The Cloud Ascends in Emerging Markets: Highlights of IEEE CCEM 2013

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A review of the second annual IEEE International Conference on Cloud Computing in Emerging Markets, held last October in Bangalore, India, provides key insights about this important and growing domain.

Within a relatively short time, cloud computing has emerged as a dominant and transformative paradigm in the world of IT, sparking a revolution in enterprise sectors ranging from telecommunications, finance energy, and retail to government, education, utilities, and transportation—with uptake in both mature and emerging markets.

Especially important for emerging markets is the tremendous boost the cloud offers to leapfrog traditional legacy IT systems. Enterprises in emerging markets can go directly to the cloud, just as they have bypassed landline phones and entered the mobile environment directly. Cloud computing accelerates development in the promising world of services on demand and presents impressive opportunities for embracing computing’s power on a scale never before possible. In a country like India, for example, national-scale clouds can foster e-governance, providing the latest economic data and legislative information, making services accessible to the widest number of people, and encouraging full participation in all aspects of civic life.

To encourage adoption of cloud computing in emerging markets, the first annual IEEE International Conference on Cloud Computing in Emerging Markets launched in October 2012, bringing together experts from industry, government, and academia to address the unique challenges and opportunities cloud computing offers for emerging markets, particularly of the Asia-Pacific countries and India. CCEM 2013, which took place in Bangalore, India, this past October, featured prominent keynote speakers, an extensive technical papers program, two expert tutorials, and a broad-based panel discussion, as well as a startup showcase, during which select companies highlighted individual approaches to cloud-based innovation. In addition, during the conference the Computing Innovation Council for India released an important white paper on cloud computing adoption and innovation in India.

Here, we present conference highlights and key insights derived from the presentations.

CLOUD DEVELOPMENTS IN EMERGING MARKETS
Papers presented at CCEM 2013 described recent work ranging from pricing decision-making and emerging market applications of cloud computing to mathematical models for load balancing and virtual CPU scheduling techniques.
For example, one paper proposed mining historical usage data to predict both short- and long-term demand for cloud resources, thereby reducing latency time in cloud provisioning while also improving longer-term planning. Another proposed a fuzzy logic model to assess the quality of software as a service, going beyond service-level agreements to measures of scalability, transparency, availability, agility, and reusability.

At the other end of the spectrum was a paper proposing improvements to virtual CPU scheduling techniques for the kernel-based virtual machine (KVM), such as choosing a better vCPU for direct yield and optimizing for under-commit cases. These techniques have been accepted into the Linux kernel—testimony to the cutting-edge cloud activities now taking place in emerging markets.

Healthcare applications were another important focus for presentations. One paper described a multitenant, secure cloud architecture developed to help Indian healthcare providers obtain a consolidated view of patient data from disparate structured and unstructured information sources. In India, as in other emerging-market countries, electronic patient medical records are not yet standardized. Taking an innovative approach particularly well-suited to such local conditions, the paper’s authors explained the use of crawlers for capturing patient information from different data sources into a cloud data store, ensuring information availability both at a specialty hospital’s headquarters and across satellite locations.

In addition, one of the two tutorials focused on cloud computing as a means to reform the healthcare industry and improve patient experiences. The other tutorial looked at platform as a service in the context of emerging markets.

EXPERT PERSPECTIVES

The conference also provided a forum for eminent international cloud computing leaders to offer expert perspectives and recommendations.

Kris Gopalakrishnan, executive chairman of Infosys, emphasized how the cloud would transform all sectors of life in India, ranging from government to healthcare and education. He pointed out the crucial role government policy must play in fostering cloud services, noting that the greatest challenge for the Indian technical community is to encourage expansion of a highly skilled, cloud-savvy workforce to meet upcoming demand in both emerging and mature markets.

Anurag Srivastava, CTO at Wipro, talked about the revolution in India’s healthcare sector that would be spurred by low-cost mobile sensors and instruments that capture patient data even from remote villages and make it accessible through the cloud, enabling rapid diagnosis and treatment by remotely located doctors and specialists.

Fausto Bernardini, vice president for cloud computing at IBM, argued that the revenue opportunity in the cloud enterprise market is far larger than that in the consumer market, and he portrayed challenges and expectations in terms of performance, reliability, and support for production-grade workloads. He offered a technical overview for an enterprise-class cloud service architecture, based on lessons learned from deploying such offerings around the world.

Manish Israni, vice president at Vodafone India, talked about the importance of a cloud infrastructure that will keep up with his company’s growing subscriber base, enumerated the new services that had to be developed rapidly to meet consumer demand, and described necessary increases in automation to provide efficient service delivery.
Finally, Steve Diamond, chair of the IEEE Cloud Computing Initiative, presented an overview of cloud computing standards development and emphasized the need for technical leaders in emerging markets to “be at the table” to ensure that these standards meet their unique needs.

CLOUD COMPUTING ROADMAP FOR INDIA

One of the most exciting events at CCEM 2013 was Kris Gopalakrishnan’s release of the white paper on cloud computing adoption and innovation in India. Produced by members of the forthcoming Cloud Computing Innovation Council for India (CCICI; cloudcomputing.ieee.org/innovations/ccici, www.ccici.in), this paper represents the work of a body of professionals from industry, academia, and government.

Associated with the white paper is a preliminary roadmap for cloud computing in India (http://cloudcomputing.ieee.org/features/pdf/A_Roadmap_for_Cloud_Computing_in_India.pdf) that proposes three phases of evolution—(1) foundation and adoption, (2) penetration and scale-out, and (3) maturity and global leadership—and defines progress in three focus areas:

- **Usage scenarios.** The roadmap offers a blueprint for establishing national-level, interoperable clouds, based on policies defined by a National Cloud Authority, with the potential to serve as an eventual global model. The roadmap also anticipates that India will pilot clouds in sectors such as health, government, education, banking, and retail that set industry-specific international standards and reference architectures.

- **Open standards and interoperability.** The roadmap envisions an open standards community innovation platform to serve as a proving ground for cloud capabilities catering to the needs of India, while also propelling India’s leadership in fostering global standards and the emergence of India-based global public clouds. It further proposes instituting national-level datasets and issuing community open-data application challenges to spur partnerships across academia, industry, and government, leading to thriving startups and world-class innovation.

- **Innovation ecosystem.** Finally, the roadmap lays out plans for national-level human resource initiatives, coupled with public-private partnerships, to create a globally enviable pool of skilled Indian cloud professionals and drive world-leading research in new computing paradigms that will emanate from converging cloud initiatives, big data analytics, social media, and ubiquitous mobile device and sensor capabilities.

CLOUD-BASED BUSINESS INNOVATION

CCEM 2013 highlighted burgeoning cloud-space startup activity in emerging markets with a startup showcase featuring representatives from the following eight companies who shared approaches to cloud-based business innovation:

- Impel CRM (www.impelcrm.in), a cloud-based customer relationship management system that enables salespeople to qualify leads and share customer information with other team members via their mobile devices;

- CloudMunch (www.cloudmunch.com), an extensible DevOps platform that enables uninterrupted delivery and management of applications and infrastructure including development and testing environments, continuous integration (CI) activity, deployment, and ongoing operations, in addition to providing tools for faster release cycles;

- Wolken Software (www.wolkensoftware.com), an enterprise-class service desk tool that adheres to the Information Technology Infrastructure Library (ITIL) framework and is deployed in the software as a service mode;

- i7 Networks (www.i7nw.com), a suite of products to help enterprises manage security in mobile enablement and “bring your own device” programs;

- Nanobi Analytics (www.nanobianalytics.com), a cloud platform for building analytics applications for information consumers;

- IDOS (www.myidos.com), an application to ensure that financial data is validated, approved, and correct at inception, before it is entered into enterprise resource planning (ERP) for further processing;

- Researching Souls (www.researchingsouls.com), which provides citizen-security application software that allows users to activate preconfigured buttons on mobile devices in the event of criminal or noncriminal emergencies, automatically informing and seeking assistance of police.
and other government authorities; and
• CloudByte (www.cloudbyte.com), a system that enables cloud-scale software-defined storage for thousands of applications in virtualized datacenters.

MOVING FORWARD
The conference concluded with a panel discussion focused on the question “How do we propel cloud-based innovation in emerging markets like India?” This lively conversation highlighted the most likely usage scenarios for cloud computing in emerging markets, the role of interoperability standards to accelerate cloud adoption, and ways to foster an innovation ecosystem spanning startups, academia, government, and industry.

The 2012 and 2013 CCEM conferences have showcased the growing interest in emerging markets for innovative cloud computing development and highlighted the need for more such specialized focus within our field. CCEM 2014 will be held in Bangalore, 15–17 October 2014 (http://ewh.ieee.org/ieee/ccem/index.html), and we invite all those interested in participating to take an active role by submitting technical papers, tutorial proposals, and startup experiences that suggest cloud computing’s wide-ranging development in emerging markets and point to ways for embracing the opportunities the cloud presents.

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COLUMN CONTRIBUTIONS
We welcome short articles (1,200 to 1,500 words) for publication in the Cloud Cover column that address the questions outlined in Computer’s January 2013 issue (S. Murugesan, “Cloud Computing: The New Normal?,” pp. 77–79) or discuss other topics of interest. Submit your ideas for advancing cloud computing or share your experiences in harnessing the cloud at cloudcover@computer.org.