High Performance COMPUTING

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CSI Communications - Call for Articles for Forthcoming Issues

Cover themes for forthcoming issues are planned as follows:

- **October 2013 – ICT in Agriculture** (Send your articles for October issue latest by 23rd September 2013)
- **November 2013 – Medical Informatics**
- **December 2013 – Computer Vision**
- **January 2014 – Open Source Technologies**
- **February 2014 – Indic Computing**
- **March 2014 – Graph Theory**

In order to provide a fair opportunity to all for contribution, we are making an open appeal to all of you to send your articles for CSI Communications magazine.

Kindly note that the Editorial Board of CSI Communications is looking for high quality technical articles for different columns pertaining to the above themes or other themes of emerging and current interests. The articles should cover all aspects of computing, information and communication technologies that should be of interest to readers at large and member fraternity of CSI and around. The articles shall be peer reviewed by experts decided by the Editorial Board and the selected ones shall be published. Both theoretical and practice based articles are welcome but not research papers. The articles and contributions may be submitted in the following categories: **Cover Story, Research Front, Technical Trends and Article**.

CIOs/Senior IT/IS personnel/consultants of the companies, who are managing technologies/projects related to the cover themes are welcome to contribute under the **CIO Perspective - Managing Technology** section. Similarly, HR Senior Managers/ Personnel/ Consultants are invited to contribute under **HR section**.

Letters to the Editors for **ReaderSpeak**, questions to be answered in **Ask an Expert**, your experience of Programming Tips under the **Practitioner Workbench: Programming.Tips**, your memories of yesteryears of computing for **IT.Yesterday()**, theme based crossword puzzle and theme based cartoon for **Brain Teaser column** are also welcome.

**Here are article submission guidelines for your information:**

- The articles may be long (2500-3000 words) or short (1000-1500 words) authored in as the original text. (Plagiarism is strictly prohibited – see the note at the end to know about meaning of plagiarism.)
- The articles may be sent to the CSI Editorial Board via email csic@csi-india.org.
- All manuscripts should be written at the level of the general audience of varied level of members.
- Equations and mathematical expressions within articles are not recommended, however, if absolutely necessary, should be minimum.
- List of references is preferred and it is recommended that list not more than 10 references at the end of your manuscript. Please don’t include any embedded reference numbers within the text of your article. If you would to like to refer, you may state names in the text and provide full reference at the end. The reference must state the names of the authors, title, publisher’s name, complete publication reference with month and year. Web URLs should be there for website references with accessed date.
- Figures and Images used should be limited to maximum of three (only high resolution images need to be sent, and the image needs to be sent separately also).
- Only MS-Word and PDF submissions are allowed.
- Include a brief biography of four to six lines for each author with author picture (high resolution).
- Please note that Editors will edit the contents as felt necessary.
- Editorial board will notify the authors of selected articles and authors will be asked to fill up the copyright transfer form before accepting the article.

Please note that months for various cover themes are tentative and may change depending on prevailing circumstances.

(Issued on behalf of Editorial Board of CSI Communications)

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**Plagiarism Alert for Prospective Authors**

- Plagiarism in the present context is - use in part or whole of other published articles with or without citing. Even with citation, pasting huge chunks of text authored by others is not admissible (the only exception being demarcated quotes when situation warrants).
- Plagiarism is against professional ethics and the editorial team has no option but to recommend black listing the authors committing plagiarism for lifetime.
- It is an extremely simple matter for a reviewer to verify plagiarism. In most cases, a deft Googling of part of the text will reveal the sources instantaneously. Plagiarism is easy to do and also easy to detect.
- Prospective authors are requested to take extreme care in avoiding intentional and non-intentional forms of plagiarism, thereby saving time for them as well as for reviewers. CSI Communications is committed to upholding ethical practices in publishing and hence would continue to take serious view of plagiarism.

- CSI-C Editorial Team
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**Important Contact Details**

For queries, correspondence regarding Membership, contact helpdesk@csi-india.org
President’s Message

Dear Members

We are progressing well with the Launch of a Curtain Raiser for Celebrating the Golden Jubilee of our Society. Hon’ble Minister for Law and Justice, Communications, and Information Technology Shri Kapil Sibal Ji has agreed to be the Chief Guest. The event is scheduled for Friday, the 6th September 2013 in Kothari Hall, DRDO Bhavan, New Delhi. An interesting Panel Discussion on “Kal Aaj Aur Kal” – Role of CSI in the Modern Cyber Era is scheduled as a part of the event. We are expecting some of the best talent from India to join us during the panel. Dr. R. Chidambaram, the Principal Scientific Advisor to the Government of India and Chairman, Scientific Advisory Committee to Cabinet has kindly agreed to Chair the Panel. Our beloved past presidents – Shri S. Mahalingam and Dr. Ratan Dutta have agreed to participate in the panel. Shri J. Satyanarayana, Secretary, Department of Electronics and Information Technology, Ministry of Communications and Information Technology, Government of India has kindly agreed to be with us for the function and be part of the panel. We are releasing the Golden Jubilee logo to mark the occasion. The logo will become part of all our communication from 6th September 2013. As the event is in New Delhi, the RVP of Region-I, Prof. R K Vyas and his team of Chapter office bearers of that region are doing everything possible to make the event a grand success. Of course, our veteran CSI enthusiast Dr Ratan Dutta, Past President of CSI and Chairman of NC, is guiding them through every step.

Vizag is getting ready to host the CSI Annual Convention. From the arrangements, I find that we can expect an excellent program this year. Pack your bags and get ready to reach Vizag in time. The city with lots of Critical Infrastructure welcomes you. Judging from the enthusiasm of the organizers, we can expect excellent hospitality as well. Be ready for a delicious Andhra Meal.

It is time for us to use ICT in full measure. Also, each Chapter should organize events that can be shared with other chapter as webinars. I would like each Division Chair and each RVP to organize webinars topic-wise and chapter-wise. We should experiment from the start of Launch of our Golden Jubilee celebrations. We must have weekly webinars by Chapters and monthly webinars through Divisions. Our web site should carry the schedule well ahead of time. In order to share visitors and lectures in their work place, after obtaining the necessary permissions locally. Let us set the trend in sharing knowledge. As a baby step, I volunteer to give a talk on “Designing Large Scale Systems” any time after 6th September 2013 launch. As the event is in New Delhi, the RVP of Region-I, Prof. R K Vyas and his team of Chapter office bearers of that region are doing everything possible to make the event a grand success. Of course, our veteran CSI enthusiast Dr Ratan Dutta, Past President of CSI and Chairman of NC, is guiding them through every step.

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Another important factor that CSI should focus on is the Academia – Industry interaction. Indian academic system have always excelled and remained comparable to the best in the West. Indian industry today is moving its attention more towards products as opposed to services. Indian industry is looking up to academia for help. CSI being a body of professionals from academia and industry is in a unique position to address this need. The work force, the students are alsoCSI members. One could start with some Brainstorming sessions to sharply define this space. Volunteers? Or should we overload NSC??

When it happens, Computer Society of India should be perceived as the anchor for such change. It is time that we put all our acts together to make necessary moves today. Everyone in CSI has a significant role to play in such transformation. Let us do our bit.

I will catch up with you soon...

With best wishes,

Prof. S V Raghavan
President
Computer Society of India

Prof. S V Raghavan

From : president@csi-india.org
Subject : President’s Desk
Date : 1st September, 2013

With best wishes,

Prof. S V Raghavan
President
Computer Society of India

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assets take the world by storm. India has the largest number of software design professionals. India moves on to Quantum Computing and Communication after unprecedented success in Silicon based computing. In India, every third person is an electronics designer of sorts. India becomes the largest designer of custom-made products. India successfully integrates 3D Printing technology and personalized product design.

When it happens, Computer Society of India should be perceived as the anchor for such change. It is time that we put all our acts together to make necessary moves today. Everyone in CSI has a significant role to play in such transformation. Let us do our bit. Another important factor that CSI should focus on is the Academia – Industry interaction. Indian academic system have always excelled and remained comparable to the best in the West. Indian industry today is moving its attention more towards products as opposed to services. Indian industry is looking up to academia for help. CSI being a body of professionals from academia and industry is in a unique position to address this need. The work force, the students are alsoCSI members. One could start with some Brainstorming sessions to sharply define this space. Volunteers? Or should we overload NSC??

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I will catch up with you soon...

With best wishes,

Prof. S V Raghavan
President
Computer Society of India

India is most connected country in the world. India has its own Search Engine. India develops world’s fastest router. India creates history by driving 1000 Terabits of data through a pair of Optical Fibers across the country. India unveils world’s largest Supercomputer. Indian software
Dear Fellow CSI Members,

It would be a cliché to say that High performance computing is in great demand by almost all sectors of ICT. CSI Communications brings to you a special issue on this area which attempts to touch a vide variety of aspects of the theme.

The first two articles in the cover story section viz. – ‘A Survey of High Performance Computing’ by Mrs. C. Sunitha and Mrs. K Vasantha Kokilam and ‘HPC in Abstract’ by Hemprasad Y. Badguyar and Dr. R.C. Thool - both make an attempt to give a bird’s eye view of the theme. The first one is an over archiving survey whereas the latter is a brief overview.

Technical Trends comes enriched with two articles on HPC. In the article titled ‘Cloud Based High Performance Computing’, Ms Tapalina Bhattachari talks about cloud-based HPC, which is fast catching up as a viable model for providing HPC power to small and medium organisations. In the article on ‘High Performance & Cloud Computing Interventions for Supply Chain Management’ by Prashant Nair, the impact of the area in business sector can be gauged.

Research Front section has an article on ‘High Performance Cryptography: Need of the Hour’ by Umadevi Ganugula and Ashutosh Saxena, in which authors talk about High Performance Cryptography, a niche area. They discuss the approaches that can be used for handling the trade-off between performing secure transactions on the internet without hindering the customer comfort of faster browsing experience.

Article section is enriched with 5 articles in all. The first two articles are related to the theme while the remaining three articles talk about other subjects of wide interest.

In the article titled ‘Is Parallel Computing Relevant in Modern Enterprise Applications?’ Bipin Patwardhan reassesses the relevance of HPC in enterprise applications and concludes that although parallel computing has made inroads in enterprise applications, many enterprise applications are still not utilizing the features of the underlying hardware as enterprises continue to develop applications based on single, powerful CPU paradigm. Amit Badheka’s article titled ‘Using Graphics Card for Accelerated Computing’ is also related to the theme HPC. He talks about using Graphics Processing Unit (GPU) computing for building solutions that can enable enterprises address their computational need while processing huge volume of data.

There are two articles in article section related to social media. The first one is ‘Banking and Social Media - A different Perspective’ by Mohan Datar and the other is ‘Detecting Fake Facebook Profiles’ by Hemant Kumar Saini. Both are strikingly current in the issues they address in the context of social media. ‘Making Surveys Paperless’ is an article by Hareesh Nampoothiri, wherein he gives useful tip to researches for conducting surveys.

Practitioner Workbench column has two sections – Programming. Tips(), which comes with an article on Fun with C++ programming wherein Dr Wallace Jacob provides tips about using this pointer - and Programming.Learn("R"), wherein P. Umesh and Silpa Bhaskaran write about how to run R scripts.

CIO Perspective’s Managing Technology section has an interesting article on ‘10 Steps for CIOs to Achieve Productivity Gains through Enterprise Social Collaboration’ written by Partho Sengupta, Ajit Mahajan and Huzefa Lokhandwala. They discuss an approach for enabling organizational intelligence using Web 2.0 solutions that provides software environment where people work online to achieve individual and team goals. They inform that social collaboration within an enterprise is becoming mainstream technology and CIOs are taking active interest as many products become commercially available.

In the Information Security section under Security Corner, we provide third article in the series on Web Application Security. This is about ‘Declarative Security Features in HTTP’ by Krishna Chatityna Telikicherla and Harigopal K B Ponnappali. In this article, they write about security features that can be expressed or declared through HTTP headers and are enforced by processing applications.

Interestingly, we come with a very useful article under IT.Society() section on ‘Women Safety using a Smart Phone Application’ by Diptiman Dasgupta, Radha M De and Indrajit Poddar. They discuss how in today’s world apart from law it is necessary to provide other means for protecting women and in that context write about smart phone application that can provide emergency response building and real time evidence gathering.

As usual, H R Mohan, Vice President, CSI, AVP (Systems), The Hindu, Chennai brings ICT News Briefs under various sectors at a glance in August 2013 in the column Happenings@ICT. Dr. Debasish Jana presents a crossword under Brain Teaser column for our enthusiastic readers who look forward to testing their IT knowledge and answers questions under the column ‘Ask an Expert: Your Question, Our Answer’.

We have other regular features like CSI Announcements, CSI Reports and Chapter and Student Branch News. Remember we eagerly await your feedback and welcome it at the email id csic@csi-india.org. Do drop in a mail if you like the articles or even if you do not like them. Do provide your suggestions on what you would like to read and learn about. Also do send your contributions and partner with us in our endeavour of making CSIC a great learning experience for its readers.

With warm regards,
Rajendra M Sonar, Achuthsankar S Nair, Debasish Jana and Jayshree Dhare
Editors
Introduction

High Performance Computing (HPC) technology is to solve computational problems that need significant processing power and resources. The goal of HPC is to reduce execution time and accommodate larger and more complicated problem. The scope of HPC is scientific research, engineering and design.

Users of HPC

The two major users of HPC are technical customers and enterprise customers. The Technical users are scientists and engineers and examples include climate prediction, protein folding simulations, oil and gas discovery, defense and aerospace work, automotive design, financial forecasting, etc. The Enterprise Customers encompasses the corporate data center that stores customer records, inventory management, and employee details.

Technical customers usually require the Message Passing Interface (MPI) whereas enterprise customers require an SQL database. Because a number of MPI and database implementations have been created with sockets or DAPL, it is possible for a company to target both classes of customer by delivering a quality software stack. Unfortunately, many smaller HPC companies often target technical customers in the hopes of becoming famous, and in the process neglect enterprise customers who would make them rich. Enterprise is a much bigger market than technical simply because storage is required more than processing.

Key Concepts

Conventional serial execution is also called sequential execution and is represented as a series of instructions that are executed by the CPU.

![Fig. 1: High Performance Computing](image1)

Parallel computing takes advantage of concurrency to:
- To Solve larger problems within specified time
- For time Saving
- To Overcome memory constraints
- To Use all resources

Scalable Speedup

Execution time reduced with fixed size workload through parallel execution.

\[ \text{SpeedUP} = \frac{\text{Execution Time on one Processor}}{\text{Execution Time on N Processors}} \]

Scalable Efficiency

Efficiency depend on actual performance to the best possible performances.

\[ \text{Efficiency} = \frac{\text{Execution time on one Processor}}{\text{Execution time on N Processors} \times N} \]

Benefits of HPC

- HPC reduces computation time, which adds quality and value of the product, using the latest HPC technology creates the maximum value.
- HPC reduces product development time and cost.
- With HPC, we can test more ideas to help set priorities for work that gets done.
- Using HPC help us to eliminate some testing and evaluate more alternatives.
- HPC lets us get faster to market and get the patent first.
- HPC increases the complexity of designs, increasing the number of patented products and protecting the designs. Design and Project run around is reduced because of HPC use.
- It improves our design process to produce better products and reduce cost of development.
- It improves the throughput of customer’s designs and thus improves their productivity and ability to innovate.
- HPC is an indispensable tool for biotech research.

Applications of HPC

- Life Sciences: In-Silico Trials, Drug Discovery
- Life Sciences: Sequencing
- Physics – Materials Science Molecular Dynamics
- Biological Modeling- Brain Science
- Environment and Climate Modeling
- Computational Fluid Dynamics
- Financial Modeling
- Streaming Data Analysis

![Fig. 4: Applications of HPC](image4)
Barriers to Acquire HPC Resources

- Costs / Budgets
- Business case / ROI
- People / Skills
- Tools / Softwares / Applications
- Power / Density / Physical Limits

The main barrier to acquire HPC is due to financial needs such as budgets, system costs, Third Party Software Costs. To have a Skilled Staff is also a Problem. Technical limitations such as system performance, interconnect performance, complexity / cable, cards, switches is also a problem for adopting HPC. Space limitations, facility issues like power, cooling, Complexity to expand and use are barrier for small scale business. Such business cannot afford more investments on supported data storage mechanisms such as databases, parallel file systems etc.

Reasons for Purchasing HPC Systems

HPC provides additional insights into current problems. It helps to solve new problems that cannot be addressed practically by other means. It helps to create new ideas and inventions. It is useful in large scale data mining or analysis, risk modeling, to meet external requirements. It helps to develop new services or business process innovations. It creates new manufacturing processes and help in supply chain optimization.

Sites with Experience in HPC

- HPC allows our user community to run larger problems than they would be able to on their desktop.
- It is possible to dock thousands of molecules of protein.
- Using HPC, our applications becomes faster, better, cheaper and it reduces cycle time in proportion in applications like seismic data analysis, oil exploration etc.

Sites without Experience in HPC

- They are limited to number of problems to model simultaneously.
- They have to do entirely new things like complex finite element analysis, 3D modeling etc.
- Could not do new or different things.
- Size of HPC Systems:
  - The HPC Servers within this group had 1,330 Processors and peak performance of 12,996 Gigaflops or 9.8 gigaflops per processor. The average central memory size was 3.7TB. The average number of nodes on the industrial user’s largest installed computer was 514, which translates to an average of about 2.6 processors per node (1,330 Processors /514 nodes).
  - In high-performance computing, gigaFLOPS, teraFLOPS, and petaFLOPS are terms used to quantify the rate at which computer systems can perform arithmetic operations on floating-point numbers. Each term combines a metric prefix (e.g., giga-) with the five-letter abbreviation for FLoating-point Operations Per Second (FLOPS). The letter “S” at the end of each term refers to the word “second”, indicating a rate of speed (as in the network bandwidth measurement Gbps, or gigabits per second), not the plural form of a noun
  - gigaFLOPS - One billion floating-point operations per second
  - teraFLOPS - One trillion (i.e., one thousand billion) floating-point operations per second; equivalent to one thousand gigaflops
  - petaFLOPS- One quadrillion (i.e., one thousand trillion) floating-point operations per second; equivalent to one thousand teraFLOPS)

Examples of HPC Systems

- Indiana University’s Big Red II system has a peak performance of 1 petaFLOPS. To match the number of calculations Big Red II can perform in one second, a human would have to perform one calculation every second for 31,687,535.79 years.
- The Extreme Science and Engineering Discovery Environment (XSEDE) digital service Stampede (TACC) has a peak performance of 10 petaFLOPS, equivalent to 10 thousand teraFLOPS, or 10 quadrillion floating-point operations per second.
- The theoretical peak computing capacity of a system is obtained by multiplying the number of processors by the clock speed of the processors, and then multiplying the product by the number of floating-point operations the processors can perform in one second.

HPC vs Grid vs CLOUD

- HPC features tight coupling between applications and the underlying homogeneous infrastructure. Focus is primarily on speed and performance in the normally client-owned environment.
- Grid computing has a lesser coupling between applications and the underlying infrastructure. The apps are less location-aware as virtual organizations allow heterogeneous and geographically dispersed nodes. Focus is on parallelism and distributed computing, and access to the shared infrastructure is restricted.

Continued on Page 33
HPC in Abstract

This is an era of High Performance Computing abbreviated as HPC. HPC evolved due to increase in demand of processing speed. It is a hybrid technology that continuously changes its colors, so it is hard to define it in static words. However, if we still persist to define it the effort leads to a definition as below -

“HPC is a branch of computer science that concentrates on combining the power of computing devices, networking infrastructure and storage systems using parallel hardware, networking and software technology that utilizes human expertise to gain optimized and sustained performance for solving scientific, engineering, big data and research problems including grand challenges like computer modeling, simulations and analysis of data.”

HPC always focuses on developing high performance and it is achieved by parallel processing systems, parallel programming algorithms and high bandwidth & low latency network by incorporating computational and process administration techniques of parallelism.

Since past several decades, HPC systems were only used for crunching numbers for scientific research, engineering and big data problems. Now they are open to everyone. Today HPC has almost become an essential part of businesses also for their daily procedures in order to help them become more competitive and profitable.

So far as history of HPC is concerned, it started in the decade of 1960s with scalar processors having SISD architecture (first highly super scalar HPC system). Next decade of HPC was 1970s with vector processors having SIMD architecture. Later phase in 1980s was marked with massively parallel processors with MIMD architecture having networked processors with own memory and OS. Later in 1990s term ‘cluster’ was introduced for indicating connected standalone computers. These were mostly developed and designed by private communities for services of commodity hardware for networking. Grid was also introduced in the same decade having foundation on collaboration of geographically distributed organizations and processing nodes for end users. Today the cloud is one of the best sources of HPC through several massively scalable and dynamic services as networking, processing, data storage, applications etc. All these services are provided through Internet.

As mentioned earlier HPC is hybrid technology that covers a wide range of technologies for example:

- Hardware technologies, which include computer architectures as New Generation processor architectures (IBM CELL BE, Nvidia Tesla GPU, Intel Larrabee Microarchitecture and Intel Nehalem microarchitecture ) and traditional processor architectures (Single Processor, SIMD, Vector computers, MPP, SMP, distributed systems, Constellations, Clusters, Grids) having CPUs, MEMORY, GPUs, Multicore Processors, Arm Processor even DSPs and FPGA,

- Networking technologies (network topology, data transfer bandwidth & latency, network protocols, network connections including infi niband, Ethernet and proprietary connections with Fault Tolerance),

- Software technologies, which include suitable compilers for certain architecture, programming models (MPI, SHMEM, PGAS etc.) and algorithms for parallel & distributed systems, use of middleware for bridging applications (Open-source, freeware, commercial) and operating system, and parallel programming for problemsolving methodologies (Data parallelism, Pipelining, Functional Parallelism), programming languages (C/ C++, Python, Fortran etc. with parallel platforms and technologies like Open MP, MPI Programming , UPC [Unified Parallel C], OpenCL, CUDA, OpenCV, etc.)

If we go with the concept of HPC we can not avoid concepts of Moore’s law, concept of Von Neumann, Flynn’s Taxiometry (SISD, SIMD, MISD, MIMD), topologies of computers, processors, memory communication networks, data concurrence and correctness (data races, atomic operations, deadlocks, live lock etc.), memory management (shared memory, distributed memory, semaphores and hybrid environments), partitioning, data dependency, synchronization, limits and cost measurement of parallel programming (Speedup, Efficiency,

<table>
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<tr>
<th>NAME</th>
<th>SPECIFICATION</th>
<th>CORES</th>
<th>RMAX PFLOP/S</th>
<th>POWER MW</th>
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<tr>
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Table 1: Top 5 super computer
Regarding HPC there are still many questions, which arise in our mind – e.g. What is the need of HPC? Why do we need this much processing power? Who are the HPC users and who are the providers? How can we use and create HPC systems? Which factors should be considered before designing HPC systems? What are the benefits of HPC to the society and businesses?

There is need of HPC where scenarios are too dangerous to be tested in real life world and for scenarios that are very much time consuming. Some scenarios are extremely complex to solve on common systems.

There are a large number of scenarios that are far beyond the limitations faced by present day systems and tools. Simulating, modeling and designing of these scenarios on HPC will gain improved and quality testing with more number of scenarios being tested, optimized time utilization and easier management even in case of complex scenarios. HPC also helps to open new windows, new possibilities of discoveries and innovations for scientists, engineers and also for all to think of at a faster pace than ever before. So don't be afraid to let your mind wonder.

Important factors to be considered before designing HPC systems are - Physical limitations of current hardware and technology such as speed of light, CPU heat dissipation etc., Economic factors (to achieve good computing performance there is need of costlier processing hardware but sometimes even cheaper components can be used to achieve comparable levels of aggregate performance), Scalability (allows data to be subdivided into fragments for processing and to fit in algorithms and resources individually to increase performance), Memory (ratio of aggregate memory bandwidth and processing power should increase together at a reasonable cost ) and last but not the least expert man power.

An HPC system includes fast and high processing devices, mass data storage and collection management capacity, optimized network with high transmission speed.

As HPC systems become more affordable and accessible, there will be many areas where HPC will have significant presence like research institutes, government labs, universities and academic institutions for basic & applied research. HPC systems are useful for weather forecasting for near term & climate/earth modeling, defense and energy research, mechanical / electrical design & drafting by 2D & 3D design verifications, geo science & geo engineering for oil, gas exploration & reservoir modeling, economic/financial applications for risk analysis, portfolio management & automated trading, plasma & nuclear physics, Quantum physics /chemistry, molecular biology / dynamics, bio science & human genomes for drug discovery & diseases detection/prevention. It also helps in business models in data warehousing, in LOB (Line of Business) Applications, in Processing Transactions.

So if you have a question in mind as to - “Who wants HPC?” - the answer is - All those want HPC, who want faster execution to provide solutions, quick decisions, competitive products and quick models of simulation.

For those who want to adapt HPC, the question is - Where to start? There is lot of material available on HPC concepts and terms. They are important to understand HPC. 1st step is learning HPC semantics and basics of technology. 2nd step is learning techniques of designing and writing programs, 3rd step is trying to implement / demonstrate programming module on computer systems. Take help from open source programming samples to improve and optimize utilization of HPC hardware.

The future of HPC will be achieving Petascale Computing to Exascale computing, transfer digital data transfer for processing from Wired Communication Channel to Optical Communication Channels, Use of new processor architecture, design of Quantum Computers to increase clock speed and transistor density in and for HPC systems, new continuous innovations and use of recent developments in Nanotechnology & Biotech and its impact on improving processing and data storage systems.
Cloud Based High Performance Computing

Introduction

Next generation Internet connects heterogeneous computing devices to create network traffic that is generated by automated objects from public sectors to day to day life of people rather than human intervention. Data is no longer in computer but computers are in the data. Nowadays organizations are challenged to process large volumes of data being generated by huge number of heterogeneous devices, social networks etc. There is constant pressure to achieve faster processing and higher throughputs. This large volume of data must be available to meet the requirements such as faster searching when necessary, analyzing large data sets to ensure improved services for real time applications. These requirements are met by the concept of high performance computing (HiPC), which provides real time and parallel execution of data.

HiPC is no longer limited to the use of supercomputers. Integration of heterogeneous computing and cloud computing is emerging as a powerful new paradigm to implement the concept of high performance computing. It provides the potential to shift from one HiPC architecture to another in a secure cloud environment flexibly. Interest in HiPC in the cloud has been growing day by day. The cloud offers applications a range of benefits, including elasticity, limited maintenance costs, and economics of scale, virtualization flexibility. In contrast to supercomputers, cloud allows users to build their own virtual machines and configure them according to their requirements. Moving heterogeneous data into cloud computing environment provides cloud computing benefits such as lower costs and rapid scalability.

HiPC applications have high impact in the cloud computing environment. Most of these applications require high capabilities of CPU and large data storage. During last era, HiPC applications have always required large number of computers interconnected in a network such as clusters or supercomputers. Clusters are difficult to setup and maintain both technically and economically. It becomes easier to deploy HiPC applications in the cloud without worrying about the costs associated with the infrastructure, with the advent of cloud computing and benefits of Infrastructure as a Service (IaaS) and Platform as a Service (PaaS). They also give guarantees on the quality of service (QoS). As the number of user requests increase the application must be able to support the increasing load. At the same time as the number of requests decrease the application should be able to scale down. So achieving dynamic scalability is a challenge for HiPC applications in the cloud. Windows Azure randomly deallocates the compute nodes when scaling down and hence follows an asynchronous process. Next section presents an idea about HiPC case study.

Case Study

Ubiquitous computing is a man-machine interaction model in which information processing has been thoroughly integrated into everyday objects and activities. It enables everyday’s object to become smarter and interactive such as refrigerator can create grocery list, room can adjust temperature and light according to the weather or number of people in the room. This concept can also be described as pervasive computing and ambient intelligence. A typical context of ambient intelligence environment is a Smart Home environment. Pervasive computing is the growing trend towards embedding microprocessors in everyday objects and activities so they can communicate information. It will revolutionize the way human interacts with the surrounding world. The significant themes that will help in the evolution of pervasive computing are intelligence, cloud based computing and sensor network. IoT is an emerging technology which has the potential to make life more comfortable by providing anytime anywhere service. Advances in wireless technology, permit real-time acquisition, transmission and processing of critical data. IoT plays a crucial role in smart home including smart healthcare. The patient’s health status is periodically sensed using sensors. The doctor from a remote location provides medical assistance based on the information received.

Ambient assisted living provides technical systems for aged people who are alone at home and need to be remotely monitored. The concept of ambient assisted living arises to promote a better and healthier lifestyle for individuals. Smart Home for aged people is a smart platform that enables the elderly people to use innovative technology for a more independent life. It also enables them to perform the activities which are important for their daily personal life and which were not be done by them before. The needs of aged people can be divided under two principle categories- Activities of Daily Living (ADLs), and Instrumental Activities of Daily Living (IADLs). Basic categories of ADLs include hygiene, dressing, eating (the ability to feed oneself), toilet (the ability to use a restroom), transferring (actions such as going from a seated to standing position and getting in and out of bed). In an assisted living facility, the amount of help needed for ADL activities determines the resident’s needed level of care. IADLs are more complex than ADLs and mainly include the following.

- Resource utilization (i.e., finding and using phone numbers in phonebooks);
- Preparation of meals;
- Shopping ;
- Housework;
- Managing finances (basic budgeting, paying bills );

Many aged people, who live independently and do not suffer from
any physical or cognitive impairment, can perform most IADLs at high level of performance. When older person suffers from severe physical or cognitive impairment, this task can be very difficult. The solutions should efficiently support independence and comfort of aged people who wish to remain in their homes alone.

The main role for smart home with healthcare technology is to enhance safety and promote physical and cognitive activities. The monitoring system should be developed with the user in mind. The system needs to be able to alert the user, as well as caregivers and first responders, when necessary. Sensors can detect when there is no movement or movement in an unusual location and issue a warning in an appropriate sequence. It includes automatic control of water temperature, room temperature, oven shut-off, lighting, window and door security, intruder alarm, identity of visitors. The frequency of a refrigerator door movement also can be recorded.

Health status monitoring can also be done by Smart Home such as under-the-bed sensors for detecting sleep patterns, a medication reminder, an appointment reminder, a toilet bowl sensor to check frequency of its use and health data such as the sugar level in urine. They may also include checking and recoding of vital signs such as blood pressure, glucose level, body temperature, pulse, weight, cholesterol, medication adherence, and interactions. A significant change in pattern or a significant delay in readings each serves as a trigger for an alert. Automatic transfer of vital signs has a purpose, but users benefit from knowing about and following the data. Audible and visual feedback from the measuring device can be very helpful when the user is monitoring his or her health status. One's caloric intake can be monitored and an audible and visual reminder alerts the person of a recommended consumption level. It includes reminder system announcing upcoming appointments or events and medication are useful for any older adult. A wearable device informs about an exercise level and warns if there is evidence of excessive exercise. A brief overview of proposed work is given here. The framework includes the following.

Thermostat-It monitors how the user sets it each day. It then uses this information to predict the ideal temperature for the time of day. It can also be controlled remotely either online or by a smart device.

Lock-A keyless lock for doors, it can be locked or unlocked via smart device. It also sends notifications to the user phone, alerting them to the door being locked or unlocked.

Active alarm system- It utilizes remote emergency system and is installed in the home of older persons.

Passive alarm system-it does not interact with the person, e.g., devices include sensors are able to recognize danger of a fire and send emergency call immediately.

Remote support for relatives- A wearable sensor that can alert caregivers or family if the wearer falls. It also monitors heart rate and temperature, which can be accessed by authorized personnel via a password protected website.

All these matters are considered to generate context of remote health monitoring of aged people to assist them in independent living.

References


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High Performance Computing (HPC)

High Performance Computers or Supercomputers made an entry in the 1960s with computers having a few processors working in parallel. Today we have come to an age where there are massively parallel high performance computers with thousands and thousands of processors. Tianhe-2 or TH-2 which translates to Milky Way-2 is currently on world’s fastest high performance computer as per the latest Top 500 list. This is a 33.86 petafl op supercomputer based at Guangzhou, China.

HPC is a type of distributed computing, where processors and cores in multiple computers coordinate their actions. One step forward is when these computers form a cluster where they work together as if they are a single system. Typical HPC applications are in the fields of high-end computational science and engineering like weather forecasting and prediction, computational chemistry & drug discovery, computational fluid dynamics (CFD), Quantum mechanics, computer-aided engineering, rapid prototyping, modeling and complex simulations. Cray Inc is the market leader in HPC. IBM, Intel and SGI are other prominent players.

Dana Holding Corporation is an HPC service provider for US department of defense and DARPA and has identified technologies and partners to support the HPC infrastructure throughout the supply chain of the department of defense.

HPCs can also contribute towards building components for the ‘Cloud’ as also be part of large data centres and server farms which host cloud-based services. HPC in the cloud is fast catching up as an effective method to manage big data and analytics. Clouds are basically high-end high performance data centres, which use virtualization technology creating virtual machines through hypervisors.

Within the public cloud of Amazon, i.e Amazon EC2, in 2011, it launched Cluster Compute EC2 instance, comprising two eight-core Xeon processors on a 10b network in a typical application of HPC in cloud. Meanwhile, SGI unveiled on-demand cloud HPC service called Cyclone in 2010 (Betts 2012).

Cloud Computing

Forrester Research projects that the global cloud computing industry will grow from $40.7 billion in 2010 to more than $241 billion by 2020 (King, 2013). Every major ERP vendor like SAP, BAAN are coming out with a cloud version of their large software solutions. This reduces the Total Cost of Ownership for enterprises and improves both their top and bottom lines.

Cloud computing is a form of utility computing, where hardware, software, storage and platform is made available as per need and subscription basis. In this model, clients can access the application through an Internet browser. The data can be resident at a remote place also. Complementing the cloud is the usage of server farms and data centres where all applications and data can be stored, shared and accessed on demand using virtualization. Cloud is an eco-friendly green technology as it eliminates the need for enterprises to maintain multiple servers, which gobble up lots of space and infrastructure. Cloud computing makes full use of shared services and resources as a form of distributed computing over a network.

There are two deployment models for cloud, public and private cloud. Public cloud services are available to general public. In public cloud, one can access the services using the Internet. Amazon and Google have built their large public clouds. Private cloud is built by enterprises for their internal company operations including communication with their divisions and branches. These could be maintained by a third party though. Of late, there is some movement to architect hybrid clouds which combine features of both private and public clouds. In a hybrid cloud, a company can maintain its own private cloud and on saturation of these resources, use the public cloud (Sujay, 2011).

High Performance Computing (HPC) & Cloud Computing Interventions for Supply Chain Management

Efficient Supply Chain Management (SCM) requires agility, collaboration, competitiveness, cost benefit, flexibility, resilience, responsiveness, scalability, simplicity, transparency and visibility, among various requirements. With the Internet and ICT revolution impacting all aspects of an enterprise, enterprises are now exposed to greater competition as a result of liberalization, privatization, outsourcing and globalization. The situation has been rendered more complex with the increasing trend of enterprises off-shoring their manufacturing and service operations to low-cost hubs in Asia and Eastern Europe.

Information and Communication Technology (ICT) tools are a great enabler of supply chain operation. Its adoption and deployment across the supply chain has become a determinant of competitive advantage for many enterprises (Nair, 2010). Extensive use of technologies like SCM software packages, RFID (Nair, 2012), software agents (Nair, 2013) bar-codes, decision support systems, warehouse, transportation & inventory management systems etc have resulted in better visibility, agility, collaboration and communication both within and among enterprises (Nair et al, 2012).

Supply chain visibility coupled with quick responsiveness and decision-making will be vital to gain a competitive advantage. This will entail actionable information about various stakeholders and processes to be available real-time. The ICT infrastructure to enable this will need to be seamlessly interconnected, networked, scalable and easily accessible. A major challenge will be lack of homogeneity in the legacy MIS and enterprise applications of various partners in the supply chain. Most of the data that companies need to run their supply chains resides with supplier and partners, who use their own MIS, SCM or ERP solutions. Another issue that prevents companies struggle to get a unified picture of their supply chains is that most of these information systems were designed to operate within a single company, not across a network of companies (Toka et al, 2013).

The intrinsic feature in High Performance Computing (HPC) systems
of scalability, data integration and interoperability makes it an ideal fit for SCM. Large companies have slowly started adopting HPC for SCM as they are grappled with the twin challenges of data management and data analysis. As result, various stakeholders in the supply chain are unified. Mega retailer, Walmart typically stocks 500,000 products each, and suppliers compete fiercely for shelf space. There is a continuous need to keep all stores updated on the inventory stocks as well as sales patterns of various products. Walmart uses HPC for shelf space determinations, store planning and resource planning. Pratt and Whitney use HPC for modeling and simulation of inventory positions and situations. They also expect their myriad suppliers to use the same system (Conway, 2006). However the fact of the matter is that HPC interventions in SCM are limited to some big players. The reasons are primarily the need for all suppliers to migrate from legacy systems to HPC systems.

Cloud computing and associated technologies like Software as a Service (SaaS), Infrastructure as a Service (IaaS) and Platform as a Service (PaaS) have been generating a lot of interest as a game changing technology. Cloud computing can integrate shippers, service providers, distributors, logistic providers, customers, sellers etc in a global extended supply chain. A social network like community could be created with typical data items, placed online on the cloud like information on prices, inventory, schedules, service options, contacts, announcements etc. Timely information updates from all stakeholders renders companies to be demand-driven rather than forecast-driven (Christopher, 2000). Major ERP vendors are also working offering cloud-based solutions.

Application areas where cloud-based solutions are available include demand forecasting, demand planning, e-procurement, distribution, inventory, warehouse and transportation systems. Early cloud deployers include vendors like IBM, JDA and Ariba, who are offering public cloud deployment models for various supply chain operations and activities (McCrea, 2012). FedEx has a private cloud deployed in 2011 with CloudX (Watkins, 2011) as service-provider with sales processing and CRM as primary activities on the cloud. Cosco Logistics, the largest 3PL company of China and the world’s second largest ocean shipping company is using SaaS service and integrating all stakeholders like customers, branches, suppliers and distributors in order all of them to use the same logistics management software (Harris and Alter, 2010).

Intel was able to replace hundreds of their order clerks using online ordering applications. Several supply chain activities like planning and forecasting, sourcing and procurement, logistics and inventory management were migrated to the cloud (Schramm et al., 2011).

However like HPC, enterprises which go for the cloud solutions will have to face challenges like legacy systems and software applications of various partners in the supply chain. There are also privacy issues in both public and private clouds as the service provider has all the data.

Conclusion

High Performance and Cloud Computing system interventions have started appearing in the domain of supply chain management. These systems help in providing transparency and visibility to supply chains. HPC systems having the advantages of scalability, data integration and interoperability. Cloud computing can integrate all partners in the global extended supply chain into an online social network like community with real-time information on all elements. Cloud interventions in the SCM space are rapidly increasing with several vendors offering Software as a service etc. HPC interventions on the other hand are limited to some big companies. A challenge faced during deployment of both cloud and HPC systems is legacy applications especially of the suppliers.

References


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High Performance Cryptography: Need of the Hour

It is an unescapably captivating observation that, as soon as we click Buy while doing online shopping, the Internet response slows down - the payment page arrives relatively slowly. This delay is the consequence of turning on secure browsing mode (https). In secure browsing mode, data exchanged on the Internet is sent over a Secure Sockets Layer (SSL). The SSL uses cryptographic operations like public key cryptography for key exchange, and symmetric encryption for confidentiality\(^1\). Though modern day computers can perform complicated mathematical operations pertaining to cryptography in \(1/100\text{th}\) of a second, they become slower when there are thousands of similar requests to be handled every minute. It is because of these computationally intensive operations; there is an inevitable delay while performing secure transactions over the Internet. However, in scenarios like online shopping, slower transactions would hinder customer comfort, who would want security to his data as well. The challenge here is to ensure secure data exchange to the customer, while giving him the comfort of faster browsing experience. Equivalent need also arises from smart mobile devices, which have limited power supply and low computation capability.

Let us consider a scenario at the backend, which is say, pertaining to medical databases. Now-a-days, medical records are preserved electronically for easier processing and reference by these organizations. In this setup, a server or backup breach leading to the compromise of patient data, would result in huge business impact for the medical organizations. This forces the organizations to encrypt and preserve the medical records in order to mitigate any risk. However, at the same time there is mandatory need for easier availability of data for medical reference; which essentially indicates that these databases ought to support faster retrieval without affecting the privacy of data. Equivalent requirements are also found in other commercial and critical databases as in employee database, financial databases, etc. to name a few. The challenge here is to ensure a right combination of database platform, processor support, and encryption/decryption techniques, so as to deliver a cost-effective privacy preserving solution to critical databases.

Now let us consider a scenario at still deeper level, say pertaining to the network design. Each device on the network is assigned a unique address, called the IP address. Since, the current standard IPv4 is running out of addresses, there is a transition to move to its successor, IPv6. It is said that more than half of the Internet users will be using an IPv6 address by the end of next six years. IPv6 assigns a 128-bit address, and this standard can render approximately \(3.4\times10^{18}\) addresses. Once IPv6 is in place, each human on earth can have at least ten unique addresses attached to him. Thus, each smart device associated with him like phone, watch, sensors and laptops; would have a unique IP address. An obvious implication of the same would be the need for secure internal as well as external communications amongst these devices as well as with external devices. Technically, in networks, there is a need for multilayer encryptions, policy and key management solutions for ensuring secure connectivity. The challenge here is to ensure secure and faster communication and information exchange between these devices. The tradeoff is to reduce the cost of compliance with data privacy regulations while enabling high performance and secure connectivity to critical infrastructures present in the network.

The desired tradeoffs can be achieved by choosing from the following bucket of solutions, given that the prime requirement is: speed. This speed is with respect to computation as well as communication.

a) **Elliptic Curve Cryptography (ECC)**\(^2\): ECC is a research proposal for high speed cryptography. It is known that strength of cryptographic algorithms is based on the length of the encryption key. Longer key lengths are needed to provide higher levels of security. However cryptography with longer key length demands higher computational effort. ECC systems ensure equivalent security as existing strong cryptographic solutions, with a relatively smaller key size and faster computation. ECC allows us to make the digital signatures shorter and efficient to process without sacrificing security.

b) **Searchable Encrypted Databases:** Recent advances in database technology like Transparent Data Encryption\(^3\), On-the-fly Encryption\(^4\) allows to handle encrypted database more efficiently. Also, there are research proposals\(^5\) which unite multiple cryptographic techniques so as to support querying upon encrypted data. Querying upon encrypted data without decrypting the data increases the efficiency of handling huge data in the database by saving the computation involved in decrypting the data.

c) **Faster Processors**\(^6\): Recent advances in silicon technology ensure the presence of faster cryptographic processors with multiple cores. These processors help in accelerating encryption with relatively lesser computational overhead. Also, these devices are packed with advanced assembly level instruction sets, which implement the core of standard encryption algorithms like AES, DES etc. This in-built instruction set help in accelerating encryption and decryption on the processors. Also there is support for high performance database engines, which store data in highly compressed multi-dimensional arrays.

d) **Network Encryptors:** Network Encryptors perform high-performance inline encryption. These encryptors enable large-scale networks to secure communications from thousands of wireless users in an enterprise WLAN or over high-
speed optical links. They process packets at a high rate with low latency, satisfying the rigorous demands of large VoIP deployments, a rapidly growing application for wireless communications. As an overlay solution, the encryptors can be plugged into any environment, regardless of topology, infrastructure vendor, or wireless technology used.

e) Quantum Computers\(^7\): A strong theoretical yet-to-be practical solution for faster cryptographic operations is, Quantum computers. It is said that computations which need exponential amount of time require only linear amount of time using quantum computers. Using quantum computers would exponentially increase the speed of cryptographic computations. However, quantum computers are yet to see reality.

The following architecture shows how these components can be incorporated into the existing two-tier architecture, to ensure faster secure computations.

In Fig. 1, we can see how High Performance Cryptography can be achieved in two tier architecture. The client (mobile, laptop, or smart phone) communicates with the server which is connected to a database. Here, when a NE is placed on the communication link, it provides faster and secure communication over the network. The servers can be plugged in with faster processors (FP) and software supporting ECC, which provides faster computation of cryptographic operations. Searchable Encrypted Databases (SEDB) can replace traditional databases; hence provisioning the application servers to store and retrieve from encrypted data efficiently. When all these components are in place, cryptographic computations happen at a much faster mode, hence realizing High Performance Cryptography.

How High Performance Cryptography answers speed concerns:

A 256-bit ECC certificate offers the equivalent security of a 3072-bit RSA certificate and a server which can handle 450 RSA certificate requests per second with an average response time of 150 milliseconds can handle similar count of ECC certificate requests under the same conditions with an average response time of just 75 milliseconds\(^8\). When all the browsers support ECC based secure communication in the Internet, then response time will be reduced by half and hence, doubling the speed of user operations. A searchable encrypted database can process user queries on encrypted data. When there are billions of records to be processed, having search enabled on encrypted data can eliminate the load of decrypting such huge data. Only the search results need to be decrypted before delivering to the user. This reduces the data reference time exponentially for critical databases. Usage of ECC and high performance cryptography components like NE, would allow smart Internet users to double their browsing time, by reducing the battery drain as compared to bulky traditional cryptography.

**References**


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Is Parallel Computing Relevant in Modern Enterprise Applications?

Abstract: For many years, the computing world has been familiar with the concepts of parallel computing. While earlier, it was the domain of specialized applications, in recent years, parallel computing has successfully made inroads in enterprise applications.

We believe that many enterprise applications are still not utilizing features of the underlying hardware, as they continue to develop applications that follow the ‘single, powerful CPU’ paradigm. To meet the performance demands of the modern, connected and ‘always on’ world, enterprises need to modify their applications to use suitable parallel programming concepts and the capabilities of the underlying platform.

Introduction

The concepts of parallel programming have been around for many decades. Many complex algorithms have been developed over the years, to work on highly parallel, specialized hardware platforms. With the rapid progress of hardware, suitably high performance is now available in commodity computers.

Initially, developing multi-threading applications was a difficult task. Over the years, hardware has evolved and so have the programming platforms. A revolution was created by Oracle, when it popularized the use of ‘threads’ for developing parallel programs. With the availability of a threading library, it became easier to develop parallel programs.

CPU Performance

For many years, hardware developments have been following ‘Moore’s Law’, as illustrated in Fig. 1, nearly doubling their speed every eighteen months. This allowed enterprise applications to become ‘faster’ simply by moving to better and newer hardware. In other words, enterprise application performance was piggy-backing on the performance of underlying hardware.

Since the early part of the first decade of the 21st century, enterprise applications have faced a difficult task. This was because hardware manufacturers were no longer able to post the same performance enhancements they had been doing for multiple decades. CPU manufacturers overcame this problem by scaling ‘horizontally’ rather than ‘vertically’. This was done by adding more CPU cores to the same die, making multiple computation units available to applications. Applications that executed multiple tasks in parallel immediately saw benefits as multiple tasks could now be executed in parallel, while sequentially executing applications (which had benefitted from the raw speed of the processor), saw their performance remain the same or worse, drop.

Though multiple processors are now available, many enterprise applications continue to function in their ‘single core’ mind-set, unaware of underlying platform capabilities. To improve performance, enterprises have two alternatives: either move to even bigger hardware or re-engineer applications to use concepts of parallel computing. Both options are non-trivial to implement due to cost and complexity.

Case Studies

As the concepts of parallel programming are well understood over the years, we would not be spending more time on those aspects. Instead, in this section, we would like to share our experience with regards to implementing parallel computing concepts for our customers. While we can state with satisfaction that we were able to show a marked performance improvement in all the cases, it has strengthened our belief that while parallel computing is a well-explored field, many enterprise applications are yet to adapt, allowing a lot of computing power go unutilized. We believe that with suitable modifications,
enterprises will be able to significantly improve the performance of their applications on the same platform.

**Case 1: Financial Documents Upload Workflow**

One of our customers was facing an issue with a financial application. The application is a continuously executing workflow that uploads financial documents to a repository. The application had a seven hour window to upload around 100 thousand documents each day. With the number of documents to be processed expected to increase, the customer was concerned about the time needed for upload.

After analysis, we found that the application in production was sequential in nature as illustrated in Fig. 2 (a). In addition to the document to be uploaded, its associated properties also had to be uploaded and had to be fetched from multiple systems. As per our solution, as illustrated in Fig. 2 (b), the application was refactored and some of the steps were executed in parallel. Additionally, some of the activities were performed outside the scope of the enterprise service bus. These changes not only improved application performance significantly, it also improved application stability. The task of uploading documents now takes less than three hours in most cases.

**Case 2: Image Processing Application**

One of our customers, wanted to improve the performance of their image processing algorithm. While the customer infrastructure was adequate to meet current demand, the customer wanted to improve application performance using GPU techniques, as they wanted to increase the size of the images generated by the device.

Due to GPU computing, application development in this case was not simple re-factoring. Significant effort was needed to identify suitable parts of the algorithm and implement using GPU programming frameworks like CUDA and OpenCL. After development, we were able to improve performance of the core algorithm by four times and the overall application by nine times.

**Conclusion**

While the concepts of parallel computing have been used in specialized fields for many decades, many enterprises are continuing with applications that were developed many years ago. Enterprise applications were able to show performance improvement by moving to new hardware. This is no longer possible as hardware has moved away from a single, very-powerful CPU to a collection of mid-powered CPUs. Hence, enterprise applications are no longer able to deliver expected performance. To improve performance, applications have to be re-factored to incorporate parallel computing techniques.

We believe that in the quest for higher performance, enterprises should not under-estimate the effort needed to enable parallel computing. For improving performance in the face of increasing complexity and humongous size of data, it is important to consider multiple performance-improvement techniques. Enterprises also need to educate their workforce to 'think parallel' in all situations, and choose the appropriate technology and implement it in a way that exploits the power of the underlying hardware.

**Acknowledgment**

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**About the Author**

Bipin Patwardhan is a Technical Architect with more than 15 years of experience in the IT industry. At iGATE, he is leading the High Performance Computing CoE. The CoE builds capabilities around technologies that help deliver high performance for enterprise applications. Presently, the CoE covers areas like Parallel Programming, GPU Programming, Grid Computing, Real-time Analysis and In-Memory Computing.
Introduction

There was a time when people looked for a good quality graphics card for their desktop computers, to enjoy playing games and to watch good quality videos. While the primary reason for purchasing a graphics card still remains the same, graphics cards are no longer considered only for enhancing the gaming and media experience. They have become an integral part of the computing system. Most operating systems and user interface applications like web browsers actively seek a graphics card, technically known as Graphics Processing Unit (GPU), to provide an enhanced visual experience and improved performance.

Today, GPUs have established their presence in almost every computing device like desktops, smart phones, tablet computers and ultra-books. Due to the popularity and availability of GPUs in devices, enterprises have an opportunity to utilize their power to enhance performance of application.

Introduction to GPU Computing

While GPU computing has been around for years, much of the earlier effort was focused around scientific applications. The wide availability of such devices and their multiprocessing capabilities are proving to be a cost-effective solution in the development of compute-intensive enterprise applications.

NVIDIA revolutionized GPU computing the computing world in 2006-2007 by introducing its massively parallel architecture called ‘CUDA’ (Computer Unified Device Architecture), allowing applications to offload their compute intensive tasks to the GPU, instead of the CPU. While CUDA is the most mature GPU programming platform, another GPU programming environment, namely OpenCL has started to gain popularity. OpenCL is being proposed as a standard for GPU development and is being actively supported by the Heterogeneous System Architecture (HSA) Foundation. Many vendors including AMD and Intel are part of the foundation. NVIDIA is also supporting HSA Foundation while continuing to develop the CUDA platform.

Drivers

Since the time when Moore’s law was postulated, microprocessor architecture has gone through significant changes in order to cater to the demand for higher performance. While, micro-processors have reached a stage where they can include multiple cores on a single chip, it may not be sufficient for deriving high performance for processing large volume of data.

Around year 2000, computer scientists and researchers found that it was possible to boost the performance of certain applications by taking advantage of the highly parallel architecture of a GPU device and the performance of its floating point operations. Today, GPU architecture has gone through various changes and provides significantly higher parallelization as compared to multi-core processors.

OpenCV, an organization that provides a Computer Vision platform, has seen noticeably higher performance across several key compute functionalities, as depicted in Fig. 1.

GPU Architecture Overview

A Graphical Processing Unit (GPU) is a specialized chip designed to accelerate the creation of images and other graphical objects. A General Purpose GPU (GPGPU) is a modified form of stream (data) processor which transforms a modern graphic accelerator into a general purpose computing device. Modern GPUs are very efficient due to their highly parallelized architecture and devote more resources for computations as compared to CPUs (Fig. 2).

GPU architecture has evolved over the last 20 years, from being a pipelined architecture where each function had its own processor, to a unified scalar architecture with one processor performing many functions.

Processor Design

A GPU streaming multi-processor (SM) is designed using unified scalar stream processing cores to provide very high throughput. The main components of an SM are as below:

- **Memory & Cache Management** - Facilitates extensive re-use of on-chip data, and greatly reduces off-chip traffic.
- **Stream Processor (SP)** - An SM contains a number of SPs, each of which contains its own arithmetic and floating point units.
- **Special Function Unit (SFU)** - Specialized processor for optimized execution of scientific functions like sin, cosine.
Double Precision Unit (DP) - Double precision instruction support required by most scientific and HPC applications.

Execution Model
A GPU is designed to provide massive parallelism by hosting and managing hundreds of light weight threads. These threads, execute - in parallel - the same set of instructions on the provided data set, providing data parallelism. A GPU also uses various optimization techniques like ‘batch execution of group of threads’, to improve throughput and reduce bandwidth. Key components of GPU execution model are:
- **Kernel** - a set of instructions to be executed in parallel, written as a C function.
- **Thread** - Also called ‘work-item’, is nothing but a single instance of a kernel function that will get executed in parallel.
- **Thread-block** - Also called ‘work-group’, is a group of threads that executes kernel instance, by sharing GPU resources. All the threads to be executed in parallel are divided into blocks of the same size.
- **Stream multi-processor** - Executes one or more thread blocks/work groups concurrently (logical parallelism).
- **Stream-processor** - Executes one or more threads/work-items in parallel (physical parallelism).

Programming Model
The early efforts of GPGPU demonstrated great performance, but had various drawbacks. First, it required developers to possess intimate knowledge of graphics API and GPU architecture. Second, programs had very high complexity due to expressions like vertex, coordinates, textures and shaders. Third, basic programming features such as read-write memory were not supported.

To overcome these limitations, a new GPU programming model was developed. The purpose of the new GPU programming model was to provide high level abstractions to programmers making it easy to write GPU programs with minimum attention to low-level details like thread management and memory management. Presently, the two popular GPU programming frameworks are CUDA and OpenCL.

- **CUDA** - developed by NVIDIA, enables programming for dedicated graphics units without using graphics APIs. Programmers can write C programs with CUDA extensions. CUDA parallel computing architecture now ships with most NVIDIA processors like Tesla, Quadro and GeForce representing a significant installed base for application developers.
- **OpenCL** - OpenCL (Open Computing Language) is the first open, royalty-free standard for developing heterogeneous systems. It provides a framework for execution on multi-core CPU, GPU, Digital Signal Processors, Field Programmable Gate Arrays, and heterogeneous Accelerated Processing Units (APU).

The diversity in architectures supported by GPU programming models allows designers to provide an optimized solution to a business problem — a solution that, if designed within the GPU programming specification, can scale with the growth and breadth of available infrastructure.

Implementing GPU Computing
GPU computing, due to its massive parallel processing capabilities can be a good solution for specific business functions like image processing, multi-media processing, statistical problem solving that involves extensive compute intensive tasks. However, like any other parallel programming model, GPU computing also comes with a few challenges as below:
- Identifying concurrency/parallelism in the given functionality,
- Grouping of parallel tasks,
- Data transformation and transportation,
- Synchronization among the tasks,
- Test & Measure performance in target environment.

In following sections we would like to share our experience in creating GPU computing solutions in domains such as high resolution image analysis, image processing and financial trading.

Image File Analysis
This solution enables GPU accelerated scanning of TIFF images generated by an electron microscope system. Generated images are enhanced for further analysis, allowing creation of high resolution images that provide more detail.

As depicted in Fig. 4, the solution uses a CUDA kernel to process in parallel, the task of scanning the image, followed by the application of multiple iterations of a fitting algorithm. The fitting algorithm was applied on a matrix of 5x5 pixels. There were on average, 400 5x5 matrices across 800 images.

The CUDA kernel enabled the application to perform on an average, four times better while processing 800 files. Some of the performance statistics are shown in Fig. 5.

Some of the features of the solution are:
• Scalable – solution is able to process images with larger dimensions,
• Performance – solution is able to process more images in the same time interval.

**Many-view Finance Dashboard**
This solution was developed to enable a web-based financial application to display multiple data views on the screen at the same time. Such views are used to monitor stock market data and perform analysis. The solution was developed using HTML5 for GUI and WebCL (Javascript bindings for OpenCL) for computational logic.

Finance dashboard applications, as depicted in Fig. 6, are very heavy applications, requiring many tiles and widgets for various data views. Additionally, the size of the data to be loaded is huge and complex computation is performed while showing information in the views.

Some key functions of the solution are:

• **Stock Comparison**: For each listed company, the current value of the stock price is compared with the previous value and an appropriate indicator and a percent change in value are derived.
• **Historical Data View**: Provides a graphical representation of historical data for any of the listed companies.
• **Live Stock Price Ticker**: Displays a continuously moving ticker that shows live stock prices for all the listed companies, with respective Up/Down sign when compared with the previous value of the stock.
• **Multiple Widgets**: Supports up to 100 concurrent widgets showing various data views.

As depicted in Fig. 7, the system memory consumption is very low as compared to non-WebCL implementation.

Some of the key features on the solution are:
• GUI rendering of HTML5 components is accelerated using the GPU.
• Computation is accelerated on the GPU using WebCL.
• Supports large number of widgets and windows.
• Client-side data processing and visualization, reducing network trips.

**Conclusion**
Over the past few years, GPU computing has enabled significant performance gains in specific application domains. GPU computing is now adopted by many applications and frameworks, which exploit parallel programming to implement their functionality. While CUDA and OpenCL provide GPU support at the programming language/environment level, frameworks like OpenCV provide a higher-level of abstraction, providing an easier interface for applications to leverage GPU computing when dealing with media objects like images and video.

While GPU computing has found wide acceptance in many products, its acceptance in enterprise applications is yet to reach critical mass. Even today, GPU computing is confined to niche domains.

At iGATE, we believe that GPU computing will play a very important role in the development of parallel, high performance enterprise applications. While GPUs are very powerful and have highly parallel architectures, it is important to note that not every enterprise application is suitable for acceleration using the GPU.

**About the Author**
Amit Badheka is a Technical Architect with over 13 years of experience in the IT industry. He has worked on various architecture and development engagement using J2ee platform in his previous experience. Currently, he works with the High Performance Computing CoE within the Research & Innovation Group at iGATE. His work primarily focuses on the hands-on evaluation of various solutions in emerging technology areas like Multi-Core Programming and GPU Computing, and to institutionalize these technologies in designing innovative business solutions.
Banking and Social Media - A Different Perspective

Background
A lot is written in praise of social media and the revolution it has already brought and continues to bring; in the cyberworld as well as the real world. Significantly, it has provided a global platform for freedom of expression, unparalleled in human history. The instant messenger and twitter have helped millions during distress and calamities. The Facebook has made a phenomenal contribution in strengthening friendships and relationships. Today, it is perhaps the best search tool for finding any person around the world. Everyone knows all these and many other contributions of the social media. The stories of desert spring in Egypt or the recent stories about the Boston bombing will get quoted for many years. Recently ‘Tweet’ has been accepted formally as a verb in English language.

However, it is not yet clear to businesses and governments, how they can leverage the social media for furthering their goals. All technology and business gurus, keep exhorting them to embrace the social media or face the prospect of extinction. This situation today reminds me of a lecture I was privileged to attend in early 1990s. I think it was Prof. Yashpal’s lecture. He said that soon a time will come when if something does not exist on the internet, it will be presumed that it does not or did not exist. He was emphasising the importance of putting information about Indian Vedic history, literature and knowledge on the internet. Today, perhaps the technology gurus perceive a similar threat with respect to social media. That could be one explanation for their exhorting everyone to join the social media bandwagon.

Current Status
Today, every business and government agency is being urged to create its footprint on the web 2.0. This reminds me of a similar phase about fifteen twenty years back when governments and businesses were advised to build their websites. In the same vein; today they are urged to build their FB pages and open their twitter accounts. Just as businesses and governments used to struggle with issues related to websites (look and feel, ease of use, content, content management etc); today they are struggling with their social media footprints (content, security, monitoring user responses, attracting traffic to their portals, avoiding nightmares of user responses going viral etc). The latest story making rounds in this connection is about the disastrous condom campaign of Durex. Allan Farnham reported the following story on 8th June 2013:

“Durex recently asked its Facebook followers to pick which city they thought should get Durex SOS Condoms, which, according to the company’s website, are provided on a rush basis to customers via a smartphone app.

According to Durex’s website, London (with 594 votes) did not win. Nor did Paris (688), New York (363), or Kuala Lumpur (1,420). Tuscaloosa wasn’t even in the running. Pranksters, according to Bloomberg, swung the vote to Batman (1,731), capital city of a conservative Muslim province in Turkey, where condoms are unwelcome.

These days, say experts, any brand that wants to remain engaged with its audience has to have a social media marketing campaign. But such campaigns, they say, are opportunities for abuse.”

In India, according to the article published in The Hindu business line on 6th June, 2013, ICICI Bank is leading all banks in its use of social media. India’s largest private sector bank, ICICI Bank, has got over 2.1 million ‘likes’ on its official Facebook page. HDFC Bank has about 1.5 million likes on its official Facebook homepage and Axis Bank has more than 1.2 million likes. But in most cases, its stock response to any business related communication from social media users is to request them to visit their formal business portal for information or services. For instance, a customer called Sameer Wagh wanted to know why his ICICI account was inactive and he posted this in the comments of a quiz posted by the bank. The bank replied asking the customer to message his contact details to receive a call back. According to N S Kannan, Executive Director and Chief Financial Officer, ICICI Bank “The social media platform offers us great opportunity to manage customer expectations and experience. All customer grievances are integrated at the back end with the customer relationship management modules built especially for Twitter and Facebook. We have created a separate form to capture queries from the social media platform.”

While this helps in ensuring protection from abuse, it also builds an image which many may perceive as unfriendly.

Another option available for exploiting web 2.0 is through paid advertisements. This simply amounts to using yet another channel for promotion available to businesses. Like all other channels, this channel also has its advantages and disadvantages. In addition, being a new medium, everyone including the digital marketing consultants and strategists are struggling with the issue of measurements and metrics to determine the effectiveness and real impact of this channel on the sales growth of businesses. The biggest problem, in my opinion, is the monopolistic situation prevailing today. The google and Facebook have have almost total monopoly on this channel. Google’s advertisement revenues (USD 43billion in 2012), exceed GDPs of several countries in the world. The Adsense mdoel developed by google is a technological marvel. The model enables corporates to post their advertisements free of cost and they need to pay only when a user clicks on their advertisement link. This payment is also miniscule, amounting a few cents per click. But Adsense decides which advertisement will appear in which place, through an auction in real time. For more details of how these auctions work, I recommend reading an article by Latanya Sweeney in Communication ACM of May 2013.

Still, the businesses understand the economics of advertising and so they can...
be published on this field. Taking a cue result, thousands of research papers have great interest to the academicians. As a citizen, the e-government projects were of were all green field ventures and since systems started in early 90’s. Since they 100% implementation of e-government Singapore, Finland etc, have achieved near across the world. Some countries, such as today, e-government the research findings about the growth of e-government. To today, e-government going back to the future

In this scenario, it will be interesting to see the research findings about the growth of e-government. Today, e-government is fairly established in many countries across the world. Some countries, such as Singapore, Finland, etc., have achieved near 100% implementation of e-government systems. The roll out of e-government systems started in early 90’s. Since they were all green field ventures and since they have a huge impact on lives of every citizen, the e-government projects were of great interest to the academicians. As a result, thousands of research papers have been published on this field. Taking a cue from the academicians, all top consulting companies and technology companies have also published research papers or white papers on the subject. There are many papers which deal with the topic of ‘Evolution of e-government systems’. Some often sited ones are by Gartners (20000, Cap Gemini E&Y, Layne and Lee, World Bank, CMM for e-government etc. The interesting fact is that almost all papers agree that e-government systems evolve (or evolved) through four phases or stages. Various researchers have chosen to name these stages differently. But essentially the four phases can be described as below:

Phase 1: Consisted of making your presence felt on the internet or Web 1.0. During this phase the general advise from consultants and strategists was to build a website. So a large number of websites got created.

Phase 2: Consisted of launching some partial services or one-way services, such as ‘forms Download’ or ‘Payment collections’ etc. The consultant’s advise during this phase used to be, “Static websites are passé. You must provide some useful service to citizens”.

Phase 3: Consisted of launching ‘end-to-end’ services. The general workflow starts with forms filling – forms submission – scrutiny – decision – and finally, communication to citizen. The consultants, during this phase used to strongly recommend ‘end-to-end’ nature of service delivery which would enable ‘Dis-intermediation’ and result in direct communication between citizens and the government.

Phase 4: Consisted of consolidation. This phase saw the evolution of portals and the concept of ‘one-stop government’. This phase saw replacement of thousands of e-gov websites of different departments and government agencies by a single portal. Now the consolidation continues at physical level of government offices, and staff. The current buzzwords are cost saving and right sizing.

Conclusion
I have taken the liberty to describe the four phases in so much detail in order to demonstrate similarities between the web 1.0 exploitation over last twenty years and what is currently unfolding in the realm of web 2.0. The phase 1 in web 1.0 was fully driven and totally controlled by the technology companies and consultants. The governments’ role was limited to just being a project sanctioning authority and a funding resource. Are we witnessing a similar situation with respect to Web 2.0 today?

But the situation was totally different during the next three phases. If one looks at any successful e-gov project falling in phase 2, 3 or 4 one will see that:

a) At every stage of this evolutionary path, the governments had to first re-engineer their processes and implement administrative reforms.

b) This had to be accompanied by strong and consistent efforts for change management.

c) The institutionalisation was achieved through well planned and well executed strategy for capacity building.

d) As e-government is moving forward on the path of inclusive growth and financial inclusion, the new or emerging challenge being faced is ‘End user or citizen education’.

I feel, we can look forward to evolution in use of social media in a similar way. It is not possible for me to predict the next phases or the type and nature of new services and ways of engagements that will emerge. However, I am pretty certain that it will follow the same path as described above. The research papers and models always succeed the reality. And reality is always unpredictable. But a few recommendations and / or predictions can be made for short term future plans. My recommendations for India are based on current experiments of banks such as ICICI, HDFC, etc. and some innovative aspects of RBI initiatives.

Some Short Term Recommendations

In the Indian scenario, four aspects of the ‘Financial inclusion’ strategy of RBI will spearhead the changes:

a. The no frills accounts.
b. Micro ATM
c. M-banking for the no frills accounts
d. AEPS (Aadhaar Enabled Payment System)

The no frills accounts already surpass the normal savings accounts by a ratio of 2:1. The gap is only going to grow further. The current focus of banks in their social media explorations are solely focussed on Gen Y. I feel that this will not yield much business outcome for the banks except a few brownie points. This current exercise can be described in the same way as ‘democracy’; “by Gen Y, for Gen Y”. What is the point in claiming so many million followers on Twitter or no. of ‘Likes’ to the bank’s FB page, unless it translates in to tangible business growth? This situation can change dramatically if some new technology innovation enables doing banking transactions extremely securely via FB or Twitter. But while waiting for such innovation, if banks focus on the no frills account holders, let us call them Gen Z, both parties may reap rich dividends. The Gen Z customers are new to banking. At the same time, they have leapfrogged, in terms of technology, directly to m-Banking. They are using the 3rd generation identification methods, viz. Aadhar based authentication. So the Gen Z customers are technologically better positioned than the Gen X or Gen Y customers. In addition to this; huge amount of government funds have already started moving through AEPS and the volume is going to grow in near future. So, in all respects, this should be the focus area for banks, including their experiments with social media.

What the Gen Z customers lack is ‘Financial education’; the ‘Dos and Donts’, ‘Best practices’, ‘Various financial products available to them’, ‘Various loans and advances available to them’ etc etc.

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Detecting Fake Facebook Profiles

Today in the world of social networking more than 80 million people use Facebook. Social sites were basically made for people at distance to keep in touch, but as these sites become popular some people start misusing them for their personal revenge or just for fun. According to estimates, about 6% of the accounts are fake. These accounts are usually made for walling the posts for embarrassing or putting up weird stuff to defame others.

How is Fake Account Detected?
It is better to prevent than to suffer from such weird attacks. The more we understand the account specifics, more will be the chances that we can secure ourselves. So it depends on people how they work on these sites. Especially the new users who use these sites to try to make many friends on web just to impress others about how very popular they are, are at risk. They don't know by doing such things they are unknowingly inviting fake account holders who can take the advantage of it.

There are many techniques for detecting fake profiles, but Google Images Search Engine provides the fastest and simplest way in detecting fake accounts without any software requirement. Most people blindly accept friend requests on Facebook without checking their personal details. Suppose a friend request has come, before accepting we should first check its personal details, pictures, posts etc. Most of the fake profiles are public in nature as they want to impersonate other people. They want to create an impression that they are the only ones who others are searching for by giving all details of location. Sometimes they have profile pictures also. We should copy the image from the Facebook profile and put into the Google Image search to find its details. Google Image searches all the details about it by crawling and gives the matching results if they have found them. Fig. 1 shows the information about the profile picture. This shows us that the profile with many more matching results does have the chances of being fake in nature.

How Does Google Image Navigate?
Today every user limits their searches to the internet. Google with their special software called SPIDERS helps in listing the words found on Web Pages and the process is called web crawling. When we drop any image in Google Image for searching, these spiders will begin travelling with popular sites or heavily used sites and spread out many portions on the web. According to Google each spider has 300 connections open at a time. Google uses four spiders to crawl 100 pages in one second and generates about 600KB data. Also it maintains its own DNS to minimize the delays. It not only finds the words (leaving the articles ‘a’, ‘an’ and ‘the’) in Web Pages but also notes the locations where they are found by travelling through hundreds of millions of pages and then builds the index, which is based on many different factors. This indexing follows different methods for different engines based on which weights are assigned. Sometimes it assigns a weight which is based on the frequency (number of times) of the word which appears on a webpage and builds a hash table based on a formula. This hash table stores the hash number, which is a pointer to actual data storage and this way hash table separates the index from its actual data entry to give efficient results.

After completing the indexing list Google applies different algorithms to look for clues, which give better understanding about what we mean and pull the relevant documents from the index. Now these results are ranked using 200 factors in Google and translated into a different variety of forms. These different varieties

![Fig. 1: Detecting fake profile](http://www.takneek01.com/internet/how-to-identify-profiles/2267/)

![Fig. 2: Google Navigation](http://www.takneek01.com/internet/how-to-identify-profiles/2267/)
are given different information like Snippets - a short description, Knowledge Graph - results based on database on real people, News - result from online blogs and newspapers, Video - result with thumbnails, Images - visit at a glance etc. All are assembled on the same page in Google for better results. This entire process of crawling, indexing, ranking and translating ends in one eighth of a second.

Conclusion

Google is designed to be a scalable search engine. Users of the Facebook can take advantage of Google Image to verify a new unknown friend request and report if it is impersonated by someone or if it seems to be fake so that Facebook can take action on it. With this facility, we can secure ourselves from fake persons online in an easiest way and in much less time.

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About the Author

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The social media with its advantage of personal attention and speedy responses could create a wonderful ecosystem for these customers. A major constraint in achieving this will be the ability to provide these services in regional languages. But banks can surely overcome this barrier with the help of available products and tools as well as thousands of ‘Ap developers’ who will be only too willing to pitch in.

The second recommendation is that banks should first build proper processes, systems, resources and infrastructure to monitor social media for protecting the bank’s reputation, before embarking upon any social media based activities. Banks should not rely only on software based monitoring. Also banks must have adequate human resources and infrastructure to take stock and respond quickly to any fire fighting situation that may arise any time due to the current nature of social media.

According to a survey conducted by Wipro Technologies and European Financial Marketing Association (EFMA), and released on 6th June, 2013, one of the weakest areas for banks is the ability to have a real time single customer view of products and transactions integrating all channels, although most banks surveyed expect to have this capability within the next 5 years. Other areas of weakness the survey found are in the limited use of test and learn processes, and the lack of measurement of return on marketing investment in digital channels. So, the third and final recommendation is to keep trying out delivery of real banking transactions, either partially or fully through the social media for the benefit of Gen Y customers. What will click and what will fail can be known only through trial and error.

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Making Surveys Paperless

Creating surveys and analyzing the outcome is often considered as an unavoidable research practice which should be adopted in any research related to communication. Meeting the audience in person and getting their response entered in a printed survey form is no longer a practical approach for conducting surveys. Often, the scope of these surveys are limited by time and location constraints. Since it involves the use of paper, it is not a very eco-friendly practice as well. Evaluation of the survey results is also a tedious process as it involves data-entry and/or making manual inferences. Online surveys are often considered as a solution for overcoming these hurdles. The tools used for creating and managing online surveys are generally referred as Computer Assisted Survey Information Collection (CASIC) tools. Creating a fool-proof survey tool from scratch may not be financially feasible for every researcher. The form feature of Google Drive becomes a handy tool for researchers in these circumstances.

Google Docs / Drive

Google Docs was initially a web-based office suite from Google. It allowed the users to create and edit documents online and also allowed real-time collaboration with other users. Now Google Docs is a part of Google Drive, a file storage and synchronization service offered by Google. In other words, Google Drive is where all the documents are stored. To start using Google Drive, visit [https://drive.google.com/]. Start by logging in using your Google Account credentials and we are all set to create our online survey form.

Creating a Form

Once we are logged into the Google Drive using the Google Account, we will reach the My Drive page where all our documents and folders will be listed. If the account is using Google Drive for the first time, then there will be no files / folders listed. Let’s start creating a sample survey form by hitting the CREATE button and then choosing Form from the drop-down menu (Fig. 2). Another window / tab will be opened in the browser showing the form edit options.

We will be prompted to choose a title and theme for the newly added form. On confirmation, we will reach the form edit page (Fig. 3) where we can start creating the form.

Question Types

The form feature in Google Drive support various query types (Fig. 4) which are required to create useful surveys. As of now it supports basic query types such as Text, Paragraph text, Multiple choice (Radio button), Checkboxes and Choose from a list. Scale, Grid, Date and Time comes under the advanced category. For layouting purposes items such as Section header, Page break and Image can be used. For all fields there is an option available to make it a compulsory field or to make it an optional query. Use the [Add Item] button menu or the Insert menu to get the list of question types and add the necessary item. It is also possible to change the question type after adding them using the Edit option.
Paginate and Navigate

The queries can be grouped into different sections or distribute across pages using the Section header and Page break elements. Limited options are available to control the navigation based on the choice entered in a multiple choice query box. Here in this example (Fig. 5): if the user selects Yes for the query 'Do you use social networking sites regularly?', s/he will be taken to the next page and if the answer is No, s/he will be taken to the last page (i.e. page 3).

General Features

The form application also allow users to customize the form to some extend by choosing different themes available. By clicking the [Send form] button (top-right corner), a window showing options for sharing the form can be made available. The link can be shared in social media services such as Google+, Facebook or Twitter directly from here. The form can be embedded in other webpages and publish in a different domain. This option becomes very useful when we want into incorporate a survey in our own website. Go to File > Embed... to get the necessary HTML to embed the form in another web page. 'Confirmation Page' section provide necessary options to a custom confirmation message which will be displayed when a user submit the form and complete the process successfully. We may also opt to publish the response summary along with the confirmation message, allowing users to view the summary of responses made till that point of time. Users may be also allowed to edit the already entered responses.

Before we start to use the form for receiving responses we need to choose a destitination for storing the responses. It can be the form document itself but for more detailed analysis we need to move it to a spreadsheet. Use the 'Choose response destination' option from the top-bar to get the options window (Fig. 7). A summary of the responses can be viewed by selecting Responses > Summary of responses and by clicking 'View responses', the linked spreadsheet can be opened.

Analyzing the Responses

The linked spreadsheet can be viewed in Normal mode or as a List. The difference between these two modes is clear from Fig. 8. The required mode can be selected from the View menu of the spreadsheet.

In the List mode, it is also possible to view the entered data based on specific values or filter responses based on the values entered. For example, it is possible to list the females who uses Facebook alone by selecting appropriate row values (Fig. 9).

Viewing Summary of Responses

Often making a summary of responses received in the survey is a time consuming process. The form facility in Google Drive allows the user to generate the summary, that too in easily recognizable...
graphical formats, with the click of a button. It is also possible to remove unwanted or spam entries by deleting corresponding rows. Once the cleaning up is complete, select **Form > Show summary of responses**. Summary of two queries in the given sample survey is given in Fig. 10. Just by looking at the graphs, one can conclude that the majority of participants use Facebook and most of them use the social networking sites for reading content.

Once the survey is over, we may disable the form by opening it and unchecking the **Responses > Accepting responses** option. You may delete the form like any other document stored in Drive or clear all responses by clicking **Responses > Delete all responses**.

We may conclude that the form app in Google Drive provides most of the features required for creating a simple, straightforward and effective online survey. At the same time, it lacks some of the useful features like user authentication options, advanced customization and use of higher level conditional statements. One may consider other options available as well as Google Drive is not the only option currently available. The users need to pay an amount for using some of these survey tools and in case of some other tools the service can be used with out charge only up to a limited number of responses. The advantage of using the Google service is that it can be used for free without any limitations. A comprehensive list of all CASIC software is available here: [http://en.wikipedia.org/wiki/Comparison_of_survey_software](http://en.wikipedia.org/wiki/Comparison_of_survey_software)
Fig. 8: The summary of responses saved in a spreadsheet can be viewed in Normal or List view.

Fig. 9: The table is generated based on the highlighted column values. It is easy to conclude that there are only 3 females who use Facebook alone.

Fig. 10: The graphical summary gives a very clear idea of the outcome.
Fun with 'C++' programs – exploring the use of this pointer
This article explores the use of this pointer.

Let's try to figure out the output of the program below:

Program Listing I

```cpp
#include<iostream>
using namespace std;

class example {
    public:
        void initializevalue(int var)
        {
            var = var;
        }
        void displayvalue()
        {
            cout <<endl <<"var = " <<var;
        }
    private:
        int var;
};

main(
{
    example obj;
    obj.initializevalue(786);
    obj.displayvalue();
    return 0;
}
```

A sample output of the program is given below:

var = 9360080

Why is the value of var not set to 786? Well! It is because of a simple reason that if a member of a class and a formal parameter have the same name or the member of a class and a local variable have the same name then the formal parameter or the local variable gains precedence over the class member. Therefore in the method (or function)

```cpp
void initializevalue(int var)
{
    var = var;
}
```

all three var's are the same; i.e. they refer to the formal parameter and the class member var is eclipsed by the formal parameter having the same name. The term shadowing is used for the concept of one variable hiding an identically named variable in a larger scope. The program below shows how to address the class member when it has the same name as a local parameter or a local/automatic variable:

Program Listing II

```cpp
#include<iostream>
using namespace std;

class example {
    public:
        void initializevalue(int var)
        {
            //this->var refers to var of obj
            this->var = var;
        }
        void displayvalue()
        {
            cout <<endl <<"var = " <<var;
        }
    private:
        int var;
};

main()
{
    example obj;
    obj.initializevalue(786);
    obj.displayvalue();
    return 0;
}
```

A sample output of the program is given below:

var = 786

[NOTE: The this keyword should not be used within a static member function.]

---

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- *On behalf of editors of CSI Communications.*
Programming.Learn("R") »

Running R Scripts

R is an interpreted language. The R interpreter parses each expression in the R program and take them as function call, evaluate it and return an object. If the expressions are entered into the console, the interpreter will pass the object after evaluation to the print function so that the result is printed.

In last issues, we have familiarized bit of programming in R interpreter window. Now let us see how to execute a block of R codes.

R code can be executed in two ways. (1) By using the R GUI and (2) By using terminal or command prompt. Let us familiarize both methods in this issue.

Running R file by using R GUI

Running an R file by using R GUI is the simplest way to execute R codes. For this, open the R programming environment. If you already have a R file written, open it. Otherwise, go to File menu and then go to option – “New script”. R editor will be opened and you can write R code in it. When you complete the code, save it with “.r” extension. Now right click and choose the option- Run line or selection. If you need to run a particular section, you can select that section and run it or otherwise select all and run. The output will appear in the R console (Fig. 1).

![Fig 1: Running R by using R-GUI editor](image)

Running R on Command prompt or terminal

R on command prompt (on Windows): You can write R codes in your favorite text editor (notepad/ notepad++) and save with “.r” extension. Now go to command prompt and reach the folder where you installed the R file. Go to the bin directory and type R –q –slave -f and your file name. If your file is not in the bin directory, give full path of your R file. This will show output in the command prompt (Fig. 2). You can also run a previously written R file by using the same method.

![Fig. 2: Running R file in command prompt to get result in command prompt](image)

Another method is to run R scripts from command prompt and receive result as an output file in the same folder. For this the following command can be used.

```
R:~> R CMD BATCH sample.r
```

The result will be saved in the sample.Rout file, which can be opened and result can be viewed by using any text editor.

R on terminal (on Linux): To work with R on Linux platform, (let us see the case of Ubuntu), first install R on the machine. For this, in the terminal, use- sudo apt-get install r-base-dev command. Now type your R script in any text editor and save the file. Then open the terminal and go to the path where you saved your R script. Now type- R CMD BATCH sample.r in the terminal. The output file will be stored in the same folder of your R script.

Apart from the above methods, there are couple of other R GUI interfaces like R studio and JGR which contains command line and console, which will ease the process of execution of R scripts.

Now let us run the first R script. R script is constituted by expressions which include assignment statements, conditional statements, arithmetic expressions etc. Expressions contain objects and functions. They can be separated by either new line or semicolon, and can be grouped together by parentheses or curly braces.

Let us start with a simple R program. Write the following code in a text editor (R GUI can also be used) and save with extension.

```
a=4
b=6
c=8
a+(c-b)
```

Now run the code by using any of the above method.

```python
a=4
b=6
c=8
a+(c-b)
```
Managing Technology>>

10 Steps for CIO’s to Achieve Productivity Gains Using Enterprise Social Collaboration

Enterprise Social Collaboration (ESC) is an approach to enabling organizational intelligence in the enterprise, using Web 2.0 solutions. ESC is based on a software environment where people work online to achieve individual and team goals. The value from these online collaborative efforts can be made available to everyone by using precision search, alerting and related ESC technologies. ESC is now a mainstream technology and CIOs are taking active interest to proliferate these technologies within their organization to help improve productivity. The concept of ESC is now broadly marketed with many commercially available products.

ESC programs allow companies to achieve productivity improvements and revenue acceleration in non-imitable ways by leveraging the excellence that can be extracted from the human intellect. The success of such programs primarily depends on deep and continuous leadership commitment, integration of the ESC system with other business systems, and the synergy between the ESC system and day-to-day work.

There are 10 steps that should be followed for implementing an effective ESC program.

1. **Ensure CIO’s deep and continuous commitment:** The first and the foremost thing for a successful implementation of the ESC program is to find your supporters in the organization. Preferably a sponsor from business (non-support organization) should be on board when presenting the business case to the CIO. Once convinced, the CIO will approve the necessary budgets. The CIO must be social; he has to lead from the front in adopting the ESC platform. He has to ensure that leadership displays exemplary behavior and participates visibly in ESC platforms. This will be followed by the rest of the organization. The success of the program hinges on the change in the organization’s culture. The CIO must act like a principal change agent and ensure participation of other business leaders as well.

2. **Define a “CIO’s Enterprise Collaboration Vision”:** ESC should not be seen as a pure technology deployment. The relationship between social networks and employee collaboration should be highlighted. Use cogent methodology to arrive at a clear collaboration strategy and vision for organization. Ensure that the strategy justifies investments in ESC solutions. Clearly articulate a program charter including the business values outcome expected from the program. Define the future state vis-a-vis current state and develop detailed gap analysis documentation.

3. **Identify challenges and seek feedback:** Identify challenges faced by employees with respect to collaboration, by seeking direct inputs from them. Tangible feedback from the employees will help the system developers identify challenges faced by the employees to increase productivity due to the lack of an effective collaboration system within the organization.

4. **Appoint an ESC Driving Committee and Program Lead:** The ESC driving committee should consist of a change management architect and Line-of-Business managers. ESC is all about implementing the vision and the program. Identify a program manager who directly reports to the CIO. Starting a group with the right leader will ensure all issues are addressed in a timely manner. Ensure that the business unit heads encourage employees to use ESC solution.

5. **Use phased approach for ESC to go viral:** The ESC program must be implemented in a phased approach. Typically ESC program should start with small groups of influencers. Every iteration should be considered like a project. The key to the success of this program is to make it viral with larger group adoption. Working with smaller groups in the initial phases will limit the consequences of failed pilot projects. Also, if the pilot is successful, early momentum will help in organization-wide adoption by larger groups.

6. **Knowledge Reuse:** Organizations should leverage knowledge from System Integrators (SI’s), who have implemented ESC programs in other organizations. The SI’s provide guidelines to align with standard enterprise collaboration frameworks and tools; and also clearly identify the issues that collaboration tools can solve before selecting the tool. Most of the SI’s have evolved product evaluation frameworks that help organizations to clearly identify the tools that best suit their requirements. They also help the organization define clear metrics to measure the benefits derived from the tool that is being implemented.

7. **Ensure adoption and institutionalization of program:** The CIO should put a mechanism in place to motivate organization-wide participation. Also, in collaboration with the key stake holders, he needs to develop and execute an effective communication plan, set appropriate policies and processes to ensure adoption and institutionalization of ESC program and keep revisiting them in order to stay in touch with ground-realities. Establish synergy between the ESC system and day-to-day work of the employees.

8. **Develop as ESC training program:** for increasing ESC adoption with the employees it is vital that the organizations include education of ESC as a part of the employee training programs. Workshops should be regularly conducted for training employees on the ESC platform.
9. **Integration with other business processes:** Prepare a roadmap for the business processes that need to get integrated with the ESC solution. The solution should be integrated with other important business systems like ERPs, CRMs, etc. This will allow users to seamlessly share and leverage knowledge as well as collaborate with experts while using these ubiquitous business systems. Information from the business systems will, in turn, allow the ESC system to be more intelligent and relevant and will help improve user acceptance of the system.

10. **Use analytics to measure adoption rates:** The organization has now deployed the system, but how does it know if it is really working. Typically the new age product deployed has rich analytics capabilities which integrate with other monitoring systems. Use analytics engines to identify what are the adoption rates, volumes of comments and if certain areas of the ESC system are still underutilized.

Today many organizations are still struggling to connect technology to community of employees to increase productivity. Enterprises can use the benefits provided by ESC programs to evolve a fully networked social organization using collaboration framework and social networking technologies to reduce costs, increase margin through revenue acceleration and time savings. The total cost to achieve these benefits will be relatively smaller when compared to resulting overall net savings. This means an improved ROI and a significant productivity increase.

**References**


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**Continued from Page 8**

- Cloud computing includes virtually no coupling between the application and underlying infrastructure. Focus is on pay-per-use and dynamic resources provisioning for anytime anywhere computation on the publicly accessible infrastructure. Lower service-level agreements (SLAs) are often acceptable.

**Conclusion**

The future of HPC is to combine CPU and GPU Co-Processing. GPU is offload graphics-relating rendering operations in the computer and offload General Purpose (GP) applications workloads and significantly speedup part of the computation is becoming the mainstream.

**Fig. 5: CPU + GPU Co-Processing**
HTTP Headers

HTTP protocol is a client server protocol in which a client (typically a browser) makes a HTTP request for a target resource on a server (typically a web server) and the server responds to the client with a HTTP response. HTTP requests and responses are structured as header and body parts that are separated by a blank line. Headers are like Meta information that provides more context of the request or the response to the processing application. Headers are in textual format in the form of “Header-Name: Value”, one per line. For example, the content-type header depicted in Fig. 1 below, is a HTTP response header that tells the browser about the type of response being sent, and its character coding, so that the browser knows how to handle the same (in this case it is simple HTML as text in UTF-8 encoding format).

Fig. 1: HTTP header

HTTP/1.1 protocol defines several request and response header fields which are followed by all HTTP-compliant protocol implementations. Apart from these, browsers implement several non-standard header fields which enhance HTTP protocol with useful features. They are conventionally marked with a prefix “X-”.

(Note: The prefix “X” is generally understood for “eXtension” or “eXperimental”. However, in June 2012, the “X-” prefix convention was deprecated as it caused confusion when non-standard headers are standardized)

Security Sensitive HTTP Headers

In this section, we will discuss in detail some of the important HTTP Headers with security significance. These headers are not defined in any specific order.

HTTP Authentication

Authentication is about validating the identity of an entity for what it claims to be. Though a wide variety of authentication mechanisms available, username/password based authentication is still the prominent one in use today. Over the time, several standards evolved specifying how password based authentication mechanism can be seamlessly integrated into HTTP based communications. The most prominent mechanisms include Basic, Digest, Negotiate (NTLM, Kerberos, etc.).

As an illustration, below we will describe the working of simple Basic authentication mechanism.

Whenever a HTTP request is made for the first time by a browser for a URI that is configured with Basic authentication protection on web server, the server sends a “401 Unauthorized” response with WWW-Authentication response header.

Fig. 2: Snapshot of HTTP response/request headers from http://google.com, captured using Firebug.
It is possible to access and manipulate cookies using JavaScript. Hence, if a web application has script injection vulnerabilities, it becomes trivial for an attacker to steal the victim’s session identifiers and any other sensitive data stored in cookies.

As e.g., a header like “WWW-Authentication: Basic realm="Tomcat Manager Application” instructs the browser that the tomcat manager application (of which the request / manager/html is part) requires Basic authentication credentials. Browser prompts the user for username and password. Once the user inputs the username, and password, a further request is made to same URI with an embedded “Authorization” Http Request header.

The “Authorization” header comprises of authentication mechanism as Basic, and username:password encoded in Base64 format. The server, on receipt of this request, validates the username, password credentials and allows access if the credentials are correct. The browser will embed this authorization header automatically in all subsequent requests to the same realm, without prompting the user, till the browser instance is closed.

Other WWW authentication mechanisms like Negotiate and NTLM use the same www-authentication and Authorization headers, though the data and flow of events vary.

In basic authentication, the username and password credentials entered by a user for the protection domain, travel in plain and can be sniffed. Hence, it is always a safe practice to use basic authentication only on encrypted communication channels like HTTPS. Further, in typical browser implementations, once the credentials are taken by a browser instance, they are cached and submitted to the protection domain subsequently, without prompting the user again. So, it is always a safe practice to close the browser instance at the end when using basic authentication in order to avoid potential misuse. In Digest, NTLM and other authentication mechanisms the password in plain never travel over wire, but a shared secret is established between browser and server using cryptographic primitives. While they are not uncommon over public facing Internet sites, they are more frequently used in Intranet scenarios to support an integrated authentication feature.

Cookies
HTTP is a stateless protocol, which means that the web server will see every HTTP request as a different one and will not be able to relate consecutive requests made by the same browser. However, this is a critical requirement for any meaningful business application. Imagine a web application that prompts for user credentials for every request being made. To address this gap, the concept of state (session) is introduced leveraging cookies[3] as one possible technology choice. A cookie is a very small text data stored by a web application on a client machine that will be sent by the browser to the web server in every subsequent request made. To create a cookie, a web application sends a “Set-Cookie” HTTP response header in the following format:

```
Set-Cookie: value; expires=date; [domain=domain]; [path=path]; [secure]; [HttpOnly]
```

Value is stored typically in name=value format. Once the Set-Cookie header is received by a browser, it stores it locally on the client machine (either in memory if it is a session cookie or in a file if it is a persistent cookie), and attach the same to every subsequent request to the server (as per rules specified by other parameters as explained below) in the format:

```
Cookie: value
```

The other optional parameters are for browser’s interpretation on how to process the cookie. If expires option is present, it indicates when the cookie should no longer be sent to server and hence can be deleted from the browser machine. The domain option specifies the domains for which the cookie should be sent by the browser. The value specified in the domain option should be part of the host name that set this cookie. The path option allows further control on to which path in the domain the cookie should be sent. As cookies are one of the key mechanisms to store the session identifiers, they form an attacker’s primary target. If an attacker manages access to valid session identifiers of a victim, he will be able to successfully impersonate the user. It is possible to access and manipulate cookies using JavaScript. Hence, if a web application has script injection vulnerabilities, it becomes trivial for an attacker to steal the victim’s session identifiers and any other sensitive data stored in cookies. To prevent this, applications can set HttpOnly attribute while setting the cookie so that cookie is not accessible for scripting, minimizing cookie stealing possibilities. Similarly, cookies can be sniffed in plain when transmitted over plain HTTP. If cookies contain sensitive data, web application can set the Secure attribute that instruct the browser to attach the cookie as part of request to same server only if the connection is secure (HTTPS). Cookies have a privacy concern too, as they can be used by advertisers to track the user’s navigation behavior. More on the privacy concerns of cookies will be covered in later articles in this series.

HTTP Strict Transport Security (HSTS)
HSTS[4] is a security policy that allows web administrators to instruct browsers to communicate with the server only over a secure channel. Normally, when a browser connects over a secure HTTPS channel to a server, the browser validates the certificates for their validity and trust during connection establishment. If there is any issue in validating the server certificate validity, trust chain, or if the certificate is not issued on the same domain name as that of web server, the browser displays a warning dialogue to the user with an option to establish connection in spite of the threat. This can be exploited by attackers using man in middle attacks to steal the sensitive cookies. HSTS will prevent this possibility and instruct browsers to establish connection only over secure channel. HSTS is declared by the administrator as a HTTP response header in the following format:

```
Strict-Transport-Security: max-age=15768000 ; includeSubDomains
```

max-age is a required directive that specify the number of seconds after receiving the HSTS header, during which the browser should consider the Host as a knows HSTS host.
**XSS (Cross Site Scripting)** is one of the highly exploited vulnerabilities and is consistently listed in OWASP Top 10 list. In this attack, an attacker injects malicious code (JavaScript) into benign websites. When a genuine user browses the XSS-attacked page, the script gets executed in the user's browsing context thereby leading to dangerous consequences.

__includeSubDomains__ is an optional directive if present instruct the browser to consider all subdomains of this host to be part of HSTS scope.

Whenever a browser receives a HSTS header, it will internally convert all insecure link references to secure ones. If there is any issue in retrieving the resource over a secure connection, browser displays an error message and do not provide an option to user to continue.

**X-Download-Options**

Some websites have a feature to upload HTML files as attachments and provide an option to download them. When a user downloads such an HTML attachment, Internet explorer versions below 8 automatically download and open the file in the context of the parent site. An attacker can misuse this feature by uploading an HTML file having malicious JavaScript code. When a genuine user downloads the file, the malicious script executes automatically, thereby stealing the cookies of the parent site.

To fix this, IE8 introduced a new response header X-Download-Options, which is configured as below:

```
X-Download-Options: noopen
```

When this header is configured, Internet explorer prompts the user to manually save the file and does not automatically open it. Even if a user saves and opens the file manually, it will no longer run in the context of the parent site, thereby preventing malicious code execution.

**X-XSS-Protection**

XSS (Cross Site Scripting) is one of the highly exploited vulnerabilities and is consistently listed in OWASP Top 10 list. In this attack, an attacker injects malicious code (JavaScript) into benign websites. When a genuine user browses the XSS-attacked page, the script gets executed in the user’s browsing context thereby leading to dangerous consequences. XSS attacks are classified into 3 categories based on their mode of execution – Stored, Reflected and DOM based XSS.

In Stored XSS, the attacker injects malicious script such that it is stored in a data store (e.g., a database). When a genuine user visits any page which fetches the attacker-stored data, the malicious script gets executed in the user’s browsing context.

In Reflected XSS, the attacker chooses such injection points, typically query strings, which reflect user inputs off the webserver e.g., error messages, search results etc. By just visiting a link crafted with malicious script, a genuine user will be a victim of the script injection.

In DOM based XSS, the attacker exploits improper DOM manipulation practices done using JavaScript (e.g., executing code using JavaScript constructs like `eval`, manipulating DOM using constructs like `document.write`, `element.innerHTML`, etc.). Unlike stored or reflected XSS, DOM based XSS does not depend on server’s response.

Microsoft introduced X-XSS-Protection response header in IE8 to defend against Reflected XSS attacks. IE8 was released with an in-built XSS filter which blocks malicious JavaScript reflected into a webpage, but renders rest of the page. The filter is turned on by default. Web developers can opt-out of the filter by setting the below header:

```
X-XSS-Protection: 0
```

The header also has a token which can be opted-in to block rendering of script-affected page, instead of removing malicious script alone. It can be enabled by setting the below header:

```
X-XSS-Protection: 1; mode=block
```

**X-Content-Type-Options**

Every content sent as a response by a webserver has an associated MIME type (also called content-type), which tells the browser the type of content being served (e.g., image, application, text etc). Legacy servers served HTML content as “text/plain” and browsers had to take up the task of sniffing the type of content being served before rendering it. So if HTML tags are found in content served as “text/plain”, browsers would intelligently guess the content as HTML and render it instead of displaying the tags as plain text. Though this helped legacy servers, it gave an opportunity to attackers to execute malicious code. E.g., an attacker can embed malicious script into an image and serve it with image MIME-type. Browsers try to sniff the content, detect script in it and execute it, thereby triggering dangerous consequences.

To prevent this automatic sniffing of content, which can often be misused, IE8 came up with an option where web applications can opt-out of browser’s MIME-sniffing feature. By setting the below header, web developers can indicate the browsers not to sniff and determine the content-type:

```
X-Content-Type-Options: nosniff
```

On configuring this header, an image (having the image MIME type) embedded with malicious script will be inferred only as an image and not as script, thereby preventing malicious code execution.

**Content-Security-Policy**

Content Security Policy (CSP) is the latest in the list of declarative security policies and is introduced by Mozilla. CSP plays an important role in filling some of the gaps left by Same Origin Policy, which we have explained briefly in our previous articles. It aims to control content inclusion from external websites as well as exfiltration of data to external websites. The below example shows how CSP can be configured in a website.

```
"X-Content-Security-Policy: script-src msysite.com; img-src:""
```

This configuration says that the webpage on which CSP is configured can include scripts only from “mysite.com” and it can include images from any website. Essentially CSP gives more fine control on declaring what sources are allowed for scripts, images, etc. In this way, CSP tightens security of the web platform. We will discuss in-depth CSP and its contribution to web platform in our upcoming articles.
The increase in interactivity, rich cross domain communication features in web applications also increased the surface area of attack, thereby inviting newer security vulnerabilities. Declarative security mechanisms, in the form of HTTP headers, provide flexibility for web administrators to enforce a consistent security policy and prevent those new vulnerabilities.

Access-Control-Allow-Origin
This is a new header which is included as a part of HTML5 specification, to loosen the restrictions set by Same Origin Policy and enhance interactions between websites. As discussed in our previous chapters, as per Same Origin Policy (SOP), script in a website will not be able to make a network call (AJAX call) to another website. Though this security restriction prevents malicious cross site interactions, it prevents genuine interactions as well. To loosen this, the Cross Origin Resource Sharing (CORS) specification of HTML5 was introduced. As per this specification, a genuine website can set the following header:

```
Access-Control-Allow-Origin: http://partner.tld
```

This says that scripts in the site on which CORS is enabled can now make AJAX calls to http://partner.tld and SOP restrictions will not apply. We shall discuss about CORS and its security considerations in detail in our upcoming articles.

X-Frame-Options
HTML specification allows a webpage to load and embed content from another webpage through the iframe tag (e.g., `<iframe src=”http://remoteSite.tld”/>`). Iframes are useful to bring content from different websites together and are commonly used in Web 2.0 sites, called Mash-ups, to provide a unified experience. The downside of iframes is that an attacker can embed a remote site in an iframe and position it in such a way using CSS that it will wrap sensitive buttons (such as “Delete my account” button) and hide them on top of genuine buttons. A regular user visiting an attacker’s site will not see the hidden iframes and will click casually, thereby sending the click to the button in the hidden iframe. This attack is called Clickjacking (click + hijacking) and is exploited heavily by spammers.

To mitigate clickjacking, Microsoft introduced a new response header in [IE8](http://blogs.msdn.com/b/ie/archive/2008/09/02/ie8-security-part-iv-the-xss-filter.aspx), which can be configured as below:

```
X-Frame-Options: token
```

Here, the token can be “DENY”, “SAMEORIGIN” or “ALLOW-FROM origin”. If the token is configured as DENY in the response header of a webpage, browsers will not render the page when it is opened in an iframe, thereby mitigating clickjacking. Almost all of the modern browsers support the X-Frame-Options header and it is recommended that developers use this on sensitive pages. We shall discuss in detail about Clickjacking in our upcoming articles.

Conclusion
The increase in interactivity, rich cross domain communication features in web applications also increased the surface area of attack, thereby inviting newer security vulnerabilities. Declarative security mechanisms, in the form of HTTP headers, provide flexibility for web administrators to enforce a consistent security policy and prevent those new vulnerabilities. In this article, we have briefly described some of the important HTTP headers that play an important role in enhancing the security of the web platform. In our upcoming articles, we will throw more light on how web developers use/misuse the loopholes in the browser security model, what is the need of coming up with certain declarative security mechanisms and the role of newer specifications in enhancing security of the web platform.

References
Women Safety using a Smart Phone Application

Introduction
Once Muhammad Ali Jinnah said “There are two powers in the world, one is the sword and other is the pen. But there is a third power stronger than both, that of the women”. Way back to historic path, we find several instances of women empowerment. Egypt was quite unusual among ancient civilizations, where women used to enjoy great deal of freedom. They could come and go as they wished. They used to own property in their own names and could sign over contracts too. While Greece used to show idiosyncrasy in terms of culture, where Greeks used to pay their tribute to goddesses, but women were inferior to men in society. Women could not vote and advised to stay at home only. While Greece was quite unusual among ancient civilizations, where Greeks used to pay their tribute to goddesses, but women were inferior to men in society. Women could not vote and advised to stay at home only.

But rights and status of women have changed a lot in 20th century. A couple of local women demanded vote to form National Union of Women’s Suffrage Societies (NUWSS) at 1897. While in 1903, more radical organization Women’s Social and Political Union (WSPU) came in existence. First Policewomen appointed by Los Angeles Police Force in the year 1910 and Britain appointed fully powered policewomen at 1916. A woman Pharaoh called Hatshepsut once ruled Egypt. Latest statistics of women engagement in society reveals optimistic facts, like below
1) Women Executive Officers in Fortune 500 organizations is around 14.3% in year 2012
2) Board seats held by women in Fortune 500 organizations is around 16.6% in year 2012

This is of course a greener landscape for those who feel empowering women may en-route society to a better tomorrow, if not all. The chunk of people who takes opposite route to this fact causes bigger wrinkle on the forehead of social leaders and prompts to take harder stuns to stop miscreants against women with immediate effect.

Apart from the hand of law, there must be other means to protect women in society. Information Technology already imprinted its stronger footfall to secure our women.

The Situation that is Alarming & Need Attention
In the age of social networking and increased trend for using mobile devices, information catering is not a matter at all. But the way it does now, is not all it can. Social Media Intelligence (SMI) enables Social Media Analytic tools provide competitive information to all its users to help stronger foothold over business rivals. US Administration is rigorously using social media information base to scan millions of profiles to understand if they have links with some malefic associations, which may become detrimental for entire state. Increasing growth of social networks are landing people in several unwanted troubles alongside fun and frolic. Again the usage of social network from mobile devices is skyrocketing exponentially. Combination of mobile device and social network can be used for a noble cause, like controlling crime against woman.

Statistics says almost all women get harassed in someway when they walk over street for regular work. Information Technology can handle such offence in structural manner, provided administration is taking adequate interest on it. Posting mere one line message over a FaceBook in own wall from own mobile device to seek help in times of need, may wake up social welfare organization if it is linked with this profile. SMI can help sending filtered alerts to concerned welfare organizations, if some alarming situation is notified in any linked profile. The same notification can reach upto local administration to take necessary actions to catch hold of perpetrators after cordonning the area where crime is being committed.

Emergency Support System
Very often people in trouble get very short time to describe a situation over phone. But to strengthen such prevalent idea of speed dialing process, some basic improvement scopes are still untouched. When a woman in trouble seeks urgent help, she can connect to a security system using a speed dial number and then its security infrastructure upholds the control of the situation happening in spot where from woman in distress were trying to connect security system. Security system simply expects a small application to remain installed over smart phone that the woman is carrying and the same application can be activated inside smart phone by a small push message from security system to show its jugglery. The push message will start some inbuilt applications inside smart phone, like GPS to continuously transmit geo-location of the smart phone carrying person. In backend there is already a database that consists of name, numbers and response areas of policemen or security personnel. So, whenever security infrastructure traces the location of the women in distress, it can simply send message to all those security personnel who are responsible for services of that particular area. So they get the alarm and get ready to handle the situation.

Emergency Response Building & Real Time Evidence Gathering Using Smart Phone
Dialing a special speed dial number has gone passé during hours of crisis like baby in trouble or disaster is under way, etc. and security system connected through this special number expects live or deferred description of the situation to help administration extend service.

So there are purely two aspects of this speed dial mechanism that may help women in trouble. one is Emergency Support system and the second one is real time evidence gathering through smart phone devices.
Security infrastructure heads for a smart security team build up with collected evidences to catch the miscreants red-handed. Security system can maintain a list of phone numbers of their security persons and update a list for their current posting location (rather geo-location). As soon as some woman dials security number to seek help, it collects geo-location of that woman using its GPS facility and transmits the SOS message to all those security team members whose postings look closer to the location of incident. Security system can also transmit the evidence captured from victim to selected security team members in respect of their posting location as proof of incident. Expectation is set by security system like the closest security team members are about to reach out to victim for help and a set of security team members can escort the entire area to arrest the perpetrators.

**Benefit of such Solution**
This solution has few benefits on detecting the crime on spot as well as handling the situation in many ways;
1. Speed dial mechanism so just press a certain number pattern that may not happen unintentional press
2. Security infrastructure sends red alert to the personnel on duty and they continuously trace the location in case mobile is on
3. Real time video, sound can easily help to detect the criminals

**Any Limitation of this Solution**
This idea may work in fullest extent with Smartphone. Apart from that feature phones may also take advantage of this kind of utility with help of SMS based data transmission from phone to security system. Innovation here may also enable voice recording system in phone when it is required by using help of external push messages. Triangulating cell phone towers to locate of feature phone is a known method, which may help security team to easily locate the people in trouble.

**Futuristic Vision**
This application for women security can be extended to a larger plan by integrating the central security system with several other bigger administrative infrastructure. This will enable the administration to track the miscreants against woman across the country with more effective way. Plus the miscreants can be placed under judiciary with rapid collection of real-time evidences from on spot machineries.

**References**
Following sources have been used for this articles:

**About the Authors**
Diptiman Dasgupta (DD) is the Lead Architect for a large account in Travel & Transportation Industry in IBM Global Delivery and is a member of IBM Academy of Technology (AoT). He is an IBM Executive IT Architect and Open Group Certified Distinguished Chief Architect in the area of Enterprise Architecture & Enterprise Integration (EI). He has 16 years of experience in design and development, architecting, providing technical strategy, solutions for creating and leveraging assets in client solution, as well as providing technical leadership to the organization. He is having multiple publications & patent.

Radha M De is an IBM Advisory IT Specialist and is currently working as Technical Lead in projects in Travel & Transportation industry. He has around 13 years of experience in IT industry and dealt with design, implementation in several critical applications, including smart phone applications. He has published one mobile solution framework in IP.com in recent time. He has publishing in IBM Academy of Technology.

Indrajit Poddar (IP) is a member of the Strategy, Technology, Architecture, and Incubation team at IBM Software Group, where he leads several integration PoCs for cloud hosted distributed solutions using middleware and software exploitation of networking (and other system) components. He is also an IBM Master Inventor and has several publications on IBM developerWorks on Software-as-a-Service and deployment automation technologies.
Brain Teaser

Crossword »

Test your Knowledge on High Performance Computing

Solution to the crossword with name of first all correct solution provider(s) will appear in the next issue. Send your answers to CSI Communications at email address csic@csi-india.org with subject: Crossword Solution - CSIC September 2013

Did you know about world’s fastest supercomputer?

A Chinese supercomputer, Tianhe-2, developed by China’s National University of Defense Technology, reported to be fastest in the world, with a processing speed of 33.86 petaflops (1000 trillion calculations per second).

Ref: Article titled China’s Tianhe-2 ‘is fastest supercomputer’ published in The Hindu, NEW DELHI, June 17, 2013. Ref URL: http://www.thehindu.com/sci-tech/chinas-tianhe2-is-fastest-supercomputer/article4823551.ece

We are overwhelmed by the responses and solutions received from our enthusiastic readers

Congratulations to

Madhu S Nair (Dept. of Computer Sc., University of Kerala, Kariavattom, Thiruvananthapuram, Kerala) for ALL correct answers to August 2013 month’s crossword
On Map-Reduce

From: Anonymous

Q: What is Map-Reduce algorithm? How is this algorithm important in handling large data?

A: About MapReduce

As per Wikipedia article reference on MapReduce algorithm (URL Ref: http://en.wikipedia.org/wiki/MapReduce), MapReduce is a programming paradigm to handle large volume of data sets in a parallel or distributed processing environment. Essentially, this is similar to traditional Divide-and-Conquer approach, where we divide the original problem into several sub-problems and sub-subproblems and try to solve (conquer) those sub-problems and uses the solution of the sub-problem into the bigger problem. For example, in a mergesort algorithm to sort an unordered list, say, \{10, 1, 7, 5\}, we divide this list into two, \{10, 1\} and \{7, 5\}, and further subdivide into \{1\}, \{7\} and \{5\}. Each of these lists being of single element, is already sorted and as such, we start merging (conquer part) and we get merged sub-solution and \{1, 10\} and \{5, 7\}. This, when merged again, will provide \{1, 5, 7, 10\}.

A MapReduce program has essentially two important parts: Map and Reduce. A Map performs filtering (kind of divide in Divide-and-conquer) and sorting (for example, sorting marks scored by students by different subject names into queues, one queue for each subject name) and a Reduce function that does a summary (such as finding the maximum value scored in each subject in each queue, giving subject highest).

Let’s look at an example. Let’s assume, we have three files for three students, each file containing two columns (a key-value pair) that represent a subject and the corresponding marks scored by a student for the entire class. In this simple example, subject is the key and marks considered as the value.

Mathematics, 90
Physics, 75
Chemistry, 92
Mathematics, 80
Physics, 85

Now, we would like to find the maximum marks for each subject scored by any student in the class across all the score files. Using MapReduce paradigm, we split this down into three map tasks, where each mapper works on one of the three files and the mapper task goes through the data and returns the maximum marks for each subject. Thus, the results produced from one mapper task for the given data would be: (Mathematics, 90) (Physics, 75) (Chemistry, 92). All three mapper tasks (for three files) would then produce the following:

(Mathematics, 90),
(Physics, 75),
(Chemistry, 92),
(Mathematics, 80),
(Physics, 85),
(Chemistry, 78),
(Mathematics, 98),
(Physics, 93),
(Chemistry, 68).

These would now be fed into the reduce tasks, that combine the results and output a single value for each subject, producing a final result set as follows:

(Mathematics, 98)
(Physics, 93)
(Chemistry, 92)

For further reading, an interesting tutorial on Map-Reduce paradigm can be read from Apache Hadoop, reference URL: http://hadoop.apache.org/docs/stable/mapred_tutorial.html

Regarding Hadoop, you may refer to the URL: http://wiki.apache.org/hadoop/FrontPage for further reading on Apache Hadoop and thought process.

An interesting C/C++ MapReduce Code & build can be found in http://wiki.apache.org/hadoop/C%2B%2BWordCount

Send your questions to CSI Communications with subject line ‘Ask an Expert’ at email address csic@csi-india.org
The following are the ICT news and headlines of interest in August 2013. They have been compiled from various news & Internet sources including the dailies – The Hindu, Business Line, and Economic Times.

Voices & Views
- E-commerce firms face cash crunch on more discount offers even though the industry is expected to grow to worth $1.8 billion in 2013 – Deepa Thomas, The Hindu.
- There are around 60,000 of Bollywood movies since 1930s. We will digitise them and make available to consumers by 2015 - 16 – Vinodh Bhat, Saavn.
- We want to bring face recognition tech to projects like Aadhaar – Partho Dasgupta, NEC India.
- Business through SMAC (Social, Mobile, Analytics and Cloud) technologies is estimated to be between $70 billion and $200 billion over the next three years.
- India is still ranked seven or eight, in terms of companies funded. In US, there are 30,000 companies get started and 6,000 get funded every year as against a little over 150 in India to be funded in 2013 – Mukund Mohan, Microsoft Ventures.
- Facebook India user base grows to 82 million of which 62 million are on mobile devices.
- The global smartphone sales rose in the Q2 of 2013 to 225 million, surpassing mobile devices.
- The spectrum pricing contributes to the $100-billion industry. A group of eight Indian IT companies has formed a lobby to influence the US Immigration Reforms Bill will be detrimental to the $100-billion industry.
- GoDaddy, Hitendran, MediaT ek, Nokia, Opera, Qualcomm and Samsung have joined to launch ‘internet.org’ to make Internet access available to all people.

Gotv, Policy, Telecom, Compliance
- DoT has finalised the new unified license regime that de-links spectrum allocation from the license. It will also allow companies to offer Internet telephony services.
- STPs to offer incentives to small units, 4,000-odd smaller units operating under STPI scheme account for nearly 65% of IT exports.
- Intelligence Bureau suspects Pakistan ISI may have got access to BSNL database.
- Software companies fear the US Immigration Reforms Bill will be detrimental to the $100-billion industry.
- The Deputy National Security Advisor has asked the DoT to look at ways to route domestic Internet traffic via servers within the country.
- US lawsuit charges TCS with making false promises and misrepresentations.
- Telecom bodies – COAI, AUSPI and TAIPA welcome mobile tower norms.
- TRAI has recommended a 100% FDI for Broadcast carriage services that include DTH, HITS, IPTV, mobile TV, teleports, cable networks and multi-system operators.
- Data Security Council of India working on a framework to protect customer data.
- Mobile network in Nashik areas: Local units to supply 75% equipment.
- Google extends support to Hindi handwriting on tablet or smartphone.
- Facebook with tech giants Ericsson, MediaTek, Nokia, Opera, Qualcomm and Samsung launches ‘internet.org’ to make Internet access available to all people.
- The recently launched Bose’s new earphones at Rs 22,388, costs more than most smartphones.
- Voice of Bigdata, analytics company, launches a ‘facial signature’ solution that can create a unique digital signature for people’s faces.
- Amazon India adds consumer electronics items to its online store and partners with brick-and-mortar companies like Croma and Vijay Sales. Also, plans to invest Rs 1,000 cr in infra expansion.
- Samsung phones to support nine Indian languages – Hindi, Punjabi, Bengali, Tamil, Telugu, Kannada, Malayalam, Marathi and Gujarati.
- The Govt. approves three projects worth Rs 200 crore under the Electronic Manufacturing Clusters (EMC) scheme.
- IT Manpower, Staffing & Top Moves
- Infosys sees huge drop in job applications. Receives 3.79 lakh in 2013 as against 8.29 lakh in 2011.
- SAP Labs, which employs 6500 in India plans to expand Bangalore facility.
- Tech Mahindra will dish out wage hikes to the tune of 8% this fiscal.
- Roshni Nadar Malhotra, taking over as the non-Executive Director of HCL Technologies.
- Infosys is facing a class-action lawsuit in the US for alleged racial discrimination in hiring.
- NEC India plans to take on board 200 people for their joint venture with HCL.
- HP India to supply 15 lakh laptops to UP by mid-Sep.
I AM BUILDING for my future

For more information and to register for an ISACA exam, visit www.isaca.org/myfuture-CSI.

**UPCOMING EXAM DATE**

**DECEMBER 2013**

Register Online and Save US $75.00!
Final registration deadline: 25 October 2013

Note: The CISA German, Italian and Dutch languages will not be offered at the December 2013 exam. Please contact exam@isaca.org for further information.
CSI Reports

From CSI SIGs / Divisions / Regions and Other News »

Please check detailed reports and news at:
http://www.csi-india.org/web/guest/csic-reports

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<tr>
<th>SPEAKER(S)</th>
<th>TOPIC AND GIST</th>
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<td><strong>DIVISION IV (COMMUNICATIONS)</strong></td>
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| Dr. Anirban Basu, Dr. K C Patra, Dr. S Lakshmivarahan, Mr. Vinay Deshpande, Dr. Ashok Srinivasan, Mr. Sanjay Mohapatra, and Dr. Rachita Misra | 8 - 20 July 2013: Two-week National Workshop on “Parallel and Heterogeneous Computing”
Recent advance in CPU-GPU and CUDA technology is driving today’s Super Computers and has changed architectural and software environment of parallel programming. Dr. Basu informed all that CDAC is leading R&D work on Parallel Computer in India. Dr. Lakshmivarahan delivered week-long short course on Introduction to Parallel programming. Mr. Deshpande explained how CUDA programming model works on GPU architecture. He also introduced working with Open Acc compilers from PGI. Dr. Srinivasan illustrated several HPC case studies using CUDA C, MPI-CUDA and Open CL. He also discussed performance issues. |

CSI REPORT

| CSI REPORT | |
|------------||
| Mr. HU Talwar and Ms. Reshmi Pillai | 26 July 2013: Inauguration of Tie-Up of Spoken Tutorial of IITB and Directorate of Technical Education, Karnataka
Mr. Talwar inaugurated the TIE-UP. Ms. Pillai spoke about Spoken Tutorial which is an initiative of HRD Ministry and is being organized by IIT Bombay. She said that this project is part of ‘Talk to a Teacher’ activity of National Mission on Education through ICT. The project is about teaching and learning a particular FOSS program like Linux, Scilab, LaT eX, PHP & MySQL, Java, C/C++, Libre Office etc. via Video tool. |

CSI Service Awards 2013
Call for nominations

The Annual Convention of the Computer Society of India (CSI) will be held at Visakhapatnam on 13th- 15th December 2013. On this occasion, CSI felicitates Chapters and Individuals with awards for their significant contributions to the society during the financial year 2012-13.

The awards will be presented during the Annual General meeting, at Visakhapatnam.

The CSI awards constituted for encouraging the persons/chapters are indicated below:

1. Best National Chapter Award
2. Best Regional Chapter Award (Category A)
3. Best Regional Chapter Award (Category B)
4. Best Regional Chapter Award (Category C)
5. Chapter Patron Award
6. Best Chapter News Letter Award
7. Significant Contribution Award
8. Active Participation Award (Youth)
9. Active Participation Award (Woman)

The norms/guidelines for each award have been well documented and are uploaded on the website (http://www.csi-india.org/web/guest/csi-service-awards)

Chapters and Individuals interested in participating for these awards, may mail their nominations in a prescribed format uploaded on the website to the Executive Secretary, CSI-HQ, Mumbai at awards_2013@csi-india.org. Incomplete application will not be considered for scrutiny.

The nomination should be routed through respective Regional Vice Presidents latest by 30th September, 2013 so that the scrutiny can be done by CSI-HQ at Mumbai and forwarded to “AWARDS COMMITTEE” headed by the Immediate Past President, for final selection.

For enquires, kindly contact Mr. Suchit Gogwekar CSI HQ at hq@csi-india.org

Thanking you
Satish Babu, Chairman, Awards Committee Computer Society of India

The best national chapter award will be given on the basis of nomination for best regional chapter award, so, a separate nomination for this award is not required.
### CSI News

**From CSI Chapters »**

Please check detailed news at:
http://www.csi-india.org/web/guest/csic-chapters-sbs-news

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<th>SPEAKER(S)</th>
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| **ALLAHABAD (REGION I)** | 10-11 August 2013: Workshop on **“Web Technology”**

D K Dwivedi, Mithilesh Mishra, Ratnesh Mishra and Prashant

Broad topics covered in 2 days workshop with specific illustrations and implementation techniques included: Website development - Static using HTML, CSS, JavaScript; Dynamic using PHP, MySQL, AJAX; Web Server configuration; Apache on Windows/Linux; Website hosting; Troubleshooting.

- Organizers and participants of the workshop

| DEHRADUN (REGION I) | 02 August 2013: One-day Workshop on **“Cloud Computing”**

Dr. Sudhanshu from Doon university spoke on cloud computing. He explained different methods, services used for cloud computing. A quiz was conducted on the same topic after the workshop. Workshop was attended by students of MCA and B. Tech.

- Faculty members and participants of the workshop

| AHMEDABAD (REGION III) | 27 July 2013: One-day Pre-ICSE Workshop on **“Software Engineering - An ICSE-2014”**

Mr. Vyas delivered talk on ‘Emerging trends in Software Security Assurance’. Dr Padmanabhuni spoke on ‘Leveraging software repositories for preventive software maintenance and rejuvenation’. Out of 4 papers, paper titled “Development of Software Infrastructure - A Case Study” was selected as the best paper. Panel discussion on topic ‘Teaching Methodology and Practices for Software Engineering’ was also conducted.

- L to R: Dr. R Nandakumar, Nisarg Pathak, Dr. Sanjay Chaudhary, Dr. Srinivas Padmanabhuni, Dr. Umesh Bellur, Santanu Chowdhury, R P Soni, Dr. Harshal Arolkar, and Pankaj Shah

| BANGALORE (REGION V) | 9 July 2013: Workshop on **“Basics of Cloud Computing”**


- Workshop participants
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<th>SPEAKER(S)</th>
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<tr>
<td><strong>BANGALORE (REGION V)</strong></td>
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<tr>
<td>Dr. Balakrishna Haridas</td>
<td><strong>17 July 2013:</strong> Technical Talk on “Biomedical Device Innovation and Translation to the Clinic”&lt;br&gt;It was informed that gaps between academic training methods and industry approaches towards medical device development appear to be blurring. Approach taken at the University of Cincinnati’s national award winning MDIEP and academic model implemented towards creation of innovation ecosystem in academic setting were talked about. There was also discussion about some bioengineering problems relevant to design of medical devices and implants for tissue repair &amp; regeneration to illustrate the concepts that lie at intersection of engineering, biology and clinical medicine.</td>
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<td></td>
<td><a href="image">Dr. Balakrishna Haridas and participants during the workshop</a></td>
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<td><strong>COCHIN (REGION VII)</strong></td>
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<tr>
<td>Dr. C P Girijavallabhan, Retd. Director-Cochin University of Science and Technology</td>
<td><strong>22 February 2013:</strong> Technical Talk on “Higgs Boson - The God Particle”&lt;br&gt;The talk was jointly organized with IEEE Cochin. The faculty gave detailed and simplified explanation on the development taking place in the Large Hadron Collider experiment and spoke about the present status of identification of Higgs Boson or otherwise called “God Particle”.</td>
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<td><a href="image">Dr. C P Girijavallabhan talking about “HIGGS BOSON”</a></td>
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<td>Mr. V Raghunandan</td>
<td><strong>15 May 2013:</strong> Awareness Programme on “ICT’s and Improving Road Safety”&lt;br&gt;The program was jointly organized with IEEE, IEI and IETE on the occasion of World Telecommunication and Information Society Day. Mr. Raghunandan delivered informative speech on the latest trends in communication and the pros and cons of using them. He also spoke about the impact of using mobile phones on road safety.</td>
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<td><a href="image">Mr. Raghunandan conducting the program</a></td>
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<td><strong>COIMBATORE (REGION VII)</strong></td>
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<td>Dr. Sandeep Chatterjee, Dr. R Nadarajan, Dr. TV Gopal Dr. P Thangaraj and Dr. Karpagam</td>
<td><strong>5-6 July 2013:</strong> Professional Enrichment Programme on “Enterprise Application Integration (EAI)”&lt;br&gt;Dr. Chatterjee handled 4 sessions - (i) Introduction and challenges in EAI (ii) Internals of mobile applications (iii) web services for mobile &amp; grid and (iv) Intellectual Property, Legalities - Web services, Grid and Cloud computing. Dr. Gopal took 2 sessions - (i) Anatomy of Distributed Applications and (ii) SOA and EAI. Dr. Karpagam spoke on Model Driven Development and Dr. Thangaraj and his team explained a case study on Web services and EAI.</td>
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<td><a href="image">Mr. Subramani MC member talking about the seminar</a></td>
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<tr>
<td>Mr. M Murali, Technologist – Computer Sciences Corporation US.</td>
<td><strong>26 July 2013:</strong> Function on “Innovation - Enablers &amp; Disruptors: A preview of 12 technologies to watch”&lt;br&gt;Mr. Murali briefed about the impact of current innovative technologies from corporate and industry perspective. He pointed out the disrupters, enablers and few outsiders in innovations. He also talked about the mechanism for deploying services and products.</td>
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<td><a href="image">Mr. M Murali with CSI Office bearers</a></td>
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### From Student Branches

http://www.csi-india.org/web/guest/csic-chapters-sbs-news

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<tr>
<td><strong>TRIVANDRUM (REGION VII)</strong></td>
<td><strong>16 July 2013</strong>: One-day Conference “SISTAAM-2013”</td>
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<td>Dr. D S Rane, Dr. M K Jana, KR Kaimal, Dr. Ravi Nambiar, Dr. M Sathyanarayana and Prabhakara Varier</td>
<td>The Sarabhai Institute of Science and Technology conducted SISTAAM-2013. The conference had three Technical Sessions. Twenty five papers covering various topics like Image Processing, Data Analysis in Cloud using Hadoop, Secure Data Storage &amp; Message Transactions, 3D Printing were presented by teachers and students of PG and UG courses. Papers were evaluated based on content and presentation.</td>
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<tr>
<td><strong>MRS. BALVINDER SHUKLA, D. VPS ARORA, K. V. SONI, MS. NITASHA HASTEER, M. VINEET TYAGI, R. RAJEEV GUPTA, T. V. VISHAL KUMAR, JAYANTHI RANJAN AND DR. BALVINDER SHUKLA</strong></td>
<td><strong>18-20 June 2013</strong>: Faculty Development Programme on “Latest Tools and Techniques in Data Mining”</td>
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<td><strong>AES INSTITUTE OF COMPUTER STUDIES (AESICS), AHMEDABAD (REGION-III)</strong></td>
<td><strong>27 June 2013</strong>: Orientation Programme for MCA</td>
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<td>Ms. Pavni Diwanji and Mr. Vimal Ambani</td>
<td>Ms. Diwanji spoke about self belief and self esteem. She talked about innovations which come from power of mind that is happy, energetic and enthusiastic. Mr. Ambani shared his experience related to technology and explained how an RFID-enabled dairy farm can leverage infrastructure towards dairy farm management.</td>
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<tr>
<td><strong>MR. PARESH MAYANI, MR. DHARMIL SHAH AND MR. PRATIK PATEL</strong></td>
<td><strong>13 July 2013</strong>: Workshop on “Android”</td>
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The workshop provided hands on exposure to developing Mobile Apps using android platform. The workshop covered android mobile application development basics, implementation of basic widgets in application, bounded widgets, Web API integration and JSON parsing, Database integration and styles - theme implementation.
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| **VASAVI COLLEGE OF ENGINEERING, IBRAHIMBAGH, HYDERABAD (REGION-V)** | 12 July 2013: Technical Talk on “Security Issues in Networks”  
Dr. Shoba Bindhu, Associate Professor, JNTUCEA, Anantapur  
Dr. Shoba Bindhu explained needs of Security and Fundamentals of Cryptography. She focused on various types of attacks and symmetric & asymmetric algorithms applied at security level. |
| **VITS COLLEGE OF ENGINEERING, VISAKHAPATNAM (REGION-V)** | 18-20 August 2013: Three Days Workshop on “HTML 5”  
Dr. B Murali Krishna, G Rajasekharam and Prof. K Shankar  
This workshop provided practical exposure to students in creating an interactive and animated web page content using JQuery, which renders the same look and feel on different browsers. |
| **MARATHWADA INSTITUTE OF TECHNOLOGY, AURANGABAD (REGION-VI)** | 08-10 July 2013: Three Days Workshop on “Faculty Development Program”  
Mr. Atul Kherde, ThoughtCraft Ltd Pune and Dr. Ranjan Garge  
Mr. Kherde spoke about role of teachers, different learning styles, communication model, conversational skills - handling questions, being a good teacher, being a glorious teacher and currency of learning with real time examples. Dr. Garge discussed about current issues in education system and spoke on “Teachers: Look beyond yourself”. |
| **DR.RANGARAJAN DR.SAKUNTHALA ENGINEERING COLLEGE, CHENNAI (REGION-VII)** | 28 June 2013: Research Forum on “Preventing Radio Frequency Radiation in Human Body”  
Mr. Rajanand  
A sensing device was applied eg: sensing pulse rate. To prevent human body from being attacked by the radiation, some precautions were suggested. A person can use ‘hands-free’ device for lower exposure. It was informed that WHO develops public information material and promotes dialogue among scientists, governments, industries and the public to raise the level of understanding about potential adverse health risks of mobile phones. |
| **DR.RANGARAJAN DR.SAKUNTHALA ENGINEERING COLLEGE, CHENNAI (REGION-VII)** | 4 July 2013: Research Forum on “Google Glass”  
K Kalaivani, S V Dhiyva  
Google Glass is a wearable computer with an optical head-mounted display that is being developed by Google with the mission of producing a mass-market ubiquitous computer. It displays information in smartphone-like hands-free format that can interact with the Internet via natural language voice commands. Many technologies are used such as wearable computing, smart clothing, eye tap technology, smart grid technology etc. |
## SPEAKER(S) TOPIC AND GIST

### DR. SIVANTHI ADITANAR COLLEGE OF ENGINEERING (SACE), TIRUCHENDUR, TN (REGION-VII)

| Dr. Flora Nelson M.D.R.D, Associate Professor & HOD of Radiodiagnosis, Thoothukudi Medical College |
| 07 August 2013: Guest Lecture on “Radiography” |

Dr. Flora demonstrated use of computer in the field of radiography. Nowadays digital X-rays have dominated traditional method of X-ray. Dr. Flora explained the way in which digital X-rays have overcome traditional method in its clarity and technology. She also gave various ideas regarding CT and Ultrasound scans. CT scans pave a way to visualize image in various angles as they are taken in slices.

![L-R: Ms. I Kalai Vani, Dr. Kamal Raj, Dr. Flora Nelson, Dr. J Maheswran, and Dr. G Wiselin Jiji](image)

### ER. PERUMAL MANIMEKALAI POLYTECHNIC COLLEGE, HOSUR, TN (REGION-VII)

| Mr. D Sai Sathish, Founder & CEO of Indian Servers, Administrator of Andra Hacker |
| 18-19 July 2013: Two-days Workshop on “Ethical Hacking” |

Mr. Sathish explained basic ideas of hacking types and hackers. He delivered speech on Virus i.e Trojan Horse, Anti Virus and explained practically about how to crack windows passwords in seconds.

### EINSTEIN COLLEGE OF ENGINEERING, TIRUNELVELI (REGION-VII)

| Mr. Navjot Singh, Program manager – EMC Academic Alliance |
| 12 July 2013: Seminar on “Cloud Computing and its applications” |

Mr. Singh explained basics of cloud computing and its applications with variety of examples. He shared knowledge about various platforms with paid and free service offered by cloud computing developers. The session ended with online test conducted.

![Resource person while giving speech](image)

### NATIONAL ENGINEERING COLLEGE, KOVILPATTI (REGION-VII)

| Mr. Rajan T Joseph and Ms. M stella Inba Mary |
| 4 July 2013: Motivational Talk on “Industry Expectation” |

Mr. Joseph conveyed that all should work for upliftment of our society and nation. He suggested that students should be aware of technology updations. He ended his speech saying Success is not the destination but it is journey. The Motivation talk on "Industry Expectation" was arranged.

![Inaugural Address by Chief Guest Mr. Rajan T Joseph L-R: Stella Inba Mary, Dr. Subburaj, Dr. Chockalingam, Dr. Manimekalai, and M Shanmugapriyan](image)

### R.M.K ENGINEERING COLLEGE, KAVARAIPTTAI, TN (REGION-VII)

| Mr. K Rajasekar, AGM-Sales & Marketing, Mobile Services, BSNL |
| 25 July 2013: Seminar on “BSNL” |

Mr. Rajasekar spoke about BSNL organization and various services provided by BSNL in the area of Telecom especially Mobile Computing. He highlighted job opportunities for fresh engineering graduates in BSNL. Then he spoke in detail about Wireless LAN, IEEE Standards in the area, Blue Tooth, Zigbee and adhoc networks and the practical implementations of these technologies when providing services to customers.

![Mr. K Rajasekar conducting the Seminar](image)

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Please send your event news to csic@csi-india.org. Low resolution photos and news without gist will not be published. Please send only 1 photo per event, not more. Kindly note that news received on or before 20th of a month will only be considered for publishing in the CSIC of the following month.
Following new Student Branches Were Opened as Detailed Below:

REGION VI
- MIT Academy of Engineering, Alandi (D) Pune
  The MIT Academy of Engineering CSI - Student Branch was inaugurated on 26th July 2013, at the auspicious hands of Mr. Amit Dangle, Chairman, CSI Chapter Pune and Dr. Y J Bhalerao, Principal MIT AOE. Prior to the inaugural function a zonal level 'C Programming Contest' was organized. The winner of this contest was felicitated during the inauguration ceremony.

REGION VII
- CK College of Engineering and Technology, Cuddalore, TN
  Inauguration of CSI Student Branch was done on 25 July 2013. A guest lecture was given by Mr. Y Kathiresan on “YOUR UNIQUE IDENTITY”. He created awareness about CSI community and motivated students for technical innovations.

REGION VII
- Sree Buddha College of Engineering for Women, Elavumthitta, Kerala
  The inaugural ceremony of CSI Student Branch in Sree Buddha College of Engineering for Women was held on 5th August 2013. Mr. Rajan T Joseph, Education Director CSI inaugurated the student branch by lighting the lamp. Mr. Kathiresan gave a brief talk about the benefits of being a CSI member. Prof. K. Sasikumar, Chairman SBCEW presided over the function.

Four good reasons to JOIN
- Take part in various forums and discuss, your favourite topics
- Make a contribution on National level through our open exchange of ideas seminars
- Share your specialized knowledge with colleagues
- Receive new information on developments in the field via regular conferences, seminars, workshops etc.

WE INVITE YOU TO JOIN
Computer Society of India
A professional body guiding Indian Information Technology Industry

Join us
and
become a member

I am interested in the work of CSI. Please send me information on how to become an individual/institutional* member

Name ___________________________ Position held_______________________

Address __________________________

City ____________ Postal Code _____________

Telephone: _______________ Mobile:_____________ Fax:_____________ Email:_______________________

*[Delete whichever is not applicable] 

Interested in joining CSI? Please send your details in the above format on the following email address.
helpdesk@csi-india.org
### September 2013 events

<table>
<thead>
<tr>
<th>Date</th>
<th>Event Details &amp; Organizers</th>
<th>Contact Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>14–15 Sep 2013</td>
<td><strong>National Seminar on ICT in Health Care for Inclusive Development</strong> At Patna. Organised by CSI Divisions (I and III) &amp; CSI Patna</td>
<td>Prof. A K Nayak, <a href="mailto:aknayak@iibm.in">aknayak@iibm.in</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Prof. T V Gopal, <a href="mailto:gopal@annauniv.edu">gopal@annauniv.edu</a></td>
</tr>
<tr>
<td>19-20 Sep 2013</td>
<td><strong>ACC-2013: Second International Conference on Advances in Cloud Computing</strong> At Bangalore. Organised by CSI Bangalore Chapter and CSI Divisions (I, III, IV, and V)</td>
<td>Dr. Anirban Basu, <a href="mailto:abasu@opgsoftware.com">abasu@opgsoftware.com</a></td>
</tr>
<tr>
<td>20-21 Sep 2013</td>
<td><strong>ICICSE: International Conference on Innovations in Computer Science and Engineering</strong> At Hyderabad. Organised by Guru Nanak Engg. College &amp; supported by CSI Div IV, CSI Hyderabad</td>
<td>Dr. D D Sarma, <a href="mailto:dirmca.gnic@gniindia.org">dirmca.gnic@gniindia.org</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Prof. Rishi Sylal, <a href="mailto:hodcse.gnic@gniindia.org">hodcse.gnic@gniindia.org</a></td>
</tr>
<tr>
<td>23-26 Sep 2013</td>
<td><strong>Third IFIP International Conference on Bioinformatics</strong> At Bhopal. Organised by IFIP TC-5 &amp; CSI</td>
<td>Dr. K R Pardasani, <a href="mailto:kamalrajp@rediffmail.com">kamalrajp@rediffmail.com</a></td>
</tr>
<tr>
<td>24-27 Sep 2013</td>
<td><strong>APCHI-2013: 11th Asia Pacific Conference on Computer Human Interaction</strong> At Bangalore. Organised by IFIP TC-13 &amp; supported by CSI</td>
<td>Anirudha Joshi <a href="mailto:chair@aphc2013.org">chair@aphc2013.org</a></td>
</tr>
<tr>
<td>30 Sep 2013 &amp;</td>
<td><strong>CSI Student Convention Region - III on Enterprise Mobility</strong> At Ahmedabad. Organised by CSI GLS Student Branch &amp; supported by CSI Ahmedabad</td>
<td>Dr. Harshal A Arolkar <a href="mailto:harsharolkar@yahoo.com">harsharolkar@yahoo.com</a></td>
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<tr>
<td>1st Oct 2013</td>
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<tr>
<td></td>
<td><strong>National Conference on Next Generation Computing Technologies and Applications</strong> At Institute of Technology and Science, Mohan Nagar, Ghaziabad, UP</td>
<td>Prof. Sunil Kumar Pandey <a href="mailto:sunilpandey@its.edu.in">sunilpandey@its.edu.in</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Prof. A K Nayak, <a href="mailto:aknayak@iibm.in">aknayak@iibm.in</a></td>
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### October 2013 events

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<tbody>
<tr>
<td>5th Oct 2013</td>
<td><strong>National Conference on Next Generation Computing Technologies and Applications</strong> At Institute of Technology and Science, Mohan Nagar, Ghaziabad, UP</td>
<td>Prof. Sunil Kumar Pandey <a href="mailto:sunilpandey@its.edu.in">sunilpandey@its.edu.in</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Prof. A K Nayak, <a href="mailto:aknayak@iibm.in">aknayak@iibm.in</a></td>
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</tbody>
</table>

### November 2013 events

<table>
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<tr>
<th>Date</th>
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</tr>
</thead>
<tbody>
<tr>
<td>12-13 Nov 2013</td>
<td><strong>International Seminar on “Knowledge Based Software Engineering”</strong> At Udaipur Organised by CSI Udaipur and CSI Div II</td>
<td>Dr. Dharsh Singh <a href="mailto:singhds@hotmail.com">singhds@hotmail.com</a></td>
</tr>
<tr>
<td>15-17 Nov 2013</td>
<td><strong>CONSEG-2013: 7th International Conference on Software Engineering</strong> At Pune. Organised by CSI Pune &amp; Div II</td>
<td>Mr. Shekhar Sahasrabudhe <a href="mailto:shekhar_sahasraudohe@persistent.co.in">shekhar_sahasraudohe@persistent.co.in</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dr. T V Gopal, <a href="mailto:gopal@annauniv.edu">gopal@annauniv.edu</a></td>
</tr>
<tr>
<td>25-27 Nov 2013</td>
<td><strong>International Oriental Cocosda 2013 Conference</strong> At Gurgaon. Supported by CSI and KiIT Group of Institutions</td>
<td>Shyam S Agrawal <a href="mailto:oc13.kiit@gmail.com">oc13.kiit@gmail.com</a></td>
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<tr>
<td>29-30 Nov 2013</td>
<td><strong>NCSS-2013: National Conference on Cyber Space Security - Research Challenges &amp; Trends</strong> At Bangalore</td>
<td>Mr. Bindhumadhava B S <a href="mailto:bindhu@cdac.in">bindhu@cdac.in</a></td>
</tr>
</tbody>
</table>

### December 2013 events

<table>
<thead>
<tr>
<th>Date</th>
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</tr>
</thead>
<tbody>
<tr>
<td>13-15 Dec 2013</td>
<td><strong>CSI-2013: 48th Annual Convention of CSI</strong> At Visakhapatnam. Organised by CSI Visakhapatnam in association with Visakhapatnam Steel Plant</td>
<td>Paramata Satyanarayana <a href="mailto:s-paramata@vizagsteel.com">s-paramata@vizagsteel.com</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td><a href="mailto:convener@csivizag2013.org">convener@csivizag2013.org</a></td>
</tr>
<tr>
<td>19-21 Dec 2013</td>
<td><strong>COMAD-2013: 19th International Conference on Management of Data</strong> At Ahmedabad. Organised by CSI SIGDATA, Div II and CSI Ahmedabad</td>
<td>Bipin V Mehta, <a href="mailto:bvmeha@aesics.ac.in">bvmeha@aesics.ac.in</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Arnab Bhattacharya, <a href="mailto:arnabb@iitk.ac.in">arnabb@iitk.ac.in</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dr. Harshal Arolkar <a href="mailto:harsharolkar@yahoo.com">harsharolkar@yahoo.com</a></td>
</tr>
<tr>
<td>2-4 Jun 2014</td>
<td><strong>IFIP Networking 2014 Conference</strong> At Trondheim, Norway</td>
<td>Prof S V Raghavan <a href="mailto:sy.raghavan@nic.in">sy.raghavan@nic.in</a></td>
</tr>
</tbody>
</table>
### Call for Nominations for Academic Awards 2013

Computer Society of India has been honoring academic excellence through academic awards every year. The awards are given away at the CSI Annual Convention. For the year 2013, the Convention is being held at Visakhapatnam, Andhra Pradesh between 13th and 15th December 2013. To facilitate the Awards Committee select the final awardees, nominations are called for the following awards:

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of the Award</th>
<th>Criteria</th>
<th>To be nominated by</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Best Student Branch Award</td>
<td>Good standing – during 2012-13 and currently, large student strength &amp; large number of activities as defined in the specified form</td>
<td>Student Branch Counsellor (SBC)</td>
</tr>
<tr>
<td>2.</td>
<td>Largest Student Branch Award</td>
<td>Continuous good standing for the past 3 years with highest 3 years averaged strength</td>
<td>Decided by ED</td>
</tr>
<tr>
<td>3.</td>
<td>Best CSI International Students Event Host Award</td>
<td>Institutional member hosted maximum students competition participated by minimum 10 foreign students</td>
<td>SBC</td>
</tr>
<tr>
<td>4.</td>
<td>Highest Sponsorship of CSI Events Award</td>
<td>Institutional member extending maximum support for CSI events during the last year</td>
<td>SBC</td>
</tr>
<tr>
<td>5.</td>
<td>Faculty with maximum publishing in CSI Publications</td>
<td>Publishing maximum articles in CSI publications over past 3 years</td>
<td>Self nomination</td>
</tr>
<tr>
<td>6.</td>
<td>Paper Presenter at International Conference for Faculty</td>
<td>Presentation of paper at prestigious International Conferences over past 3 years</td>
<td>Self nomination</td>
</tr>
<tr>
<td>7.</td>
<td>Students with maximum publishing - CSI publications</td>
<td>Publishing maximum articles in CSI publications over past 3 years</td>
<td>SBC</td>
</tr>
<tr>
<td>8.</td>
<td>Most Active Student Volunteer Award</td>
<td>One from each Region</td>
<td>SBC</td>
</tr>
<tr>
<td>9.</td>
<td>Best Ph D Thesis Award</td>
<td>Active CSI member, who submitted a high-quality thesis (Thesis quality to be evaluated by a panel of eminent research scientists) leading to acceptance for Ph D degree by a recognized University</td>
<td>Research Scholar who got his/her Ph D during the award year or the research supervisor</td>
</tr>
</tbody>
</table>

To be eligible for the Award, the awardees should be CSI members. Also, wherever applicable, they should belong to CSI Student Branches in good standing during 2012-13 and 2013-14. Forms for nominations are available at www.csi-india.org

The forms are to be downloaded and hard copy nominations should reach Education Directorate, through proper channel as specified in the forms, latest by **12th October 2013**. Education Directorate will verify membership status, student branch strength and the extent to which criteria are met. The shortlist of Awardees cleared and recommended by the Education Directorate will be forwarded to CSI Awards Committee headed by Immediate Past President Mr. Satish Babu. The decision of the Awards Committee will be final and Awardees will be invited to attend CSI 2013 and receive the prizes.

Regional Vice Presidents, RSCs, SSCs, SBCs and Chapter OBs are requested to give wide publicity and encourage nominations.

For enquiries, please contact edawards@csi-india.org

**Rajan T Joseph**
Director (Education)
Computer Society of India,
Education Directorate,
CIT Campus, IV Cross Road,
Taramani, Chennai - 600 113.