared to copper wire, optic fiber has enormous bandwidth for data transmission in a cost-effective manner.

Another trend that has attracted the eyeballs of the researchers is the multi-terabit transmission. It means increasing availability of more bandwidth in the fiber optic networks. It is a costly affair and justified only for trans-ocean and other long-distance systems.

# Modern History of India

Amit Singh, TE (ETRX)



During the late 16th and the 17th Centuries, the European trading companies in India competed with each other ferociously. By the last quarter of the 18th Century the English had outdone all others and established themselves as the dominant power in India. The British administered India for a period of about two centuries and brought about revolutionary changes in the social, political and the economic life of the country.

Once the British set their foot solidly on Indian soil, they began the commercial exploitation of the natural resources of India. By the middle of the 19th Century arrogant exploitation of the people had tried the patience of the Indians to the limit. The British imperialism reached its zenith between the middle of the nineteenth century and the First World War. The exploitative policies of the British in India saw the birth of nationalist agitation against it. With increas-

ing intrusion of aliens in their lives, a group of middle class Indians formed the Indian National Congress(1885).

The anti British struggle became truly a mass movement with the arrival of Mahatma Gandhi (1869 - 1948). It was followed by numerous movements against the British rule. With the passage of time and stubbornness of the Indians the British had come to realize that the day was not far off when they will have to quit India. Successive campaigns had the effect of driving the British out of India in 1947, but with independence came the independence of the country into Pakistan.

## Freedom Fighters India

His brave deeds earned Vallabhbhai Patel the title of the iron man of India. For his role in the Bardoli Satyagraha, Patel came to be called the Sardar. Sardar Patel was a famous lawyer but

gave up his practice in order to fight for the freedom of the country. After independence he became the deputy PM of India and played an important role the integration of India by merging numerous princely states with the Indian Union.

### Indian Independence

The feeling of nationalism had started growing in the minds of Indians as early as the middle of the nineteenth century but it grew more with the formation of the Indian national Congress in 1885. Though the Congress started on a moderate platform but with the passage of

time and apathetic attitude of the British government, the national movement began to shape well.

### Mahatma Gandhi

Mahatma Gandhi was born as Mohandas Karamchand Gandhi on 2nd October 1869. He was the most popular as well as the most influential political and spiritual leaders of India. His contribution to the freedom struggle of India is priceless and the country owes its independence, partly, to this great man. The Satyagraha movement, which led to India's independence, was founded by Mahatma Gandhi.

## Software to automatically outline bones in x-rays

Compiled by- Umesh Pandey, BE (ETRX)



Research into disorders such as arthritis is to be helped by new software developed at the University of Manchester which automatically outlines bones -- saving thousands of hours of manual work

Amidst a national shortage of radiographers in the UK and an increasing requirement for researchers to work with large databases of radiograph images, the software which is being funded by the Engineering and Physical Sci-



ences Research Council, is being designed to automatically pick out the shapes of bones in the images, rather than relying on individual researchers.

The system can already identify hips, but the researchers from the University's Institute of Population Health will now adapt it to map out knees and hands and to be able to learn to identify other bones and structures within the body.

The funding will allow further development to ensure the system is accurate enough that it can be used in hospitals to help provide faster diagnosis of problems in patients.

Professor of Computer Vision, Tim Cootes said:

"Mapping the outlines of bones from radiographs is hard work that takes time and skill. When researchers into conditions like arthritis are working with hundreds of images, it's a very inefficient way of obtaining data.

"The idea of this software is to take the routine tasks out of human hands, so scientists can focus on drawing conclusions and developing treatments."

This free software has been adopted by a number of research groups, including some based in Oxford and California.

"Ultimately we want to get this technology into hospitals where it can save time and resources for the benefit of patients."

## साइबर वर्ल्ड हो फ्री... फ्री... फ्री...

Compiled by-Yashvardhan Rathi, SE (ETRX)



हाल ही में दुनिया भर में फ्री कंटेंट डाउनलोड करवाने वाली साइट पाइरेट बे (Pirate Bay) के को-फाउंडर हांस फ्रेडरिक लेनार्ट नेज को थाईलैंड बॉर्डर पर गिरफ्तार कर लिया गया। वह उन लोगों में से एक हैं, जो इंटरनेट पर मौजूद हर चीज को फ्री उपलब्ध करने की मुहिम का हिस्सा हैं। नई तरह की इस साइबर क्रांति के बारे में बता रहे हैं

### इंटरनेट पर सब कुछ सबका

गूगल और विकीपीडिया जैसे टूल्स के आने के बाद इंटरनेट के बिना जिंदगी की कल्पना करना ही मुमकिन नहीं है। कभी सोच कर देखिए कि अगर ये दोनों ही साइट्स अपनी सर्विस और कंटेंट के लिए पैसे वसूलने लगे तो क्या हाल हो? इस संभावना से ही नई साइबर क्रांति



का जन्म होता है। दुनिया के चंद कंप्यूटर इंजीनियरों का मानना है कि इंटरनेट चूंकि सहूलियतों के दरवाजे खोलने का जरिया बन चुका है इसलिए इस पर मौजूद हर चीज फ्री होनी चाहिए। ऐसा कुछ भी रोकने के लिए दुनिया भर के कानूनों का सहारा लिया जा रहा है। लोगों को गिरफ्तार भी किया जा रहा है लेकिन यह मुहिम साल-दर-साल जंगल की आग की तरह फैलती जा रही है। इस क्रांति का हिस्सा बनने वालों में भी दो तरह के लोग हैं - एक वे, जो नियम-कायदों में रह कर इस तरह की छूट देने की मांग कर रहे हैं और दूसरे वे, जो हर हाल में ऐसा कर गुजरने पर आमादा हैं।

## टॉरेंट की टक्कर

दुनिया भर में इंटरनेट पर सबकुछ फ्री पाने के जिस ठिकाने पर लोग सबसे ज्यादा जाते हैं, उसका नाम है 9टॉरेंट“ (दूदाहू)। इंटरनेट के अज-ब-गजब क्रांतिकारियों का यह एक ऐसा कारनामा है, जिसे बंद करवाने के लिए दुनियाभर की सरकारें लामबंद हो चुकी हैं लेकिन यह फिर भी बदस्तूर जारी है। यह इंटरनेट का एक ऐसा करिश्मा है, जिसे किसने बनाया यह किसी को पता नहीं। इसे कौन चला रहा है, यह भी किसी को पता नहीं। पता है तो बस इतना कि इस साइट को खुद को सबसे तेजी से अपडेट करना आता है। मूवी हो, सॉफ्टवेयर हो या कोई पॉपुलर किताब, यहां सबकुछ फ्री है।

## कैसे काम करता है टॉरेंट का जादू

असल में टॉरेंट एक ऐसा प्लैटफॉर्म है, जहां पर फ्री में कंटेंट उपलब्ध कराने वाले और उसे इस्तेमाल करने वाले एक जगह पर आ जाते हैं। टॉरेंट पर फ्री कंटेंट उपलब्ध कराने वाले गुमनाम क्रांतिकारियों ने इंटरनेट पर एक ऐसा जाल बुना है, जो दुनिया के किसी भी कंप्यूटर को होस्ट में तब्दील करके मनचाही जगह पर फाइल को डाउनलोड करने लायक बना देता है। मिसाल के तौर पर अगर आपको कोई हॉलिवुड की फिल्म डाउनलोड करनी है तो टॉरेंट आपको ऐसे किसी कंप्यूटर से कनेक्ट करा देगा, जिस पर यह फिल्म मौजूद होगी और वहां से सीधे ही यह फाइल डाउनलोड हो जाएगी। इतना ही नहीं, इस पूरे साइबर आदान-प्रदान में उस कंप्यूटर की लोकेशन को खास कोडिंग के जरिए छुपा दिया जाता है, जिसमें फिल्म मौजूद है। अगर जांच होती भी है तो वही पकड़ा जा सकता है, जो फिल्म डाउनलोड कर रहा है।

## पाइरेट बे के लुटेरे

२००३ में स्वीडन के तीन कंप्यूटर एक्सपर्ट्स पीटर सुंडे, गॉटफ्राइड स्वॉथहोम और फ्रैडरिक नेज ने मिल कर ऐसे फाइल शेयरिंग प्लैटफॉर्म को खड़ा किया, जिसने इंटरनेट की दुनिया को बदल कर रख दिया। 9द पाइरेट बे“ जिसे साइबर दुनिया के दीवाने टीपीबी के नाम से भी

जानते हैं, देखते-देखते फ्री फाइल शेयरिंग के सबसे बड़े प्लैटफॉर्म की तरह उभरा। दुनिया भर में कॉपीराइट और कंटेंट को बेंच कर ज्यादा-से-ज्यादा पैसा कमाने वालों की नींद उड़ गई। पाइरेट बे पर केस दायर किया गया और २००९ में तीनों फाउंडर्स को १ साल की सजा के साथ हर्जाने के तौर पर ३.६ मिलियन डॉलर (करीब २२ करोड़ रु.) की रकम भरने के लिए कहा गया। रकम भरने से उन्होंने साफ इनकार कर दिया और जेल जाने के लिए तैयार हो गए। इस बीच फेडरिक नेज स्वीडन से भाग निकले और बाकी दोनों को कॉपीराइट से लेकर हैकिंग तक के केस लगाकर जेल भेज दिया गया। वह अब भी अपनी कानूनी लड़ाई लड़ रहे हैं लेकिन साइबर आजादी की लड़ाई से उन्होंने फिलहाल तौबा नहीं किया है।

## लॉरेंस लेसिंग : साइबर गांधी

जिस तरह से दुनिया भर में अहिंसक तरीके से अन्याय के खिलाफ लड़ाई का चेहरा महात्मा गांधी हैं, कुछ वैसा ही चेहरा साइबर दुनिया को फ्री करने की मुहिम में प्रफेसर लॉरेंस लेसिंग का है। प्रफेसर लेसिंग वार्टन स्कूल अमेरिका से मैनेजमेंट, यूनिवर्सिटी ऑफ कैंब्रिज इंग्लैंड से फिलॉसफी में मास्टर्स और येल लॉ स्कूल से रिसर्च करने के बाद क्रिएटिव कॉमन्स मूवमेंट का चेहरा बने। ५३ साल के प्रफेसर फिल-हाल हॉवर्स यूनिवर्सिटी लॉ के प्रफेसर हैं। वह बदलती दुनिया में कॉपीराइट, ट्रेडमार्क और रेडियो फ्रीक्वेंसी स्पेक्ट्रम के कानूनों को फिर से गढ़ने की वकालत करते हैं। उनका मानना है कि इंटरनेट के युग में इनमें भारी फेरबदल करने की जरूरत है, जिससे इंटरनेट पर मौजूद ज्ञान का खजाना दुनिया में हर इंसान तक पहुंच सके।

## क्रिएटिव कॉमन्स

२००१ में प्रफेसर लेसिंग ने क्रिएटिव कॉमन्स नाम के एक ऐसे प्रोजेक्ट पर काम करना शुरू किया, जो कॉपीराइट के कानून के उलट 9कॉपीलेफ्ट“ मूवमेंट की बात करता था। इस प्रोजेक्ट से कई होनहार व-कंप्यूटर एक्सपर्ट्स भी जुड़े और सबने इंटरनेट पर सबके लिए सबकुछ की लड़ाई को आगे बढ़ाया। उनका तरीका किसी कॉपीराइट कानून को तोड़ने का नहीं, बल्कि ऐसे लोगों को एक प्लैटफॉर्म पर लाना था, जो किसी भी तरह के कॉपीराइट या परमिशन लेने की व्यवस्था में विश्वास नहीं रखते थे। लेसिंग इसे इंटरनेट पर मौजूद ज्ञान के बड़े खजाने को ऐसे लोगों से आजाद कराने के मूवमेंट का हिस्सा मानते हैं, जो पैसों की दम पर इंटरनेट पर कंटेंट को कंट्रोल कर रहे हैं। क्रिएटिव कॉमन्स साइट पर जाकर कोई भी खुद की रचना को अपलोड कर सकता है और उसे इस्तेमाल करने के लिए फ्री कर सकता है। इस्तेमाल करने वाले को बस कंट्रीब्यूट करने वाले को क्रेडिट भर देना होता है।

## ऐरॉन श्वार्ट्ज : एक सपने की मौत

दुनिया का कोई भी मूवमेंट बिना युवा ताकत के चला पाना मुश्किल है। ऐसे ही एक जोशीले और टैलेंटेड युवा का नाम है ऐरॉन श्वार्ट्ज। बचपन से ही इंटरनेट की दुनिया को जुनून की हद तक चाहने वाले ऐरॉन भले ही कंप्यूटर साइंस की कोई बड़ी डिग्री नहीं ले पाए लेकिन प्रोग्रामिंग का टैलेंट जैसे उनके खून में ही था। १० साल की उम्र से ही उन्होंने प्रोग्रामिंग फील्ड के बड़े अवॉर्ड्स जीतने शुरू कर दिए थे। जवानी की दहलीज तक पहुंचते-पहुंचते उनकी मुलाकात प्रफेसर लेसिंग से हो गई। वह भी इंटरनेट पर मौजूद कंटेंट को सबके लिए फ्री करने की मुहिम का हिस्सा बने। इस दौरान उन्होंने अमेरिकन फेडरल कोर्ट की साइट को हैक करके लाखों डॉक्यूमेंट्स को फ्री में डाउनलोड करने के लिए उपलब्ध करा दिया। गौरतलब है कि इसके लिए पहले सरकार पैसे लेती थी। उनके ऊपर कोई चार्ज तो नहीं लगाया गया लेकिन वह एजेंसियों के राडार पर आ चुके थे।

विकीलीक्स में उनकी भूमिका को लेकर उन्हें ६ जनवरी २०११ में गिरफ्तार किया गया। कोर्ट में सुरक्षा एजेंसियों ने उन पर ऐसे कानूनों का उल्लंघन करने का आरोप लगाया, जिसके लिए ऐरॉन को ५० साल तक की कैद और १ मिलियन डॉलर तक हर्जाना भरना पड़ सकता था। तकरीबन २ साल तक केस लड़ने के बाद ११ जनवरी २०१३ को ऐरॉन ने हॉस्टल के अपने कमरे में खुदकुशी कर ली। ऐरॉन की याद में बनाई गई वेबसाइट पर लिखा है, 9 ऐरॉन ने अपनी प्रोग्रामिंग और टेक्नॉ लॉजिस्ट की विलक्षण प्रतिभा को खुद का इस्तेमाल खुद को आगे बढ़ाने के लिए नहीं, बल्कि इंटरनेट और दुनिया को एक बेहतर और न्यायपूर्ण जगह बनाने के लिए किया।“

## भारत और कंटेंट की आजादी

एक तरफ दुनिया इंटरनेट पर आजादी की लड़ाई लड़ रही है, वहीं भारत में फिलहाल इस तरह की मुहिम पर ज्यादा बात नहीं हो रही है। इसकी

एक वजह तो इंटेलेक्चुअल प्रॉपर्टी राइट और कॉपीराइट जैसे मुश्किल कानूनों का लोगों की समझ से बाहर होना है और दूसरा साइबर कानूनों को सख्ती से लागू न करवा पाने की लाचारी है। साइबर एक्सपर्ट पवन दुग्गल का कहना है कि बड़े गुप तो कॉपीराइट आदि की लड़ाई लड़ सकते हैं लेकिन आम आदमी के लिए यह मुश्किल है। जहां तक बात कंटेंट को फ्री करने की है तो दुनिया भर में यह लड़ाई जोरों से जारी है लेकिन इसके खिलाफ खड़ी मजबूत बिजनस लॉबी के चलते जल्दी आजादी के आसार कम ही नजर आते हैं।

## इन्होंने जला रखी है आजादी की अलख

Free Software Foundation : १९८५ में रिचर्ड स्टॉलमैन ने इस फाउंडेशन का गठन फ्री सॉफ्टवेयर को जरूरतमंदों तक पहुंचाने के लिए किया था। यहां पर इंडिपेंडेंट सॉफ्टवेयर डिवेलपर ऐसे जरूरतमंदों को अपने सॉफ्टवेयर उपलब्ध करा सकते हैं, जो इसे खरीद नहीं सकते। यह पूरी तरह से नॉन प्रॉफिटेबल फाउंडेशन है।

Software Freedom Law Center : २००४ में बने इस सेंटर को ईबेन मॉग्लेन ने इस सपने के साथ बनाया कि जब भी दुनिया के लिए फ्री में सॉफ्टवेयर बनाने वालों को लीगल मदद की जरूरत पड़े तो लोग उनके साथ खड़े हों। यह संस्था दुनिया भर के इस्तेमाल के लिए फ्री में सॉफ्टवेयर बनाने वालों को फ्री में कानूनी सलाह और मदद देती है।

Electronic Frontier Foundation (EFF) : १०९० में जॉन गिल-मोर, जॉन पेरी बारलो और मिच कापर को खुद पर चल रहे एक केस के दौरान अहसास हुआ कि दुनिया को अब इंटरनेट सिविल लिबर्टी की भी जरूरत है। मतलब साफ था कि सरकार भी इस बात को समझ पाने में असमर्थ थी कि कब कानूनों का उल्लंघन हुआ है और कब यह गलती से हुआ है। ऐसे में ईई ने कई साइबर क्रांतिकारियों का केस लड़ा। मशहूर राइटर डैन ब्राउन की टेक्नो थ्रिलर नॉवल 9डिजिटल फोर्टेस“ में भी इस फाउंडेशन का जिक्र आता है।

## Beauty of Nature

Prajakta Pawar, TE (ETRX)

**Sunset at the dawn of a New day**

**Just watching it melts your stress away.**

**Waterfalls pouring from a height**

**Quite an awesome, amazing sight.**

**Moon and Stars shining so bright**

**At night, Darkness bears no fright.**

**On the Beach, the Ocean gently roars**

**Meditating with it, our spirit soars.**

**Summer – flowers in the park,**

**squirrels running round**

**Trying to find any nuts left on the ground.**

**Nature is so beautiful**

**Are we appreciating it to the full?**



### Year of Blessing

I'm hoping for Miracles in 2015

Right from the Beginning until the very end.

Last two years have been quite sad

To see the back of them, makes me Glad.

\* \* \*

I've tried but can't seem to figure life out

I believe there's a God, but sometimes tempted to doubt.

Why is it people who have the best intentions

Are locked up in what I call "Life's detention"?

\* \* \*

So, it's a new year, it's a new dawn

All bad memories erased and gone.

Miracles spring forth all around me

2015 – only Blessings I see.



## I Shudder

Anshuman Pathak, TE (ETRX)

A few days after Christmas,  
a father shoots his daughter  
Before killing himself,  
he also shoots her mother.  
All because of a relationship  
that went wrong,  
Twinkle of an eye,  
three lives – just gone.



**What's the Movie?**

Angrily, he slits his wife's face  
She's caused him so much disgrace.  
Then she's taken from her lover  
Who searches the whole town for her.

\*\*

Finally, he finds her in an Orphanage  
The scar on her face, mars her beautiful image  
He carries her out into the sunshine – she's so weak  
She holds him closely, but can't speak

\*\*

Mustering strength she whispers "I love you" in his ears  
Then dies in his arms – His eyes well with tears.

\*\*

What's the name of the film?

## Here today, There tomorrow

Parmar Nidhi, TE (ETRX)

**Life is full of uncertainties. It's the one thing that man has no guarantee over, but I'll write this from a positive point.**

\*\*\*

**One minute your single, sad and all alone**

**The next, you can't get your new love off the phone.**

\*\*\*

**One day you come to terms with the fact you'll never be parents**

**The next year, your driving with your baby at the back of your Merc Benz.**

\*\*\*

**One minute your threatened with eviction from your home**

**Not long after, your comfy and even buy a holiday home in Rome.**

\*\*\*

**Split of a second someone gets Sacked in an unfair way**

**next job - what's normally a week's wages, they now earn in a day.**

\*\*\*

**The Doctors says its all over for you, nothing more they can do**

**5 years down the line, in life your still happily sailing through.**

\*\*\*

**Then there's those that had it all, lost it, and gained it right back**

**Anthony Robbins, Stephen Pierce, Multi-millionaires, back on track.**

\*\*\*

**and there's those that keep on saying "I wanna win the lottery"**

**They get lucky, win a few Million and get bankrupt in two years or three. Doh!!**

\*\*\*

**Here Today, there Tomorrow**

**May life treat us kind and keep us from sorrow.**

\*\*\*

**For some, it's the story of "Rags to Riches"**

**Through the years, they built a strong Business.**

**For others, Fortune simply went after them**

**They never saw it coming – it just came to overwhelm.**

**\***

**Being at The right place at the right time, can make one a Star.**

**Maybe not a famous one, but still twinkling from afar.**

**One lucky to have opportunity knock on their door**

**and use it very wisely, never to become poor.**

**\***

**Young (then) Naomi Campbell was spotted in Covent Garden,**

**Richard Branson worked hard from youth to make his first Million,**

**Paris Hilton has Fortune handed down by her Father,**

**Susan Boyle never gave up her dream, 'til she became a Star.**

**\***

**So, lets hope at some point we get lucky in Life**

**and be a channel to end other people's strife.**

**Hold on to your dream, stay positive.**

**There's gifts waiting for you, that life has to give.**

## **You have the Key**

NARKHEDE SAYALI, SE (ETRX)

**Most of the time we have the Key,  
But we're too stressed out to see.**

.

**You have no Job and you feel helpless,  
But have you considered opening a small Business?**

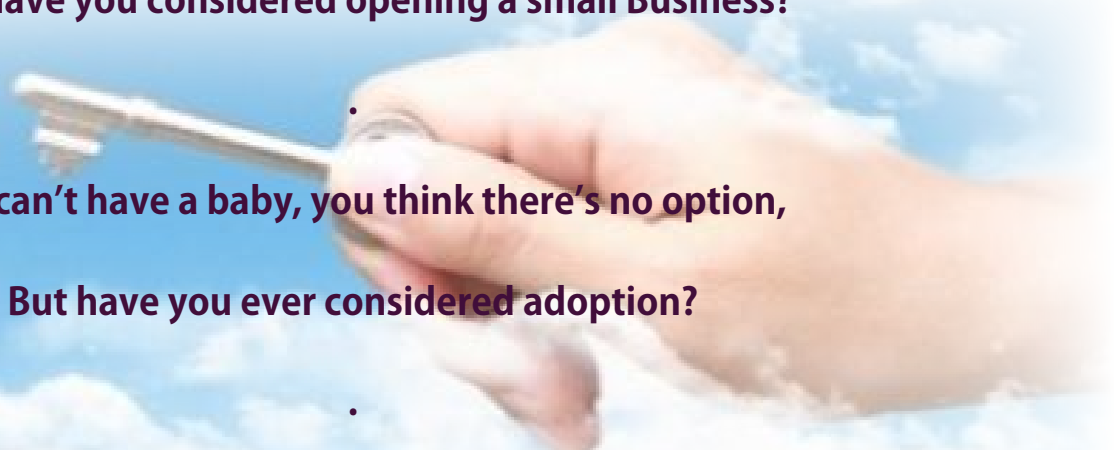
**You can't have a baby, you think there's no option,  
But have you ever considered adoption?**

.

**Your tired and don't understand the purpose of living,  
But have you considered a life full of giving?**

.

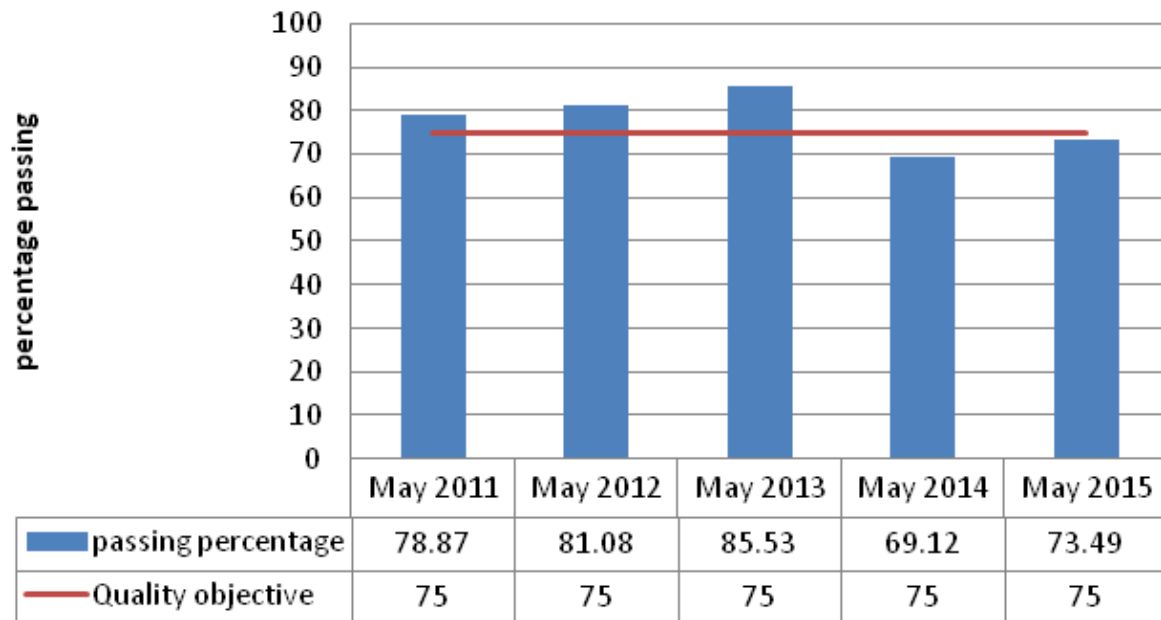
**We go round in circles, making such a fuss,  
While most of the time, the answers lie within us.**



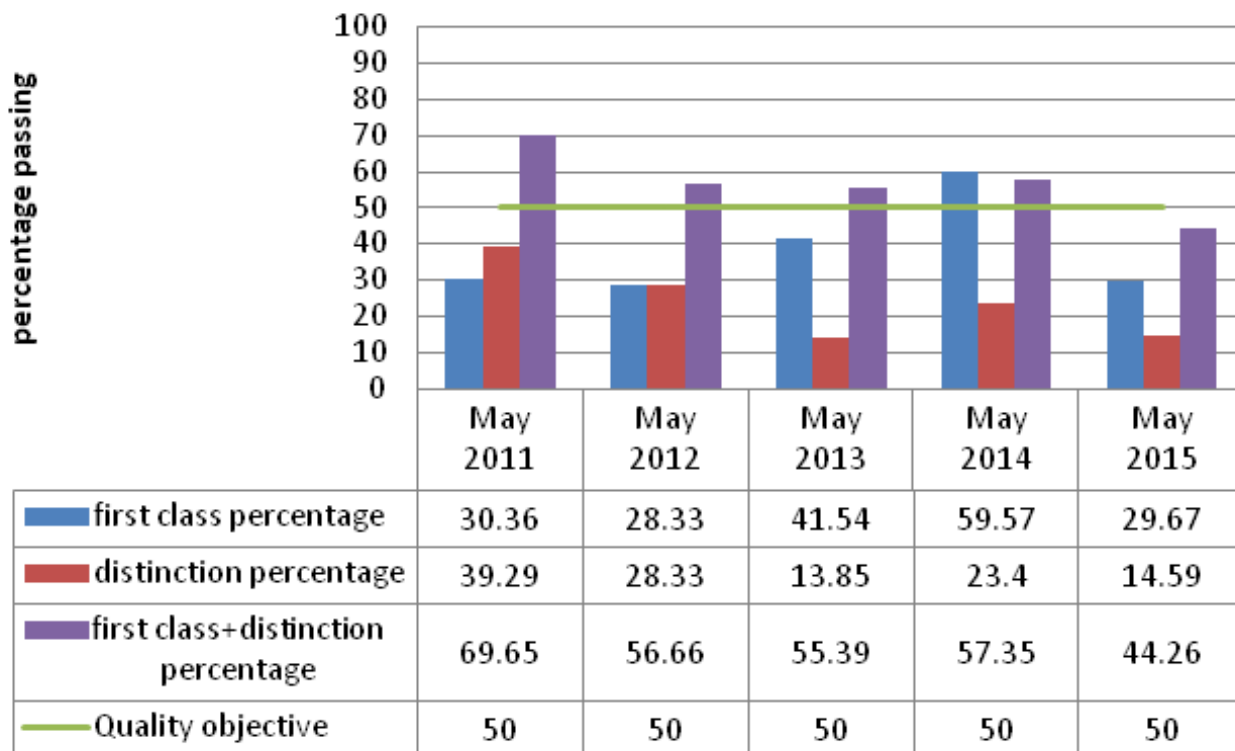


# Result Analysis (SE, TE & BE)

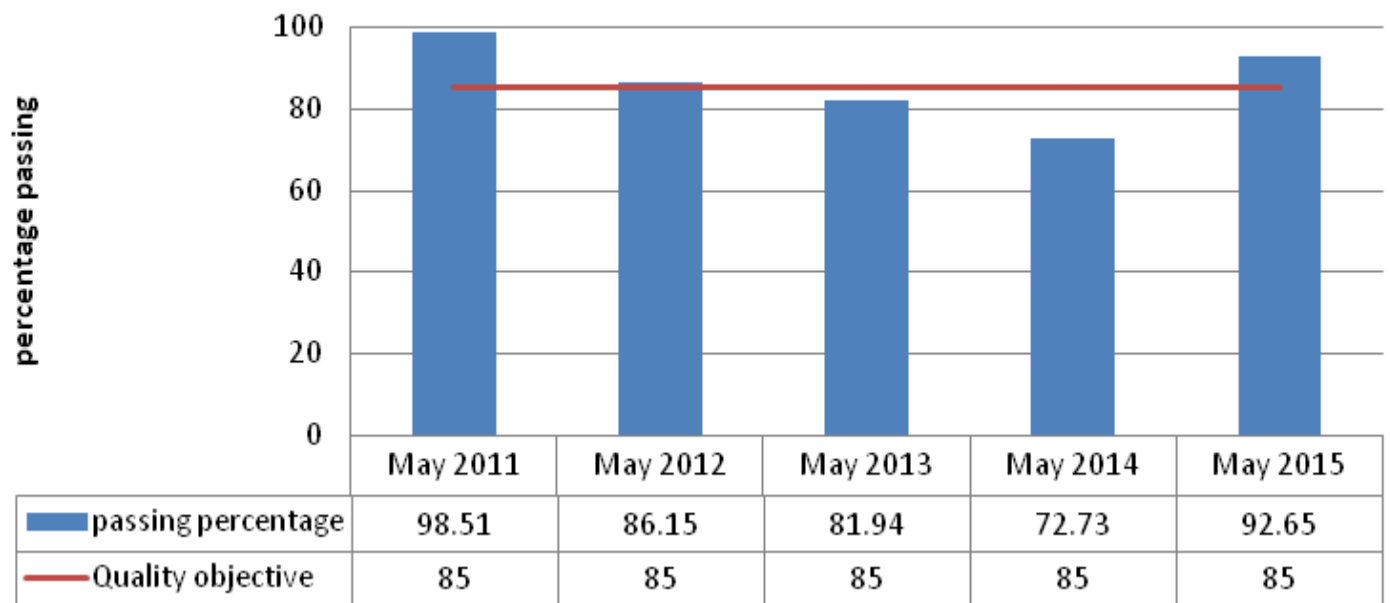
## S.E ETRX Result



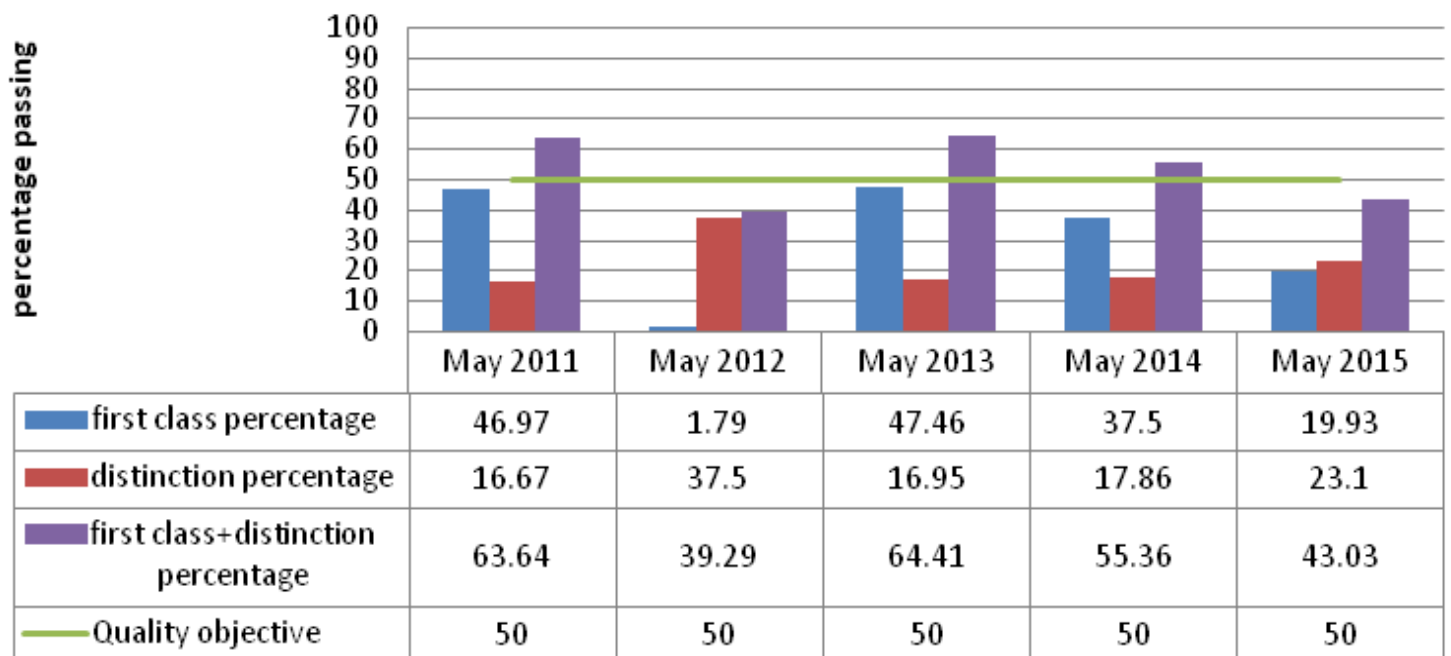
## S.E ETRX Result



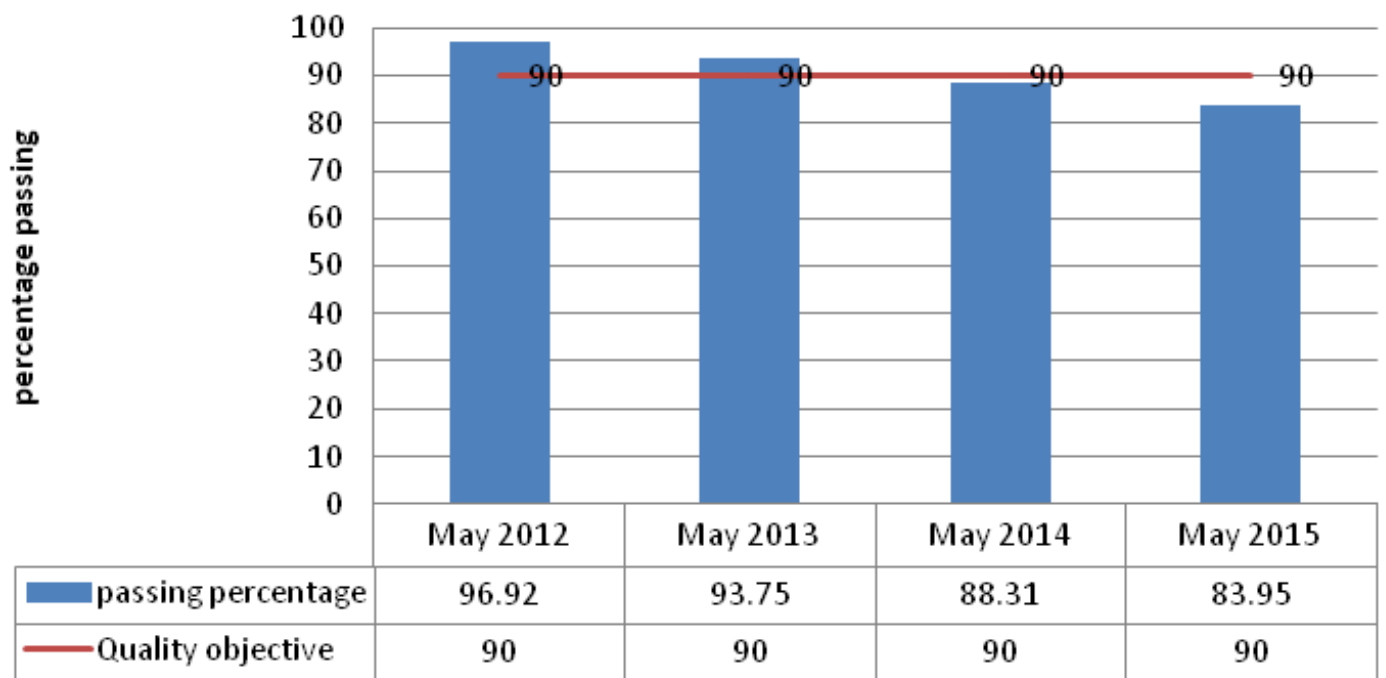
## T.E ETRX Result



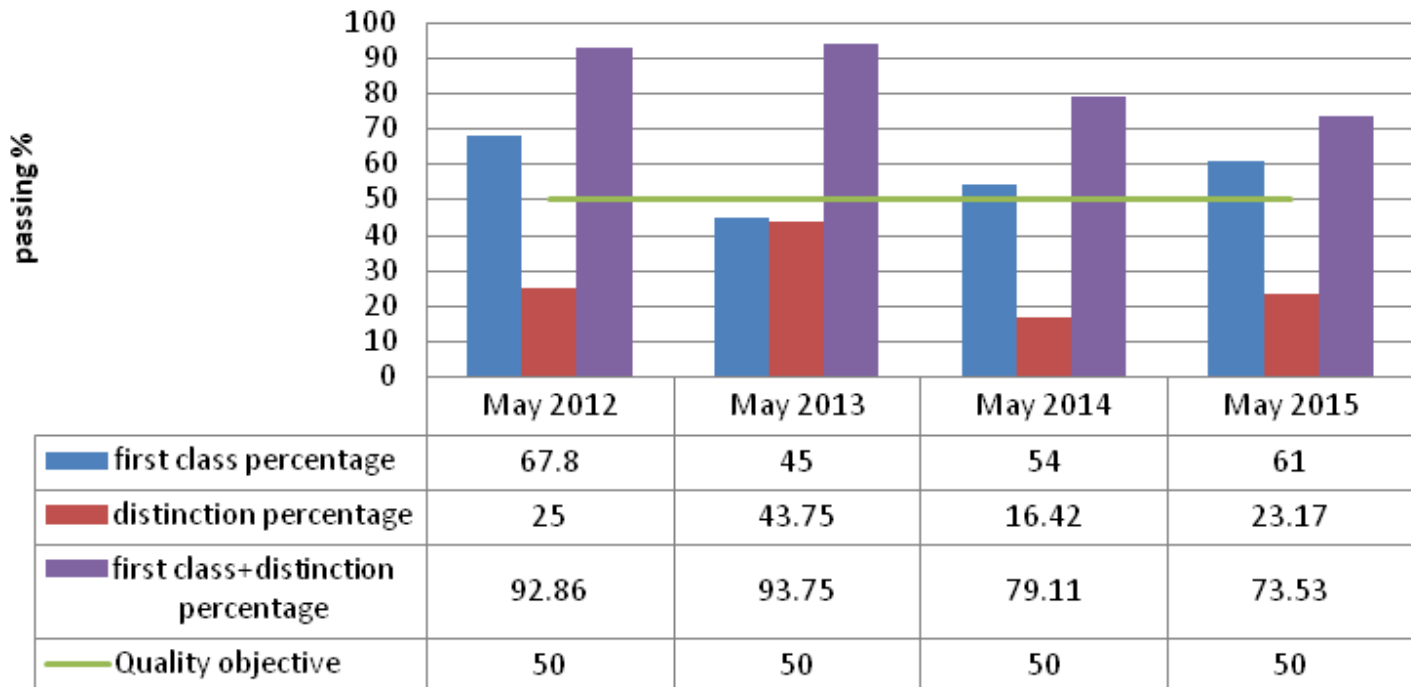
## T.E ETRX Result



## B.E ETRX Result



## B.E ETRX Result



# Topper's List

## SE (ETRX)

Sr. No.	Name	GPA
1	Jain Vishal Pawan	9.36
2	Yadav Sanket Amit	8.79
3	Sanghvi Monik Kishor	8.64

## TE (ETRX)

Sr. No.	Name	GPA
1	Umrigar Arshis R	9.46
2	Kanojiya Mangesh R	8.62
3	Rane Onkar A	8.46

## TE (ETRX)

Sr. No.	Name	GPA
1	Palekar Aaditya A	79.23% [7th in UOM]
2	Singh Shikha S	76.45%
3	Kalewar Sae S	76.39%





# प्रगती पुस्तकातील अधोगती

Compiled by- Prof.Dr.S.C.PATIL



**प्रश्न :** माझ्या मुलाची गेलं वर्षभर अभ्यासात घसरण चालू आहे. त्यासाठी पालक म्हणून आम्ही नेमकं काय करणं अपेक्षित आहे ?

**उत्तर :** मुलांच्या प्रगती पुस्तकामध्ये अधोगती दिसायला लागते, तेव्हा साहजिकच त्यांच्या मनामध्ये चिंता, काळजी, खिन्नता, असहाय्यता आणि अपराधीपणा अशा विविध भावनांचं वादळ निर्माण होतं. नकारात्मक विचारही अशा परिस्थितीत कदाचित मनात येत असतील. यासाठीच स्वतःच्या आणि मुलांच्या मनाशी कनेक्ट व्हा. प्रगतीपुस्तकात अधोगती दिसायला लागली, की घरातलं वातावरण गढूळ होतं. सगळेच एकमेकांवर आरोप करू लागतात. जणू काही युद्धजन्य परिस्थितीच निर्माण होते. हा उपाय नव्हे. अशाने मुलाचा प्रवास दिशाहीन होण्याची शक्यता असते.

यात सर्वात महत्वाचं म्हणजे, कुठलीही टीका न करता, तुलना न करता, दोष न देता मुलासोबत शांतपणे बोलणं, त्यांच्या पाठीशी खंबीरपणे उभं राहणं गरजेचं आहे. या शोधप्रक्रियेमध्ये पहिली पायरी म्हणजे नेमकी समस्या ओळखणं. काही प्रश्नांची उत्तरं शोधणं गरजेचं आहे. उदा. गुणांच्या घसरणीला कुठं व का सुरुवात झाली ? विषय समजण्यात किंवा विशिष्ट संकल्पना समजण्यात मुलगा कमी पडतोय का ? एखादा विषय त्याला अवघड जात आहे का ? अभ्यासाच्या प्रयत्नांमध्ये स्वयंप्रेरणेमध्ये कुठं कमी पडतोय का ? अभ्यास करण्याच्या पद्धतीमध्ये काही गफलत होतेय का ? त्यांच्या वैयक्तिक आयुष्यात काही ताण आहेत का ? मानसिकरित्या तो डिस्टर्ब आहे का ? काही विशिष्ट क्षमता कमी पडत आहेत का ? हे शोधणं आवश्यक आहे. ही प्रक्रिया करताना तुम्ही मुलाला विश्वासात घ्या. तसंच, त्यांच्या शिक्षकांशी संपर्क

साधणं आणि मुलाची उत्तरपत्रिका काळजीपूर्वकपणे तपासून मगच मुलाशी बोला.

विशिष्ट विषयाच्या संकल्पना समजण्यास जड जात असल्यास अनुभवी शिक्षकांचं मार्गदर्शन घेता येईल. मुलं अभ्यासाच्या बाबतीत संभ्रमित असल्यास अभ्यास कौशल्य आणि वेळेचं नियोजन इत्यादी गोष्टी शिकवता येतील. वैयक्तिक आयुष्यात काही ताण तणाव किंवा वर्तन समस्या असल्यास समुपदेशकाची मदत घेणं इष्ट ठरेल. परीक्षेच्या आधी किंवा परीक्षेच्या काळात चिंता, घालमेल या भावनांना सामोरं जाण्यासाठी रिलॅक्सेशन, मेडिटेशनची कौशल्य आणि इतर भावनिक

बुद्धिमत्ता कौशल्य शिकवता येऊ शकतात. या उपाययोजनांसाठी त्या-त्या क्षेत्रातील तज्ज्ञांची मदतही घेता येईल. लगेचच चमत्काराची अपेक्षा करू नका; कारण आज उपाय केले आणि उद्या मुलाचे मार्क वाढले, असं होणार नाही. मुलाच्या क्षमतेप्रमाणे कमी-अधिक वेळ लागणारच. आशा सोडू नका आणि मुलालाही सोडू देऊ नका. अपेक्षेचं ओझं मुलावर न टाकता प्रयत्नांकडे लक्ष द्या. छोट्याशा यशालाही प्रोत्साहन देऊन त्याचा आत्मविश्वास वाढवा. यातूनच पुढे गुणांची घसरण थांबून आशेचा किरण गवसेल, अशी खात्री वाटते.

**ऑल द बेस्ट!!!**

## Stress and Approaches to Reduce It

Compiled and edited by: Ms.Poorva Wiangankar, Associate Professor,ETRX department

**M**any people do not act positively to reduce the stress in their lives until physical symptoms force them to consider how their lifestyle is affecting their well-being.

Learn to recognise when you are stressed and take steps to minimise stress and avoid additional stress.

There are numerous steps that can be taken to reduce the risk of being affected by stress and many of them are a matter of simple common sense. This page contains some simple steps that you can take to help minimise or avoid stress. The page continues to suggest some techniques to help you relax, medical, complementary and self-help methods designed to alleviate the negative symptoms that stress can cause.

There many things one can do to help alleviate stress in life, learning to relax and incorporating time to relax as part of daily routine can help to manage the symptoms of stress. By considering the approaches outlined below, one will be able to think about and experiment with what works best for an individual.

### Self-Help Techniques

Once learned, self-help relaxation techniques are particularly useful as they are available to the stressed individual whenever the need arises and allow one to gain control over feelings and anxieties. A very wide range of relaxation techniques have been developed, although many can be seen as variations on a number of basic methods, focusing on the physical feelings of tension, or using mental imagery to

induce calm. Perhaps the most powerful method of relaxation is mindfulness. At its simplest mindfulness is focusing on the current moment, the here and now and allowing, through a type of meditation, worries about the future or regrets about the past to melt away. The following are some of the more familiar self-help relaxation techniques available:

**Creative Visualisation:** Imagine yourself lying in a cornfield, in a hammock by the sea, sitting in a deck chair, or anywhere you feel relaxed and to hear the sounds of the trees, wind and waves. Being immersed in such an idyllic scene induces a state of relaxation and tension should drain away.

**Quieting:** Aims to provide a way of diverting the mind from stressful thoughts by focusing on more relaxing emotions: for example, chanting, focusing on breathing, counting things such as instances of a particular colour. The traditional 'counting sheep' when trying to fall asleep can be seen as a form of quieting.

**Progressive Relaxation:** This involves tensing and then relaxing each part of the body in turn, working up through the whole body until completely relaxed. This technique takes about 20-30 minutes to complete and is very effective at bringing about physical relaxation.

**Tension Recognition:** One form of this therapy involves intentionally clenching groups of muscles in successive areas of the body, for example the hand, shoulders and stomach, concentrating on the tension, feeling it, and then relaxing. The aim is to encourage the recognition of tension when it occurs and to voluntarily relax the muscles when they tense. However,

with the very highly stressed, this form of tension recognition could possibly lead to muscle cramps so a second version is preferred. This alternative approach involves stretching rather than tensing the muscles and requires some knowledge of human musculature. Successive muscles are stretched so that opposing muscles contract, and the process is then reversed. The aim is to find the half-way point, where opponent muscles are balanced, and then to relax further. Tension recognition methods are useful in situations where it is not easy to 'switch off' external events such as working at a desk or in meetings.

**Breathing Exercises:** These can be used to help relax the entire body as tension leads to breathing too rapidly. Such techniques teach the individual to breathe calmly and deeply and encourage awareness of bodily tension.

**Light Exercise:** Do brisk Walk for 15-20 minutes and listen music while walking. Or play any outdoor game, play with small children which gives enough physical activity for all muscles and body tend to relax.

Very important thing is "understand your limitations, control your expectations and emotions"

ENJOY LIFE..... L..... Love unconditionally everything you have

I.....just forget I, Me and Myself

F.....Forget and forgive

E.....leave your EGO

**Find more at:** <http://www.skillsyouneed.com/ps/avoiding-stress.html>

# E-Waste & its Management

Compiled By- Mr. Vaibhav V Gijare

**E**lectronic waste or e-waste describes discarded electrical or electronic devices. Used electronics which are destined for reuse, resale, salvage, recycling or disposal are also considered e-waste. Informal processing of electronic waste in developing countries may cause serious health and pollution problems, as these countries have limited regulatory oversight of e-waste processing.

Electronic scrap components, such as CRTs, may contain contaminants such as lead, cadmium, beryllium, or brominated flame retardants. Even in developed countries recycling and disposal of e-waste may involve significant risk to workers and communities and great care must be taken to avoid unsafe exposure in recycling operations and leaking of materials such as heavy metals from landfills and incinerator ashes.

“Electronic waste” may be defined as discarded computers, office electronic equipment, entertainment device electronics, mobile phones, television sets, and refrigerators. This includes used electronics which are destined for reuse, resale, salvage, recycling, or disposal. Others are re-usables (working and repairable electronics) and secondary scrap (copper, steel, plastic, etc.) to be “commodities”, and reserve the term “waste” for residue or material which is dumped by the buyer rather than recycled, including residue from reuse and recycling operations. Because loads of surplus electronics are frequently commingled (good, recyclable, and non-recyclable), several public policy advocates apply the term “e-waste” broadly to all surplus electronics. Cathode ray tubes (CRTs) are considered one of the hardest types to recycle.



**Fig: Defective and obsolete electronic equipment**



**Fig: Disassembling (center) and collecting (right) electronic waste**





CRTs have relatively high concentration of lead and phosphors (not to be confused with phosphorus), both of which are necessary for the display. The United States Environmental Protection Agency (EPA) includes discarded CRT monitors in its category of “hazardous household waste”[3] but considers CRTs that have been set aside for testing to be commodities if they are not discarded, speculatively accumulated, or left unprotected from weather and other damage.

The EU and its member states operate a system via the European Waste Catalogue (EWC)- a European Council Directive, which is interpreted into “member state law”. In the UK (an EU member state). This is in the form of the List of Wastes Directive. However, the list (and EWC) gives broad definition (EWC Code 16 02 13\*) of Hazardous Electronic wastes, requiring “waste operators” to employ the Hazardous Waste Regulations (Annex 1A, Annex 1B) for refined definition. Constituent materials in the waste also require assessment via the combination of Annex II and Annex III, again allowing operators to further determine whether a waste is hazardous.

Debate continues over the distinction between “commodity” and “waste” electronics definitions. Some exporters are accused of deliberately leaving difficult-to-recycle, obsolete, or non-repairable equipment mixed in loads of working equipment (though this may also come through ignorance, or to avoid more costly treatment processes). Protectionists may broaden the definition of “waste” electronics in order to protect domestic markets from working secondary equipment.

The high value of the computer recycling subset of electronic waste (working and reusable

laptops, desktops, and components like RAM) can help pay the cost of transportation for a larger number of worthless pieces than can be achieved with display devices, which have less (or negative) scrap value. In A 2011 report, “Ghana E-Waste Country Assessment”, found that of 215,000 tons of electronics imported to Ghana, 30% were brand new and 70% were used. Of the used product, the study concluded that 15% was not reused and was scrapped or discarded. This contrasts with published but uncredited claims that 80% of the imports into Ghana were being burned in primitive conditions.

### **Amount of E-waste World-wide**

Rapid changes in technology, changes in media (tapes, software, MP3), falling prices, and planned obsolescence have resulted in a fast-growing surplus of electronic waste around the globe. Technical solutions are available, but in most cases a legal framework, a collection, logistics, and other services need to be implemented before a technical solution can be applied.

Display units (CRT, LCD, LED monitors), processors (CPU, GPU, or APU chips), memory (DRAM or SRAM), and audio components have different useful lives. Processors are most frequently out-dated (by software no longer being optimized) and are more likely to become “e-waste”, while display units are most often replaced while working without repair attempts, due to changes in wealthy nation appetites for new display technology. This problem could potentially be solved with Modular Smartphones or PhoneBlocs. These types of phones are more durable and have the technology to change certain parts of the phone making them more environmentally friendly. Being able to simply

replace the part of the phone that is broken will reduce e-waste. An estimated 50 million tons of E-waste are produced each year. The USA discards 30 million computers each year and 100 million phones are disposed of in Europe each year. The Environmental Protection Agency estimates that only 15-20% of e-waste is recycled, the rest of these electronics go directly into landfills and incinerators.

According to a report by UNEP titled, "Recycling - from E-Waste to Resources," the amount of e-waste being produced - including mobile phones and computers - could rise by as much as 500 percent over the next decade in some countries, such as India. The United States is the world leader in producing electronic waste, tossing away about 3 million tons each year. China already produces about 2.3 million tons (2010 estimate) domestically, second only to the United States. And, despite having banned e-waste imports, China remains a major e-waste dumping ground for developed countries.

Society today revolves around technology and by the constant need for the newest and most high tech products we are contributing to mass amount of e-waste. Since the invention of the iPhone, cell phones have become the top source of e-waste products because they are not made to last more than two years. Electrical waste contains hazardous but also valuable and scarce materials. Up to 60 elements can be found in complex electronics. As of 2013, Apple has sold over 796 million iDevices (iPod, iPhone, iPad). Cell phone companies make cell phones that are not made to last so that the consumer will purchase new phones. Companies give these products such short life spans because they know that the consumer

will want a new product and will buy it if they make it. In the United States, an estimated 70% of heavy metals in landfills comes from discarded electronics.

While there is agreement that the number of discarded electronic devices is increasing, there is considerable disagreement about the relative risk (compared to automobile scrap, for example), and strong disagreement whether curtailing trade in used electronics will improve conditions, or make them worse. According to an article in Motherboard, attempts to restrict the trade have driven reputable companies out of the supply chain, with unintended consequences.

### **Environmental Impact**

The processes of dismantling and disposing of electronic waste in the third world lead to a number of environmental impacts as illustrated in the graphic. Liquid and atmospheric releases end up in bodies of water, groundwater, soil, and air and therefore in land and sea animals – both domesticated and wild, in crops eaten by both animals and human, and in drinking water.

One study of environmental effects in Guiyu, China found the following:

- Airborne dioxins – one type found at 100 times levels previously measured
- Levels of carcinogens in duck ponds and rice paddies exceeded international standards for agricultural areas and cadmium, copper, nickel, and lead levels in rice paddies were above international standards
- Heavy metals found in road dust – lead over 300 times that of a control village's road dust and copper over 100 times

## The environmental impact of the processing of different electronic waste components

<b>E-Waste Component</b>	<b>Process Used</b>	<b>Potential Environmental Hazard</b>
Cathode ray tubes (used in TVs, computer monitors, ATM, video cameras, and more)	Breaking and removal of yoke, then dumping	Lead, barium and other heavy metals leaching into the ground water and release of toxic phosphor
Printed circuit board (image behind table - a thin plate on which chips and other electronic components are placed)	De-soldering and removal of computer chips; open burning and acid baths to remove final metals after chips are removed.	Air emissions as well as discharge into rivers of glass dust, tin, lead, brominated dioxin, beryllium cadmium, and mercury
Chips and other gold plated components	Chemical stripping using nitric and hydrochloric acid and burning of chips	Hydrocarbons, heavy metals, brominated substances discharged directly into rivers acidifying fish and flora. Tin and lead contamination of surface and groundwater. Air emissions of brominated dioxins, heavy metals and hydrocarbons
Plastics from printers, keyboards, monitors, etc.	Shredding and low temp melting to be reused	Emissions of brominated dioxins, heavy metals and hydrocarbons
Computer wires	Open burning and stripping to remove copper	Hydrocarbon ashes released into air, water and soil.

### **E-Waste Management**

Audiovisual components, televisions, VCRs, stereo equipment, mobile phones, other handheld devices, and computer components contain valuable elements and substances suitable for reclamation, including lead, copper, and gold.

One of the major challenges is recycling the printed circuit boards from the electronic wastes. The circuit boards contain such precious metals as gold, silver, platinum, etc. and such base metals as copper, iron, aluminum,

etc. One way e-waste is processed is by melting circuit boards, burning cable sheathing to recover copper wire and open-pit acid leaching for separating metals of value. Conventional method employed is mechanical shredding and separation but the recycling efficiency is low. Alternative methods such as cryogenic decomposition have been studied for printed circuit board recycling, and some other methods are still under investigation.

As properly disposing of or reusing electronics can help prevent health problems, reduce

greenhouse-gas emissions and create jobs, there have been calls to reform "the methodology for e-waste disposal and re-use in developing countries with reuse and refurbishing offering a more environmentally friendly and socially conscious alternative to downcycling processes.

### **How is electronic waste recycled?**

As Australia's leading electronic waste company, we collect and recycle hundreds of items of ewaste every week. Many of our customers are trying hard to do the right thing with their obsolete computers and televisions; others just can't wait to get rid of the fridge that's been wasting space for months. Whatever the story and whatever your intentions, we are often asked the same question regarding our services.

### **"What do you do when you collect our electronic waste?"**

Once you've organised a collection with one of our sales team, the rest is up to us. The driver will arrive in the agreed two hour window and always call you on approach to make sure you're ready. We will also re-confirm the price of your collection before he begins to load the truck. (If you're not going to be home that's no problem, just let us know where you'll be leaving your electronic waste and we can organise payment over the phone.)

Once we've loaded up the day's ewaste onto the truck, it's taken to a private recycling facility within Australia to be recycled. This is where it gets complicated...

**Electronic Waste** – recycling laptops, computers and other electronic equipment.

Most electronic waste goes through a recycling system called a WEEE (Waste Electrical and Electronic Equipment), which not only recycles 95-98%, by weight, of all ewaste passed through it, but ensures that any data left on hard drives and memories are thoroughly destroyed too.

- ※ **Picking Shed** – first all the items are sorted by hand and batteries and copper are extracted for quality control.
- ※ **Initial Size Reduction Process** – items are shredded into pieces as small as 100mm to prepare the ewaste to be thoroughly sorted. This is also where the data destruction takes place.
- ※ **Secondary Size Reduction** – the small debris is shaken to ensure that it is evenly spread out on the conveyor belt, before it gets broken down even more. Any dust extracted is disposed of in an environmentally friendly way.
- ※ **Overband Magnet** – using magnets, steel and iron are removed from the debris.
- ※ **Metallic & Non-Metallic Content** – aluminium, copper and brass are separated from the non-metallic content. The metallic can then be reused and resold as raw materials.
- ※ **Water Separation** – Water is used to separate plastic from the glass content. Once divided all raw materials can then be resold.



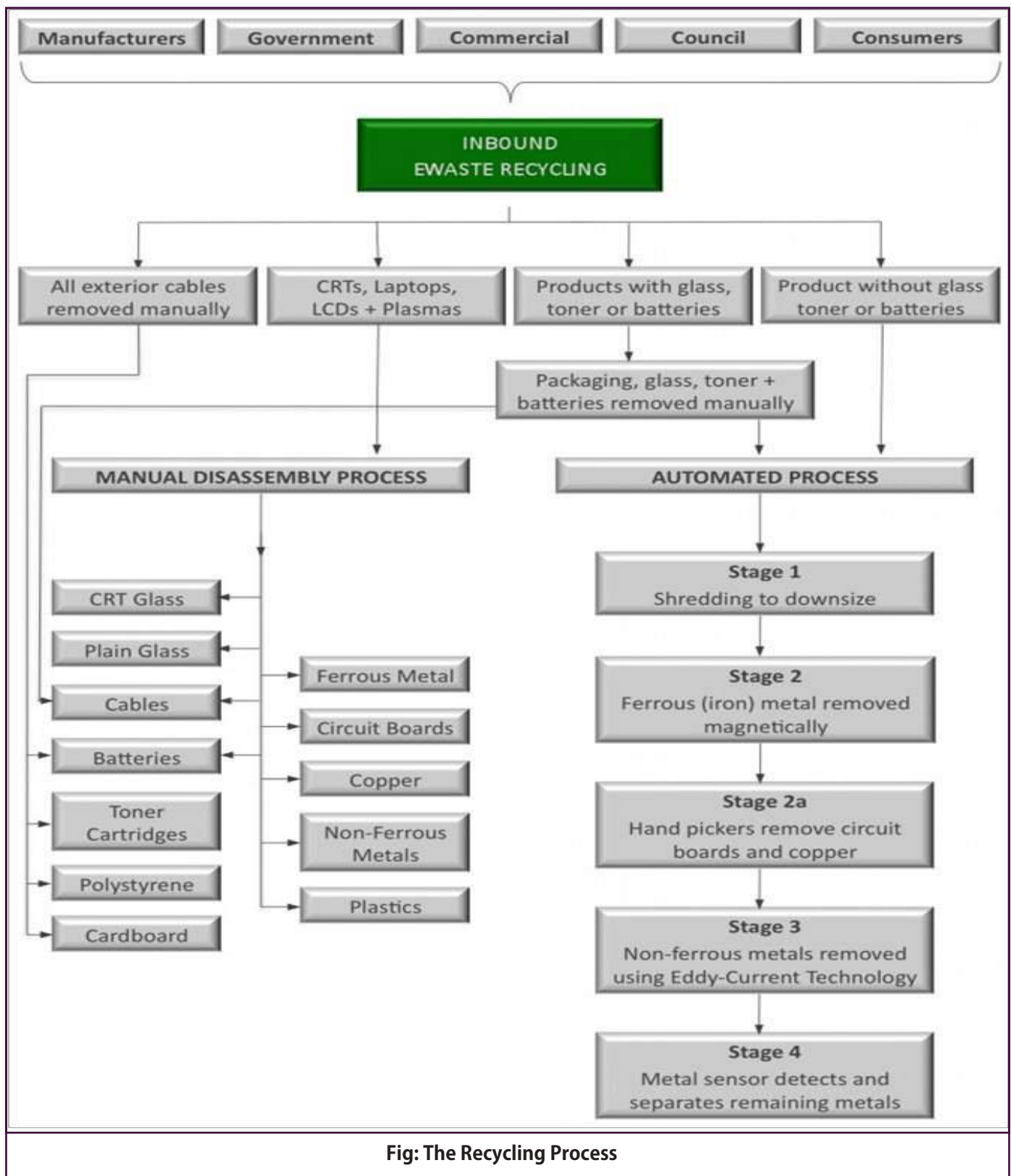


Fig: The Recycling Process

## References

- 1."Ghana e-Waste Country Assessment" (PDF). Ghana e-Waste Country Assessment. SBC e-Waste Africa Project. Retrieved 29 August 2011.
2. Smedley, Tim. The Guardian, 2013. Web. 22 May 2015. <<http://www.theguardian.com/sus->

- tainable-business/phonebloks-future-sustainable-smartphone
- 3."Environment". ECD Mobile Recycling. Retrieved 2014-04-24.
4. <http://www.ewaste.com.au/ewaste-articles/how-is-electronic-waste-recycled>

# Dhirubhai Ambani- An Eminent Personality

Compiled By- Mr. Vaibhav V Gijare



**D**hirubhai Ambani was an Indian business magnate who founded Reliance Industries. He is one of the few to be selected in the 'top 50 businessmen in Asia' list of Sunday Times. His entrepreneurial efforts have made his family amongst the richest families of the world.

Ambani was born on 28th December 1932 in Gujarat, British India. The rags to riches story began when Ambani began his career in 1950s at a Yemeni firm. He had moved to Yemen at the age of 16, after completing his matriculation. He came to Mumbai in 1958 to start his own business. After some time he went into textiles and opened a mill in Naroda industrial area in Ahmedabad. He established Reliance

Industries in 1966. Today the company consists of more than 85,000 employees and is the provider of approximately 5 percent of India's Central Government's total tax revenue. Ambani is credited for building Reliance from scratch to become one of the biggest companies in the private sector. He diversified his business to include petrochemicals, information technology, telecommunications, power, energy, capital markets, infrastructure services, retail, logistics and textiles. He developed the brand Vimal; which is now a household name in India.

Dhirubhai Ambani revolutionized capital markets in the country by appealing to millions of retail investors to invest in the market which

was previously controlled by financial organizations. Those who invested in the company earned millions. Reliance Industries was a stock market favorite. It was the first company in India that raised money in international markets and the first to be listed in the Forbes 500 list. Ambani created this vast business empire in only two decades. It was under his visionary management and guidance that the Reliance Industries turned out to be the biggest conglomerate in Indian history. There is no other Indian company that can match the growth rate of the Reliance Group. It is a living example of Ambani's invincible willpower, perseverance and unrelenting dedication to his objectives.

The number of groundbreaking examples set by Dhirubhai Ambani are countless. He challenged conventional wisdom with his unique vision. He was the first Indian businessman to realize the importance of investors and learn

the huge prospects of the capital markets. He won several accolades and titles in his life. The Federation of Indian Chambers of Commerce and Industry called him the 'Indian Entrepreneur of the 20th Century'. He was given the Dean's Medal for 'setting an outstanding example of leadership' by the Wharton School of the University of Pennsylvania in 1998. According to a poll done by The Times of India, Ambani was the 'greatest creator of wealth in the century'. He was given the 'Man of the Century' award by the Chemtech Foundation and Chemical Engineering World due to his huge contribution to the development of the Indian chemical industry. Ambani is a big inspiration for young entrepreneurs, developing companies and business leaders.

Ambani died on 6th July 2002 after going through a major stroke. After suffering a heart attack in 1986 he had given the Reliance Empire to his two sons Mukesh and Anil Ambani.

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