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EXPERIENCE & EXPOSURE

TECH QUIZ

The department of IT organized a tech quiz on 18th february ,2012 in which 6 teams participated.Each team has 4 members which includes two from second year and two from third year. The Winning team and Runner-Up team have been awarded cash prize and certificates. Ultimately the result was as follows :-

Winning Team :

Saketha(3/4)
Tejaswi(3/4)
Jyothi priya(2/4)
Mounika.C(2/4)

Runner-up Team:

Vaibhav(3/4)
Sowmya(3/4)
Manish(2/4)
Vijay(2/4)

STUDENT ACHIEVEMENTS

Two students from IT department Spoorthy(3/4) and Mounika.R(3/4) have presented a paper on "Blue Ray Teachnology" in PRAMANA 2K12,a technical fest organized by GITAM University,Hyderabad campus and won first prize .

National Conference on Computer Networks & Information Security on April 16 - 17, 2012
This National conference (NCCNIS-12) focuses on cutting-edge Technologies in Computer Networks and Information security and provides an opportunity to interact with experts in this area for better understanding of different topics. The conference provides an opportunity for young teaching faculty and students to present their work for validation by peer review and possible publication. Special lectures on latest topics are arranged by experts from premier institutions and industries.

It's not a faith in Technology. It's faith in people.

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ALUMNI COLUMN

Name: Ashwini Reddy
Batch: 2010
Currently working with *Infosys*

Name: Achyuth Bukkapatnam
Batch: 2010
Currently studying at *North Caroline state University*

Name: Shravan Kumar Malla
Batch: 2011
Currently working with *Oracle India Pvt. Ltd.*

Name: Anupama Boppana
Batch: 2011
Currently working with *Cognizant Technology Solutions*

Everybody is a genius. But, if you judge a fish by its ability to climb a tree, it will spend its whole life believing that it is stupid

*- **Albert Einstein***

When I was 5 years old, my mother always told me that happiness was the key to life. When I went to school, they asked me what I wanted to be when I grew up. I wrote down 'happy'. They told me I didn't understand the assignment, and I told them they didn't understand life.

*– **John Lennon***

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FIELD PROGRAMMABLE GATE ARRAY (FPGA) – Part-2

By:- Mohd. Misbahuddin

FPGAs Vs Microcontrollers

Are FPGAs and microcontrollers the same thing? No

- FPGAs implement programmable logic elements running in a parallel fashion.
- Microcontrollers are based on a CPU architecture (executes a set of instructions in a sequential manner).
- Microcontrollers have on-chip peripherals that also execute in parallel with their CPU. But they are still much less configurable than FPGAs.

Logic-cells

FPGAs are built from one basic "logic-cell", duplicated hundreds or thousands of time. A logic-cell is basically a small lookup table ("LUT"), a D-flipflop and a 2-to-1 mux (to bypass the flipflop if desired).
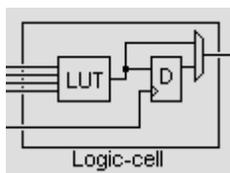
The LUT is like a small RAM that can implement any logic function. It has typically a few inputs (4 in the drawing above), so for example an AND gate with 3 inputs, whose result is then OR-ed with another input would fit in one 4-inputs LUT.

Interconnect

Each logic-cell can be connected to other logic-cells through interconnect resources(wires/muxes placed around the logic-cells). Each cell can do little, but with lots of them connected together, complex logic functions can be created.
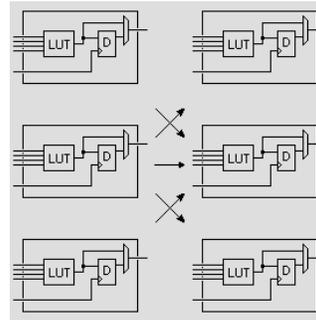
IO-cells

The interconnect wires also go to the boundary of the device where I/O cells are implemented and connected to the pins of the FPGAs.

Dedicated routing/carry chains

In addition to general-purpose interconnect resources, FPGAs have fast dedicated lines in between neighboring logic cells. The most common type of fast dedicated lines are "carry chains". Carry chains allow creating arithmetic functions (like counters and adders) efficiently (low logic usage & high operating speed).
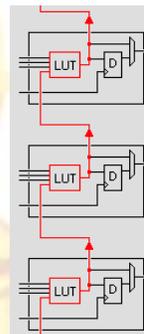
Older programmable technologies (PAL/CPLD) don't have carry chains and so are quickly limited when arithmetic operations are required.

FPGA pins

FPGAs tend to have lots of pins... So to make it a little simpler, let's put them into two bins: "user pins" and "dedicated pins".

User pins

The user pins are called "IOs", or "I/Os", or "user I/Os", or "user IOs", or "IO pins", or ... you get the idea.
IO stands for "input-output".

- You usually have total control over user IOs. They can be programmed to be inputs,outputs,or bi-directional.

- Each IO pin is connected to an "IO cell" inside the FPGA. The "IO cells" are powered by the VCCIO pins (IO power pins) - more details below.

Dedicated pins

The "dedicated pins" are hard-coded to a specific function. They fall into the three following sub-categories.

- Power pins.
- Configuration pins: used to "download" the FPGA.
- Dedicated inputs, or clock pins: these are able to drive large nets inside the FPGA, suitable for clocks or signals with large fan-outs.

The power pins fall into two categories: "core voltage" and "IO voltage".

- The core voltage is named "VCC" for Xilinx and "VCCINT" for Altera. It is fixed (set by the model of FPGA that you are using). It is used to power the logic gates and flipflops inside the FPGA. The voltage was 5V for older FPGA generations, and is coming down as new generations come (3.3V, 2.5V, 1.8V, 1.5V, 1.2V and even lower for the latest devices).
- The IO voltage is named "VCCO" for Xilinx and "VCCIO" for Altera. It is used to power the I/O blocks (= pins) of the FPGA. That voltage should match what the other devices connected to the FPGA expect.

An FPGA has many VCCIO pins that may be all powered by the same voltage. But new generations of FPGAs have a concept of "user IO banks": the IOs are split into groups, each having its own VCCIO pins. That allows using the FPGA as a voltage translator device, useful for example if one part of your board works with 3.3V logic, and another with 2.5V

Clocks and Global lines

An FPGA design is usually "synchronous". Simply put, that means that the design is clock based - each clock rising edge allows the D-flipflops to take a new state.

In a synchronous design, a single clock may drive a lot of flipflops simultaneously. That can cause timing and electrical problems inside the FPGA. To get that working properly, FPGA manufacturers provide special internal wires called "global routing" or "global lines".

They allow distributing the clock signal all over the FPGA with a low skew (i.e. the clock signal appears almost simultaneously to all the flipflops).When you feed a clock signal to your FPGA, you shouldn't use any FPGA pin, but use a dedicated input clock pin. Usually, only such pin has the ability to drive a global line. FPGA software are aware of these dedicated input pins, and will automatically assign clocks to them if given the choice.

FPGA configuration

An FPGA can be into 2 states: "configuration mode" or "user mode". When the FPGA wakes up after power-up, it is in configuration mode, sitting idle with all its outputs inactive. You need to configure it.

Configuring an FPGA means downloading a stream of 0's and 1's into it through some special pins. Once the FPGA is configured, it goes into "user-mode" and becomes active, performing accordingly to your programmed "logic function". There are 3 classical ways to configure your FPGA:

- You use a cable from your PC to the FPGA, and run software on your PC to send data through the cable.
- You use a microcontroller on your board, with an adequate firmware to send data to the FPGA.

- You use a "boot-PROM" on your board, connected to the FPGA, that configures the FPGA automatically at power-up (FPGA vendors have such special boot-PROMs in their catalogs)

During development, the first method is the easiest and quickest. Once your FPGA design works, you probably don't need the PC anymore, so the other 2 methods come in use.

Most FPGAs can be be configured in multiple ways, using either:

- The JTAG interface.
- The "synchronous serial" interface.

The JTAG interface (or JTAG "port")

JTAG was originally designed for test and manufacturing purposes (as electronic boards became more and more compact, testing that a board was "good" became more and more difficult).

JTAG primary purpose is to allow a computer to take control of the state of all the device pins on a board. In turn, this allows all device-to-device combinations on the board to be tested. Standard JTAG commands can be used for this purpose.

How JTAG works

JTAG consists of 4 signals: TDI, TDO, TMS and TCK. A fifth pin, TRST, is optional.

A single JTAG port can connect to one or multiple devices (as long as they are all JTAG-aware parts). With multiple devices, you create what is called a "JTAG chain". The TMS and TCK are tied to all the devices directly, but the TDI and TDO form a chain: TDO from one device goes to TDI of the next one in the chain. The master controlling the chain (a computer usually) closes the chain.

TCK is the clock, TMS is used to send commands to the devices, and TDI/TDO are used to send and receive data. Each device in the chain has an ID, so the computer controlling the JTAG chain can figure out which devices are present.

STUDENT COLUMN

CONNECT WITH KINECT
By Spoorthy Reddy

Do you Like games..?   //everybody does

Do you Play games..?   //everybody does

Well, now you can actually feel games…provided you have kinect. Connect yourself to the games, physically with Kinect. First, let us get to know kinect better.

So, what is Kinect . . ?

Kinect is a motion sensing input device for the Xbox 360 video game console and Windows PCs. Based around a webcam-style add-on peripheral for the Xbox 360 console, it enables users to control and interact with the Xbox 360 without the need to touch a game controller, through a natural user interface using gestures and spoken commands.

Kinect, referred to as the 'new XBOX' by the CEO of Microsoft, builds on a software technology developed internally by Rare, a subsidiary of Microsoft Game Studios owned by Microsoft.

After selling a total of 8 million units in its first 60 days, the Kinect holds the Guinness World Record of being the "fastest selling consumer electronics device".10 million units of the Kinect sensor have been shipped as of March 9, 2011.

How does it look like .. ?

The Kinect sensor is a horizontal bar connected to a small base with a motorized pivot and is designed to be positioned lengthwise above or below the video display. It captures the player's motions through a camera attached to the device.

A picture of the Kinect device on the LCD display.

How does it work..?

The device features an "RGB camera, depth sensor and multi-array microphone running proprietary software",which provide full-body 3D motion capture, facial recognition and voice recognition capabilities.

The depth sensor consists of an infrared laser projector combined with a monochrome CMOS sensor, which captures video data in 3D under any ambient light conditions.The sensing range of the depth sensor is adjustable.

So first, the camera captures the image which is converted into an infrared image by the infrared laser of the depth sensor. Using the color gradients ,the depth of the image is then calculated.

This infrared image shows the laser grid, that Kinect uses to calculate depth.
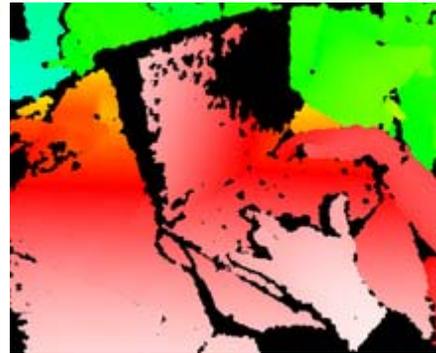
The depth map is visualized here using color gradients from white (near) to blue (far).

You might wonder how the kinect works if there are several other objects in the room other than the player. Here's your answer…

The Kinect software is capable of automatically calibrating the sensor based on gameplay and the player's physical environment, accommodating for the presence of furniture or other obstacles.

Kinect is capable of simultaneously tracking up to six people, including two active players for motion analysis with a feature extraction of 20 joints per player. However, the number of people the device can "see" (but not process as players) is only limited by how many will fit in the field-of-view of the camera.

Enter the virtual world ..

Experience the real emotions..

Enjoy kinect ☺

BLU RAY DISC-The Next Generation optical disks
By Mounika Ravilla

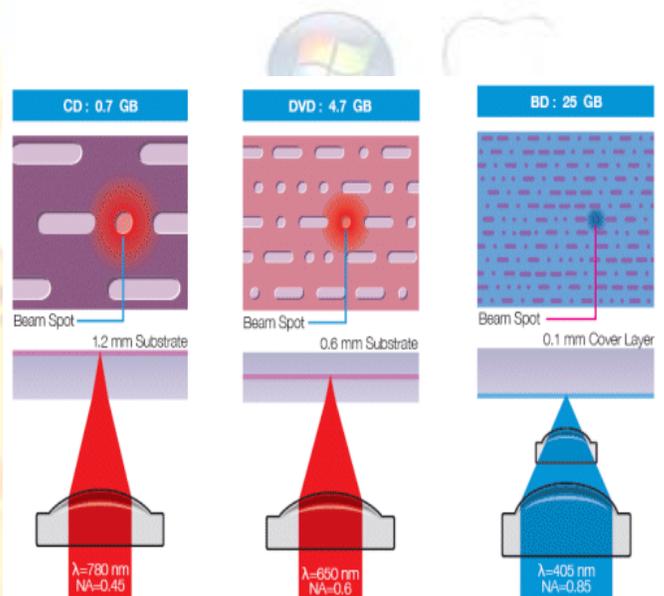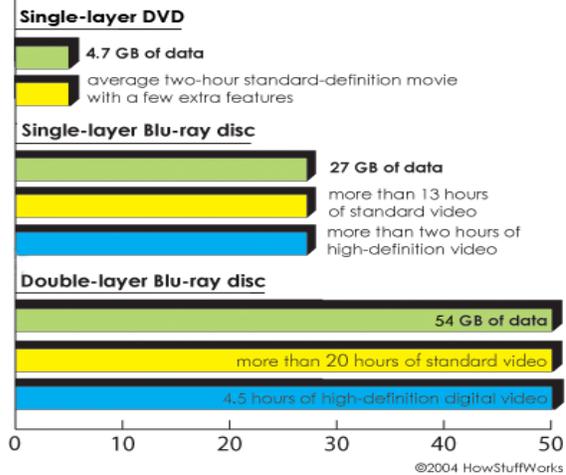Did you get the difference between these 2 images?

If yes, this is why u should know about Blu-ray technology:

Blu-ray also known as Blu-ray Disc (BD), is the name of a new optical disc format jointly developed by the Blu-ray Disc Association (BDA), a group of the world's leading consumer electronics, personal computer and media manufacturers (including Apple, Dell, Hitachi, HP, JVC, LG, Mitsubishi, Panasonic, Pioneer, Philips, Samsung, Sharp, Sony, TDK and Thomson). The format was developed to enable recording, rewriting and playback of high-definition video (HD), as well as storing large amounts of data. The format offers more than five times the storage capacity of traditional DVDs and can hold up to 25GB on a single-layer disc and 50GB on a dual-layer disc.

A current, single-sided, standard DVD can hold 4.7 GB (gigabytes) of information. That's about the size of an average two-hour, standard-definition movie with a few extra features. But a high definition movie, which has a much clearer image, takes up about five times more bandwidth and therefore requires a disc with about five times more storage. As TV sets and movie studios make the move to high definition, consumers are going to need playback systems with a lot more storage capacity.

Blu-ray vs. DVD Capacity

Single-layer DVD
- 4.7 GB of data
- average two-hour standard-definition movie with a few extra features

Single-layer Blu-ray disc
- 27 GB of data
- more than 13 hours of standard video
- more than two hours of high-definition video

Double-layer Blu-ray disc
- 54 GB of data
- more than 20 hours of standard video
- 4.5 hours of high-definition digital video

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| CD : 0.7 GB	DVD : 4.7 GB	BD : 25 GB
Beam Spot	Beam Spot	Beam Spot
1.2 mm Substrate	0.6 mm Substrate	0.1 mm Cover Layer
λ=780 nm NA=0.45	λ=650 nm NA=0.6	λ=405 nm NA=0.85

It differs from the traditional DVD that, in a DVD the data is sandwiched between two 0.6mm polycarbonate layers. While in the case of a BD the data layer is placed on a 1.1mm polycarbonate layer. To prevent the data on the top of the disc from getting erased, the data layer is covered by a 0.1 mm protection layer. This makes the size of all the CD's DVD's & the BD's constant.

CONSTRUCTION:

The construction of the bumps (spiral track) is explained here from a closer view of the disc. The view is so close that the bumps can be seen clearly.

DVD Vs. Blu-Ray Construction
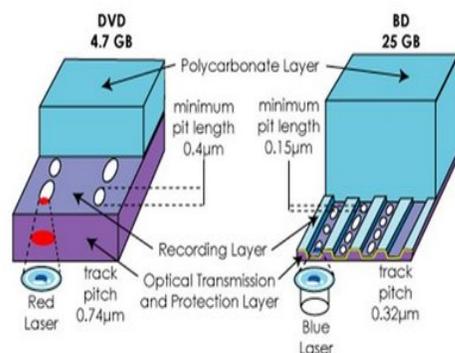
Each white hole represents a bump (pit). For clear understanding it is effectively compared with a DVD.
The key terms used here are:
1) **Pit Length**: It is the length of the pit on the spiral track which holds the data.
2) **Track Pitch**: It is the distance between any two successive tracks.

From the figure above :
The minimum pit length of a BD is 0.15 microns which is more than twice as small as the pits on the DVD which is at minimum 0.4 microns. Also the track pitch of the BD is 0.32 microns which is more than twice as small as that of the DVD which is 0.74 microns. This small pit & reduced track pitch enables the accommodation of a data of about 25 GB on a single sided Blu-Ray disc which is almost 5 times that of a single sided traditional DVD.

READING ISSUES FACED BY CDs AND DVDs:

The DVD's & VCD's used so far face two basic problems regarding their physical structure. They are

Birefringence: In a DVD, the data is sandwiched between two polycarbonate layers, each 0.6-mm thick. Having a polycarbonate layer on top of the data can cause a problem called birefringence, in which the substrate layer refracts the laser light into two separate beams. If the beam is split too widely, the disc cannot be read.

Disk Tilt: If the DVD surface is not exactly flat, and is therefore not exactly perpendicular to the beam (laser), it can lead to a problem known as disc tilt, in which the laser beam is distorted. This sometimes may lead to reading or writing into other undesired memory locations.

SOLUTION PROVIDED BY BLU-RAY DISCS:

The Blu-ray disc overcomes DVD-reading issues by placing the data on top of a 1.1-mm-thick polycarbonate layer. Having the data on top prevents birefringence and therefore prevents readability problems.
And, with the recording layer sitting closer to the objective lens of the reading mechanism, the problem of disc tilt is virtually eliminated.

Hard-coating technology-The powerful Feature of a Blu-ray disc :

Because the Blu-ray standard places data so close to the surface of the disc, early discs were susceptible to dust and scratches and fingerprints and had to be enclosed in plastic caddies for protection. Such an aggravation, the consortium worried, would hobble Blu-ray's adoption in the face of the rival HD DVD standard; HD DVDs can be handled bare (caddy less) like CDs and DVDs, making them familiar to consumers as well as attractive to manufacturers and distributors who might be deterred by additional costs.

The solution to this problem arrived in January 2004 with the introduction of a clear polymer that gives Blu-ray discs unprecedented scratch resistance. The coating, developed by TDK Corporation under the name "Durabis," allows BD's to be cleaned safely with only a tissue—a procedure that can damage CDs, DVDs, and (presumably) HD DVDs, which are manufactured by the same process as these older optical media. Bare BD's with the coating are reportedly able to withstand attack by a screwdriver.

Characteristics of a Blu-Ray disc:

1) On Guard:

Blu-ray discs are better armed than current DVDs. They come equipped with a **secure encryption system** -- a unique ID that protects against video piracy and copyright infringement.

2) Formats:

Unlike DVDs and CDs, which started with read-only formats and only later added recordable and re-writable formats, Blu-ray is initially designed in several different formats:

Read only memory Blu-Ray disc [BD-Rom] – This type of BD can only be read but cannot be written over. The content will be pre-recorded.

Recordable Blu-Ray disc [BD-R] – This BD is mainly used for storage of PC data.

Re-writable Blu-Ray disc [BD-RW] – This BD is mainly used for storage of PC data. The contents in this disc can be written over and over.

Re-writable Blu-Ray disc [BD-RE] – This BD is mainly used for recording of data to be used in HDTV. This disc can also be written over again and again.

Applications of Blu-Ray Technology:

1) High Definition Television Recording:

The Blu-ray Disc format offers consumers the ability to record their High Definition television broadcasts in their original quality for the first time, preserving the pure picture and audio level as offered by the broadcaster.

2) High Definition Camcorder Archiving:

As the market penetration of High Definition TV sets continues to grow, so does the demand of consumers to create their own HD recordings. With the advent of the first HD camcorders, consumers can now for the first time record their own home movies in a quality level unlike any before.. Now, the Blu-ray Disc format, with its unprecedented storage capacity, allows for the HD video recording with an HD camcorder to be converted and recorded on a Blu-ray Disc. When the HD content is stored on a Blu-ray Disc, it can be randomly accessed in a way comparable to DVD. Furthermore, the disc can be safely stored for many years, without the risk of tape wear.

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SERIES: *PART-2*
JUST MAKE IT HAPPEN
- **Ali Intakhab**

I have to start from the 'Technical Event' which was given to us. Ms. Archana Sukhdev gave us the mammoth task of getting registrations for an event which even I won't pay a single buck to participate. We were her first choice considering the fact of us making the magazine the top notch of the college within the span of three months. It's once again work time. I still didn't forget the rejection from Sana but had to keep it aside and work like a salesman for the next eight days as a respectable target of 50 was in my sight that would help me at least stand in Ms. Archana's cabin with something to utter from my side. I started texting Sana in relevance with work to which late respond became as consistent as me not being present in classroom. Sana was the only person about whom I never discussed with Sid due to some weird reasons. Coming back to late responding, for the first time I just had to keep my ego in right pocket and work through. This action actually worked and we reached the target of 125 within a span of five days. Deepak Sir congratulated us when we (Me and Sana) were discussing about the execution of the event "Good job guys! Great Team." "Thank you Sir!" responded both of us in unison. I wished 'Team' was heard by Sana.

The final count was record breaking from our department, 159. Damn it! Happiness was something which went on a marathon from my life but never came back. Praises came to me like flock of birds chirping near my ears. I was walking back to my place that particular evening after the grand success of the event. I finally questioned myself on the deserted road since its least accessed during that time, "what's making Ishan so uneasy in recent days?" I looked dumb then but that question was important to me.

I think it was time to be honest and accept the fact that I did fall for Sana but will never tell her about all this immature feelings. A very precise promise of me not being in contact with Sana was not fulfilling but no way out.

Time passed by and semester exams were nearing like bulls running towards Trio in Zindagi Milegi Na Dobara. This is the time when you feel even a leap year would have turned the result in your favor. The preparation started because this is the only time most of the engineering students actually clean up their dusted pile of books. Writing exams in third year had a numb feeling on my nerves. Exams went off well so did the next holidays and next semester. Let me tell you about the last semester of my engineering life.

This is the semester where unique emotions rush down your nerves where you start loving your college which you hated the most in past three and a half years, you are treated like a prince after you pocket jobs from MNCs (I got two!), will start connecting to people whom you hardly bothered about just thinking whether you would meet them again in your life or not, etc.

But I bothered about Sana who came to meet me three days before the end of semester. My words of matter still didn't spill. On the day of meeting, both of us spoke at length since we became good friends as she was no more ignorant to me in past four months. After 2 long hours of chat, Sana paused and spoke slowly after twenty eight seconds (I counted every pulse when Sana was with me) "I have started liking a guy. Can you just……?" I don't know remember the words she told after that because at that point of time it was like an arrow piercing my body and me lying on the floor with blood flowing on it. I promised to be a good friend and help her out but for obvious reasons, broke my saint sort of promise. I didn't even bother to ask that lucky _____'s (Not allowed to use that word) name. Then I was only rhyming the lines of Shah Rukh Khan from Kuch Kuch Hota Hai in my mind "Hum Jeete ek baar hain, marte ek baar hain aur pyar bhi ek baar hi kartein hain." Though I hated

this dialogue once but ultimately had to agree with this emotional content.

I promised you that this is not a love story. I will follow that from now ☺

Three years into my slog for work, in front of a non-living thing called laptop. I never knew my fantasy of having one in my childhood would turn out to be a nightmare now. I still had two years of job left. I'm not retiring at the age of 25 years but respecting the promise which I gave to my papa (I prefer calling him papa over 'Dad'). The promise stated in the words of papa which goes like "You can put the work of Ornate Event on hold and work for five years and resume it after that mentioned tenure." He gave me that duration of five years thinking I might start loving my job and forget about Ornate but nothing of that sort was going to happen. Varun Negi and I were working in parallel inspite of me getting that order by papa. I just can't stay away from my creation (OEMG). Varun was working full time with this group and I was always a good business partner but never made an appearance in front of any client because if you are working for a MNC then a side business would help you get nothing more than a termination Letter. One day I got a call from someone who was my best friend during college days but both of us rarely spoke in these three years after college life, my soda partner 'Sid'. He was getting hitched with a girl of his parent's choice. He knew of my OEMG so he wanted us to help him in getting him this slow poison of marriage. One month down the line was the date decided and apart from being the wedding planner of his wedding, I was still his soda partner meaning, he was a person who barely made any friends so I was still his buddy. On one late evening with a week to go for the *Saat Phere,* we were chatting on roof top of my party house in the outskirts of city. "So tell me one secret you never told me about during college days?" asked Sid in a serious baritone. "I loved Sana and I still do but never told about this to anyone on this planet except Varun" I replied with a straight face trying to avoid eye contact with Sid. At the age of 25 years people tend to mature and understand the situation so both of us changed the topic. I took a week off from job to have some fun after a long time with Sid's wedding to come. Finally it was the day when Sid was getting married to a

stranger which is now as rare as India winning its *Away Test Series in Cricket.* Sid called me near the *Mandap* and asked me to meet her batch mate from his college who was supposedly my batch mate too. "why did you call me to see you suicide?" I enquired jovially. "Shut up! You moron! Meet the girl standing behind you." Replied Sid. I turned and found Sana standing in green Sari and smiling. This is the best surprise I have ever got in my life. "Hi! Long time." I asked in a very low voice. "Where have you been in these past three years Mr. Jerk?" replied Sana literally shouting at me. Sid left us alone and went to dive into the well of marriage. I wish I could hug him for the gesture he has shown towards me. I was itching with the question which ultimately popped up, "So how is your boyfriend?" I enquired. "Which boyfriend?" came the question from Sana as if she had lost the count on her relationships. "I mean the guy you told me about on the last day of college." I said. "We both dated for a year but finally it didn't work out as he was against me doing mass communication in journalism." Replied Sana with no signs of emotion showing up on her face. "Wow!" I exclaimed. "Ah?" asked Sana. " I exclaimed for journalism and not for the break-up. You fit in well for journalism" I replied in an excited mode. "I was just trying to pull your leg." Said Sana with a grin on her face. "Any future plan?" I asked. "I have been transferred to Bihar. I will be leaving in two weeks for that state. Sid called me two days back for his wedding but initially I gave an excuse of all being strangers to me in party but when he said Mr. Jerk will be present then I just had to change my mind." She replied with a wink. Girls are the best living matter god could create to confuse a guy. After the wedding I dropped Sana to her place and the next day at 10am I called up Varun and told him about the meeting with her the previous day. Before I could throw the news at him, Varun said "Don't lose her. Go. Happy vacations. I will take care of work here." After I ended the call my eyes were actually moist. I convinced my parents within a span of 2 hours and 17 minutes. It was actually an easy task for me since five days back I received my MBA degree which I was pursuing as distance studying course. Parents were really happy about it. Let me tell you the luck factor I had in

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convincing my parents. My *Baba,* grandfather lives in Bihar so now you probably would understand the reason behind my dad getting convinced quickly. I still didn't mention about Sana to them. *Baba* is the leader of a particular Panchayat which mostly runs in a village as mostly seen in movies. I told about me accompanying her for Bihar. This was the first instance she hugged me. God was on my side for the first time. I told her that spending time with *Baba* was making me go to that state. Baba is someone who is above to my papa in regards for me.

Both of us left for Bihar. This departure of mine from Delhi for Bihar changed my life forever. I will tell you about this very soon. Folks I will stand on my words of this not being a love story. You will find out the reason in the next edition. Till then drive safe and eat healthy. Bye-Bye! ☺

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Also catch us on *facebook* on the link mentioned below: http://www.facebook.com/group.php?gid=123474171037593

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Flash Soft Tech Pvt. Ltd.

Flash Soft Tech Pvt. Ltd. was established in the year 1995; offering web based collaborative business & business intelligence solutions. Managed by a team of experienced technocrats with strong business practices, Flash is now an established leader in the Android, Web Technologies, Mapping, GIS, Surveying arena.

Since inception, the Company has maintained an excellent track record in tapping new customers by proactively understanding their requirements and offering customizable products - synonymous with innovation, quality and cost-effectiveness.

Areas of specialization

- Web Technologies

- Android

- Mapping

- GIS

- Surveying

Contact Info: 040-65142141, 09246262141, 09246242141