REVOLUTION AND TRANSFORMATION IN INFORMATION TECHNOLOGY

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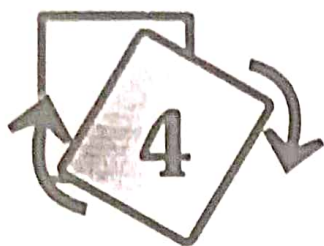Organised by

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THE EMERGING TECHNOLOGICAL TRENDS AND ITS IMPACTS IN SOFTWARE DEVELOPMENT IN THE NEW COMPUTING ERA: A COMPREHENSIVE STUDY

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Abstract

Today's modern fields in all over the world not only rely on information technology, they can't even compete without it. It is integrated into products. The objective of this paper is to understand the new technological trends for the development of software on a secure platform of mobile, social, cloud, and big data/analytics capabilities is impacting business models and processes. Keeping pace with new trends such as mobile, big data analytics, and the growing move towards cloud-based systems has brought new and more challenging issues to the forefront of application development. Application software developers must transform old legacy applications to align with fast changing business needs.

Section I of this paper is about the emergent need 'Just-in' Technology in modern world.

Section II of this paper is about various emergent trends to be implemented in modern software development process such as: (i) Triumph of public clouds, (ii) Hybrid cloud, (iii) Micro service architecture, (iv) Liquid computing, (v) Container madness, (vi) Machine learning, (vii) End of Network switches, (viii) 3D Printing, (ix) Innovate for "Third platform, (x) Design for hybrids, (xi) Open source and embedded systems, (xii) Digital tools in commerce and (xiii) Software skills in demand industry.

Keywords: Cumulative Aggregate Growth Rate (CAGR), International Data Corporation (IDC), Infrastructure as a Service (IaaS), Network Function Virtualization (NFV), OSS (Open Source Software).

INTRODUCTION

Section I: Emergent Need of 'Just-in' Technology in Modern World

The new century has been defined by "application of and advancement in information technology. Information technology has become an integral part of our daily life". Information technology has served as a big change agent in different aspects of business and educational, nanotechnology, biotechnology, cognitive science, robotic, artificial intelligence, agriculture, medicine, military, satellite advancement and application of information technology are ever changing. Some of the Information Technology has supported miniaturization of electronic circuits making many products portable, for example, computers, phones, etc. Information technology has helped development in communication technology by making it affordable. Penetration rate of mobile phone is higher than ever before with greater coverage and with ever lowering cost. The concept of big data has become reality, with development of high memory storage devices in different structures.

Section II: Emergent Trends to be Implemented in Software Development Process

(i) Triumph of Public Clouds: Cloud computing is, therefore, a type of computing that relies on sharing a pool of physical and/or virtual resources, rather than deploying local or personal hardware and software. IDC estimates the CAGR for the Public Cloud at 23.5%, which is five times the growth rate of the IT industry overall. This expansion can be seen in the growth of the infrastructure supporting the Cloud. Microsoft deploys a million serve more than double the number attributed to Amazon two years ago. Although Google estimate of 1.8 to 2.4 million total Google servers.

(ii) Hybrid Cloud: A Hybrid cloud is an integrated cloud service utilizing Therefore, an organisation can maximize their efficiencies by employing public cloud services for all non-sensitive operations, only relying on a private cloud where they require it and ensuring that all of their platforms are seamlessly integrated. Hybrid cloud models can be implemented in a number of ways:

- Separate cloud providers team up to provide both private and public services as an integrated service.
- Individual cloud providers offer a complete hybrid package.
- Organizations which manage their private clouds themselves sign up to a public cloud service which they then integrate into their infrastructure.

In practice, an enterprise could implement hybrid cloud hosting to host their e-commerce website within a private cloud, where it is secure and scalable, but their brochure site in a public cloud, where it is more cost-effective and security is less of a concern. Alternatively, an IaaS offering hybrid cloud shown in Fig. 1.
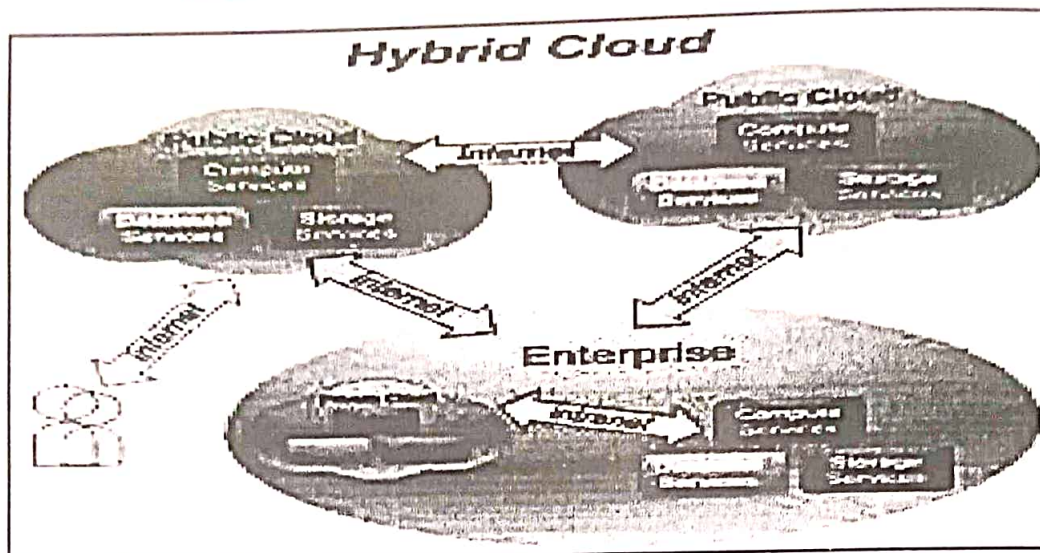
Fig. 1: Hybrid Cloud Structure

(iii) Micro Services Architecture: Developing a server-side enterprise application. It must support a variety of different clients including desktop browsers, mobile browsers and native mobile applications. The application might also expose an API for third parties to consume. It might also integrate with other applications via either web services or a message broker. The application handles requests (HTTP requests and messages) by executing business logic; accessing a database; exchanging messages with other systems; and returning a HTML/JSON/XML response. The application has either a layered or hexagonal architecture.

- Presentation components – responsible for handling HTTP requests and responding with either HTML or JSON/XML (for web services APIS)
- Business logic – the application's business logic
- Database access logic – data access objects responsible for access the database
- Application integration logic – messaging layer, e.g., based on Spring integration.

There are logical components corresponding to different functional areas of the application.

(iv) Liquid Computing: This is not another form of hardware or processor like quantum computing. As with many technology driven discussions, the focus is on mobile computing. The case is being made, and pursued, by companies such as Apple and Microsoft that the data businesses uses is fluid over a number of devices – smartphones, tablets and laptops.

The idea of having data shared and available on multiple devices in real time is the latest concept being explored for mobile computing. The short version is that you can be working on a smartphone compiling a spreadsheet, shut it down, when your battery runs low for example, and then turn on your desktop at work and pick up exactly where you left off. No saving, copying, or storing it anywhere beyond the individual user, businesses would be able to use liquid computing to have real-time collaboration between any number of team members and instead of waiting to see the final result, you are actually able to see what someone else is doing. Therein is the important difference.

(v) Multi-cloud Management: Clouds tend to be big, complicated platforms. The more you build on any platform, the more you become dependent on its unique features – and in the case of a public cloud, the more you're locking yourself into a platform owned and operated by someone else. Tools to manage deployments across multiple clouds emerged a while ago and are gaining more

traction. CliQr, a multi-cloud management startup backed by Google Ventures, claims to be able to determine dynamically which clouds should run which workloads.

There are many benefits of multi-cloud management, especially for IT executives who need help managing basic infrastructure lifecycle tasks on various clouds. This allows users to reap the efficiency benefits of a third-party provider, while removing a lot of challenges associated with traditional infrastructure. Multi-cloud management integration can give customers access to a familiar interface, usually an on-premise virtualization tool, to access instantly scalable resources in the public cloud. While this multi-cloud scenario is not necessarily a way to gain a competitive advantage from cloud, it can make the day-to-day lives of IT staff easier.

(vi) Container Madness: It is still in full force with more big name vendors like AWS, Google, Red Hat, IBM, Microsoft and VM ware jumping on the container bandwagon that Docker got rolling. The madness is also fueled by container technologies driving changes in the Docker doesn't seem to be worried with the growing competition from the big names in tech or the smaller ones like Core OS's Rocket. As the *de facto* leader in the space, Docker is still going strong and recently announced new Docker Raises $95M Series D Round for its Container Platform. They are investing heavily in their go-to-market strategy as well as the technology stack where they plan to expand the platform's capabilities with a focus on networking, security and storage tools around their service. Docker's David Messina cited the acquisition of software-defined networking startup Socket Plane as an example of how their focus on moving Docker forward in these areas.

(vii) Endpoint Security Innovation: Enterprise security will remain in a desperate state as long as systems remain unpatched and untrained users continue to accidentally download malware. Nonetheless, I've been impressed with several new security solutions that emerged this year. The first innovative search techniques to interrogating endpoints across the enterprise Interesting solutions for mobile have appeared as well – and not just fingerprint reading. Several Bluetooth LE proximity solutions enable you to use your smartphone as a security key or pair a physical token with a mobile device for proximity-based authentication. More recently, Android 5.0 Lollipop introduced "trusted places," which uses location to remove password or pin code gates when you're in a zone you feel secure about, such as your home or office.

(viii) Machine Learning: This is pretty much the new name for artificial intelligence. On the one hand, it's important not to overpromise the near-term potential of machine learning. On the other, it's essential in making sense of big data, and open source projects like Mahout Spark/MLlibare easing the path. IBM is mainstreaming that idea by opening Watson APIs while startups like the Andreessen-backed are applying today's abundant compute horsepower to revive neural net algorithms.

(ix) The End of Network Switches: No, we won't see network switches disappear in 2015. But virtual network devices, software-defined networking, and the abundant horsepower of servers are leading to a major rethink of the data center network. The long-term prospect of the network being reduced to "the wires between the servers" is becoming more real.

Cumulus Linux brings the network control plane to industry standard hardware, and within reach of today's server orchestration tools, while preserving wire-speed network operations. A recent Open Flow project released by Infoblox called Lincx this year shows the potential power of a completely software-programmable network. Meanwhile, NFV – leveraging server virtualization and data center orchestration to deliver load balancing and firewalling.

(x) **3D Printing:** 3D printing or additive manufacturing is a process of making three-dimensional solid objects from a digital file. The creation of a 3D printed object is achieved using additive processes. In an additive process, an object is created by laying down successive layers of material until the entire object is created. Each of these layers can be seen as a thinly sliced horizontal cross-section of the eventual object. 3D printing process – It all starts with making a virtual design of the object you want to create. This virtual design is made in a CAD (Computer Aided Design) file using a 3D modeling program (for the creation of a totally new object) or with the use of a 3D scanner (to copy an existing object). A 3D scanner makes a 3D digital copy of an object. Fig. 2 shows 3D printing process.
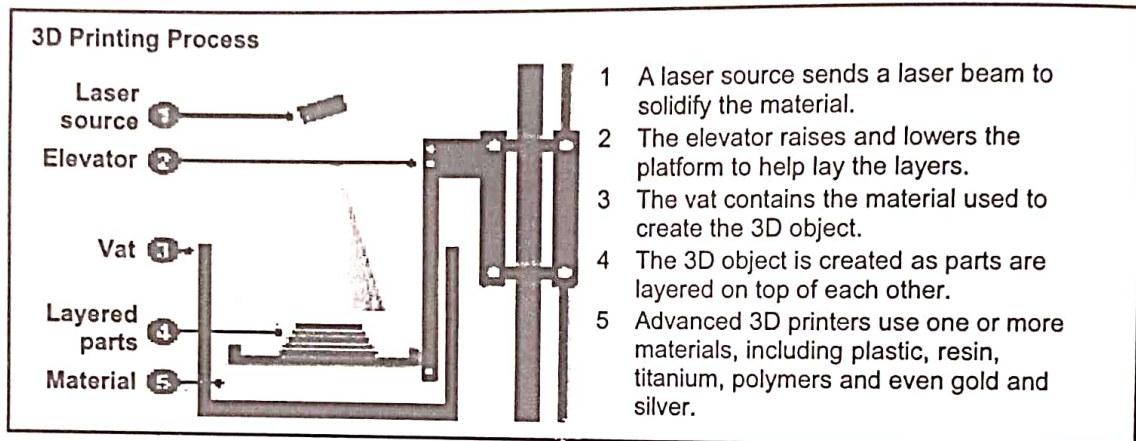

3D Printing Process

Laser source	1	A laser source sends a laser beam to solidify the material.
Elevator	2	The elevator raises and lowers the platform to help lay the layers.
Vat	3	The vat contains the material used to create the 3D object.
Layered parts	4	The 3D object is created as parts are layered on top of each other.
Material	5	Advanced 3D printers use one or more materials, including plastic, resin, titanium, polymers and even gold and silver.

Fig. 2: 3D Printing Process

(xi) **Software Tools in Commerce:** Commercial fields today use software tools.

1. **Google Analytics:** The first tool is one that every business should have on their web store website..

2. **Mail Chimp:** E-mail marketing is still essential to the success of any website. This is especially the case when e-mail is the preferred methods of communication among consumers..

3. **Google Ad Words:** Most effective methods of traffic acquisition and sales promotion – whether through search, display, or both – having a highly focused search strategy for the holiday season is a must for e-Commerce.

4. **Topsy:** Taking the industry by surprise with a recent purchase by Apple for $200 million, Topsy has solidified its place as a major social analytics player. The platform offers an array of valuable features including the identification of influencers, trends among specific keywords, and with a little savvy, the ability to analyze your competitors' performance on social.

5. **Sprout Social:** Although most businesses use Hoot suite, Sprout Social remains as my favorite social media monitoring platform. Offering a slew of features that you can't get from Hoot suite in a very user-friendly way, those who are highly engaged in social will find that this platform pays in dividends if you are willing to put up a little extra cash. Some of my favorite features are their aggregation of all social activity and mentions into a simple "messages" format and their many exportable reports.

6. **Online Conversion Insights:** Knowing your conversion process is of utmost importance when trying to optimize and identify problematic areas of your funnel.

7. **Adroll:** Last, but certainly not least, is Adroll. Identifying itself as the leading retargeting platform, AdRoll is a must for retailers that want to recapture the attention of visitors that did not buy—or did not buy enough. Although many choose to keep their retargeting efforts in AdWords using their remarketing platform.

(xii) High Demanded Software Skills in Industry: Hiring requirements for thousands of tech companies and consulted with our top tech recruiters to determine which software development skills will be the most in-demand in 2014. "While heavyweights like Java and C# remain in demand, we are seeing strong growth in mobile and big data technologies like HTML5, CSS3 and Hadoop," says CyberCoders CTO Matt Miller.

(1) Java/java Script, (2) C#/ASP.Net, (3) C++, (4) Python, (5) PHP, (6) SQL/MySQL, (7) HTML5/CSS3, (8) Ruby on Rails, (9) Hadoop and (10) ios/Android.

(xiii) 3D Platform Integration Platform: The advent of the Internet of Things has led to a proliferation of consumer devices in the business that need to access enterprise applications and data. Our 3D Platform Integration. Fig. 3 shows platform integrated environment.
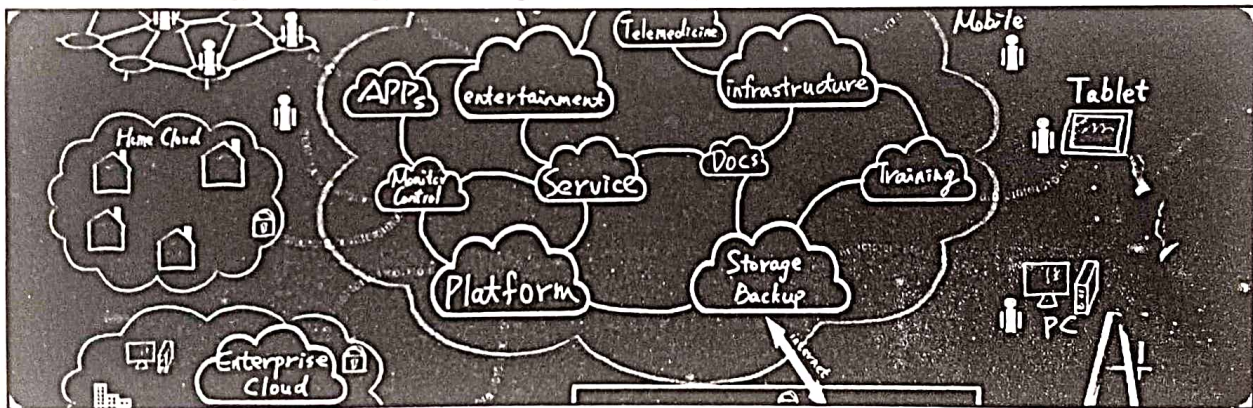

Fig. 3: Integrated 3D Platform Environment

Services help you unlock data, events and processes from silo systems, allowing you to innovate with your existing assets. A message-oriented middleware solution, our 3D Platform Integration Services operate between the various enterprise applications and enable communications among them. In other words, you can now create valuable new applications and processes from previously isolated data sources through application programming interfaces (API).

This will not only increase your flexibility to scale from point solutions to enterprise-wide deployment but also enhance your ability to manage change requirements through an easy plug-in and plug-out system.

(xiv) Open Source in Embedded Systems: Embedded device and systems manufacturers use open source software (OSS) to build products faster, better and cheaper. While the benefits of open source are well-known, the fact that *ad hoc* use limits these potential benefits and may expose your organization to challenges is lesser known. Device companies that employ industry best practices use 60% to 80% open source code in their products.

Using open source at significant scale requires proactive management, especially to ensure compliance. However, few organizations have implemented proactive governance solutions to optimize OSS benefits. Gartner predicts that 50% of companies will face challenges due to lack of open source policy and management. In order to maximize the benefits of open source while ensuring

that the proper controls are in place, your organization needs to employ a program that encompasses a combination of strategy, policy and technology. Collection of open source EDA tools that forms part of the standard Fedora Linux distribution. Compiler tool chains whether you have physical hardware or only a model, you will need a compiler tool chain and associated CASE tools. For compilation, the GNU Compiler Collection (GCC) has dominated for the best part of 25 years, and supports nearly 40 architectures in its standard distribution, with a wide range of languages (C, C++, Java, Objective C/C++, Fortran and Ada as standard).

CONCLUSION

As the future is uncertain, the only thing relatively clear is that much of what we will experience in the future will be different from the past. We must understand it is not information or even technology that will produce this unprecedented change, but the impact of technology on all aspects of human life; not computers or even bits and bytes, but the ability to apply and integrate rapid technological change in the field of business, medical, telecommunication and education.

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