RapidValue™
Enabling Mobility

THE ADOPTION OF CLOUD TECHNOLOGY BY ENTERPRISES

Trends, Reasons and the Future

A RapidValue Solutions Whitepaper

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Executive Summary

If we go back in time, people were dependent on the physical computer storage or servers in order to run their programs. Now, with the introduction of cloud computing, people, organizations and enterprises are able to access their programs through the Internet. Cloud computing is gaining prominence, rapidly, and the popularity is growing, each day. Cloud computing is big business, today. According to PC Magazine, it was, already, generating around $100 billion a year in 2012. It is forecasted to increase up to $270 billion by the year 2020.

Enterprises and organizations, these days, are relying heavily on the cloud services and cloud platforms to obtain resources on-demand and that too, in an automated manner. Organizations can, now, only pay for the resources that they use. Enterprises, also, relinquish unnecessary resources with the help of using a self-service portal. This serves as a big cost-effective solution, as you can eliminate the need for investing a huge sum of money as capital investment.

This paper addresses the primary reasons for the enterprises migrating to the cloud infrastructure, various types of cloud deployment (technology & services) models IaaS, PaaS, SaaS, public cloud, private cloud and hybrid cloud, feature comparison of three popular cloud platforms - AWS, Microsoft Azure, Google Cloud and some examples of how enterprises and consumers are using the cloud technology.

Did you know?

- The global cloud computing market will grow to more than $241 billion by 2020
- More than 60% of enterprises will have at least half of their infrastructure on cloud-based platforms by 2018
- By 2018, the public cloud spending will be more than double and it will rise to $127.5 billion
- 80% of cloud adopters believe that it helps their organization reduce IT costs
- 82% of enterprises have a hybrid cloud strategy, up from 74% in 2014

Source: Forrester, Digital Business, IDC, TCS, Right Scale

As you read further, the paper presents a case study of a leading telecom industry, which draws upon RapidValue's experience, with helping enterprises, succeed in the complex and evolving technology ecosystem.

Why Cloud? - Key Benefits

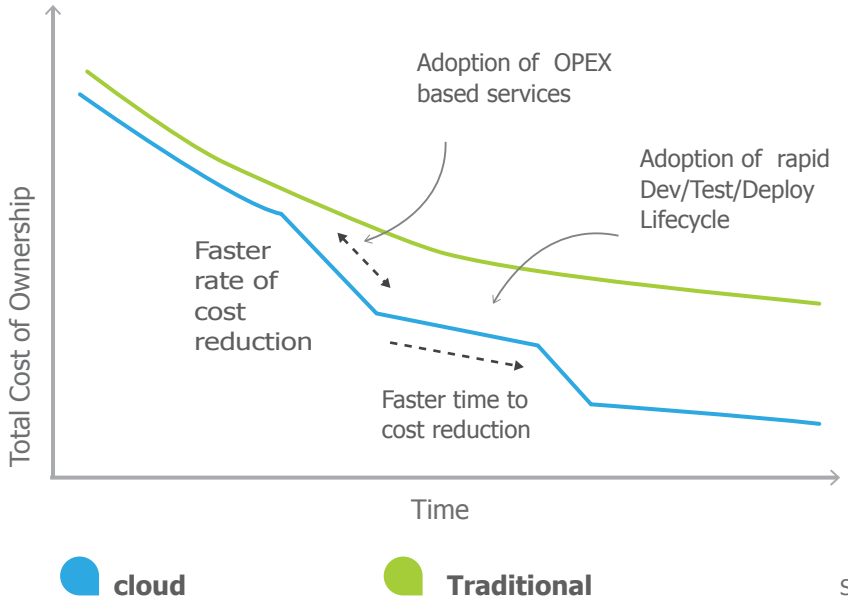
We, often, wonder why enterprises are going 'the cloud' way. There are several reasons behind this transition. The cloud technology helps organizations to redesign their IT infrastructure.

In addition, to lowering the cost for enterprises, there are manifold benefits of cloud technology. The effective features of the cloud solutions are agility, scalability and sustainability. Cloud technology is characteristic of reliability and faster time to market. It develops prototypes with increased efficiency. Other important aspects of the cloud technology are storage and disaster recovery.

The cloud services are considered to bring in a kind of reverberation in the IT landscape. The rate of adoption of the cloud technology services is increasing at an alarming rate. This section, explains in detail, some of the primary benefits offered by the cloud technology.

1. **Cost Saving -** If you are opting for the cloud you are, actually, helping your business to save money in many ways. It eliminates the need to invest in storage hardware and other physical infrastructure, like the servers. You do not have to employ a technical team to maintain the infrastructure. Depending on the plan, that you opt for, you pay for the cloud service, for a specific duration of time.

   The graph illustrates the speed of reduction, in cost reduction, by adopting cloud solution.



Source – The Open Group

Moving to Cloud can reduce Total Cost of Ownership (TCO) of Infrastructure by 50 to 75% over time.

2. **On-Demand Scalability** - Cloud computing provides infinite computing resources to the users. In cloud computing, the resources claim to show rapid elasticity. Resources can be provisioned or released according to the demand. Cloud services are able to handle the traffic demand, as the resources can be expanded, elastically. When the demand tends to get subsided, the resources, which are not needed, are, then, released, automatically.

3. **Resilient -** Resiliency is important for any enterprise, since organizations depend on digital data to run their day-to-day operations. Cloud technology platforms have proved to be more resilient than the traditional storage solutions. This means, if a part(s) of the cloud platform fail(s), then the rest of the platform resources are able to function, until the problem/issue is solved.

4. **Superior Performance -** One of the most popular feature of cloud computing is that all your applications are updated, automatically. Cloud computing allows the employees to operate from any location as long as they have a good Internet connection. The employees can synchronize their documents in high speed and it appears as if they are working from an office room.

5. **High Security -** In the current scenario, organizations agree that cloud technology enforces the best security policies. These policies ensure that the unauthorized parties do not get access to your data and are not able to modify them. You, no more, have to fear about losing your data. Cloud technology ensures proper protection of data and information. It, also, ensures that cloud networks and connections are secure. Evaluating security controls on physical infrastructure and facilities is a high priority task for Cloud computing. It enforces privacy policies and manages security terms in the cloud SLA. With the adoption of cloud technology services, you can be pretty assured that your data remains safe, regardless of what happens to your infrastructure.

6. **Anytime, Anywhere Network Access -** The network access is ubiquitous. Cloud computing facilities can be accessed from anywhere over the network – personal computers, laptops, tablets, phones etc.

7. **Development and Testing -** During development and testing processes, cloud computing works in the most effective manner. Cloud computing secures a budget. It is said to set up your environment, through physical assets, with significant manpower and in a much shorter span of time.

8. **File Storage -** Cloud computing offers you the possibility of storing, accessing and retrieving your files from any web-enabled interface. These web services' interfaces are very simple. High availability, speed, scalability and security for your environment can be obtained at any time and from any place.

9. **Disaster Recovery -** Disaster Recovery is yet another benefit which is derived from using cloud services. The cost effectiveness of a disaster recovery (DR) solution, which is provided by cloud computing, gives you a faster recovery. This is much advanced than the traditional DR site, which has rigid procedures and a much higher cost.

10. **Backup -** The Backing up of data has always been a tedious, complex and time-consuming task. With cloud, this operation is, also, taken care, in a much efficient manner. Cloud computing ensures that whenever a backup is performed, it is not prone to problems like running out of backup.

11. **Customer Centric -** Cloud services are very much customer-centric and help in the transformation of the business. The various features of cloud computing, which are flexibility, secured, affordability, economical, scalability, and convenience, have made it immensely popular among enterprises and assist in redesigning the IT infrastructure.

12. **Focusing on the Core Business -** Cloud computing is convenient since your systems and applications will run over the Internet. You do not have to be concerned about the technical problems and other issues, for instance, problems with regards to physical storage spaces. There is, absolutely, no need for you to be concerned about the backup issues, which is a great relief. Enterprises can run their business operations, in a better way and much more effective manner.

The Cloud Deployment Models

There are several types of deployment models available to host systems and applications on the cloud.

Technology Models

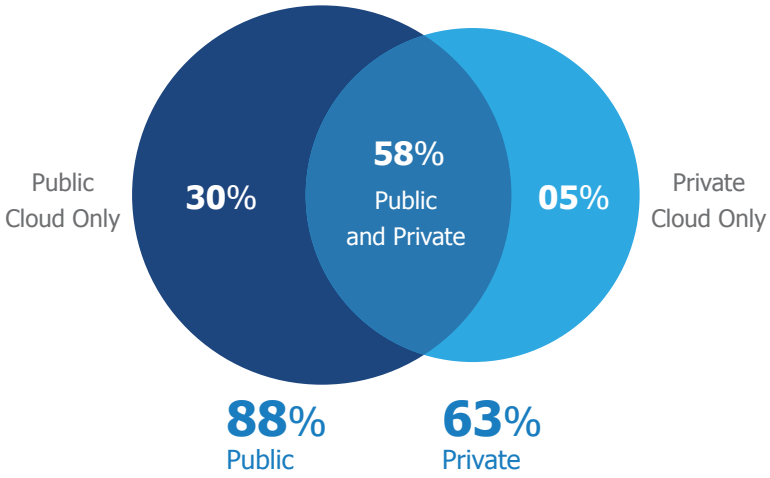
The three most popular cloud computing models are:

01. **Public Cloud -** Computing resources, provided by a cloud, have been adopted by various organizations and enterprises, through the public Internet. Cloud providers ensure that there is a kind of separation for the resources that are used by different enterprises and organizations. It is based on the standard cloud computing model. The service provider builds resources - the applications and storage. These resources are available to the public through the Internet. Public cloud services can be obtained, either, free or bought on a 'pay-per-usage' model.

02. **Private Cloud -** Cloud infrastructure is, entirely, owned by the enterprise and maintained, either, by the enterprise or a third party. It can be located either on-site or off-site. Private cloud is a cloud computing platform, which is implemented within the corporate firewall. It is under the control of the IT department. A private cloud is designed in such a way that it offers the same features and benefits of the public cloud systems. But, private cloud removes a number of objections to the cloud computing model. This includes control over the enterprise and customer data, issues about security, and concerns connected to regulatory compliance.

03. **Hybrid Cloud -** Hybrid cloud is considered to be the combination of any type of cloud model mentioned above, connected by a standardized technology. It is a combination of, on and off premises. Hybrid cloud offers best of both the worlds. And performs distinct functions, within the same organization.

Hybrid Cloud is the most preferred strategy



7% respondents are not using cloud

Source – RightScale 2015 State of the Cloud Report

Adopting a hybrid cloud approach is said to support the testing application workloads. This provides the comfort of an environment, without the initial investment, that might have been rendered useless, should the workload testing fail.

Another use of the hybrid cloud is the ability to expand during periods of limited peak usage. Moreover, there is one more deployment model which is still gaining popularity; especially in the healthcare industry, is the community cloud.

04. **Community Cloud -** As for Community cloud, the cloud infrastructure is said to be owned and shared by multiple organizations, with a shared concern.

Service Models

On the services side, there are three key service models in cloud computing:

01. **Infrastructure as a Service (IaaS) -** It is the delivery of computing infrastructure as a service. IaaS is using an existing infrastructure which can be adopted on a pay-per-use scheme. Because of this reason, it has become an obvious choice for the organizations. Companies find it useful as they can save on the infrastructural cost. In this way, organizations can obtain, use, maintain and manage the IT infrastructure.

02. **Platform as a Service (PaaS) -** Providers deliver not only infrastructure but also middleware (databases, messaging engines etc.) and solution stacks for the application, build and development and deploy.

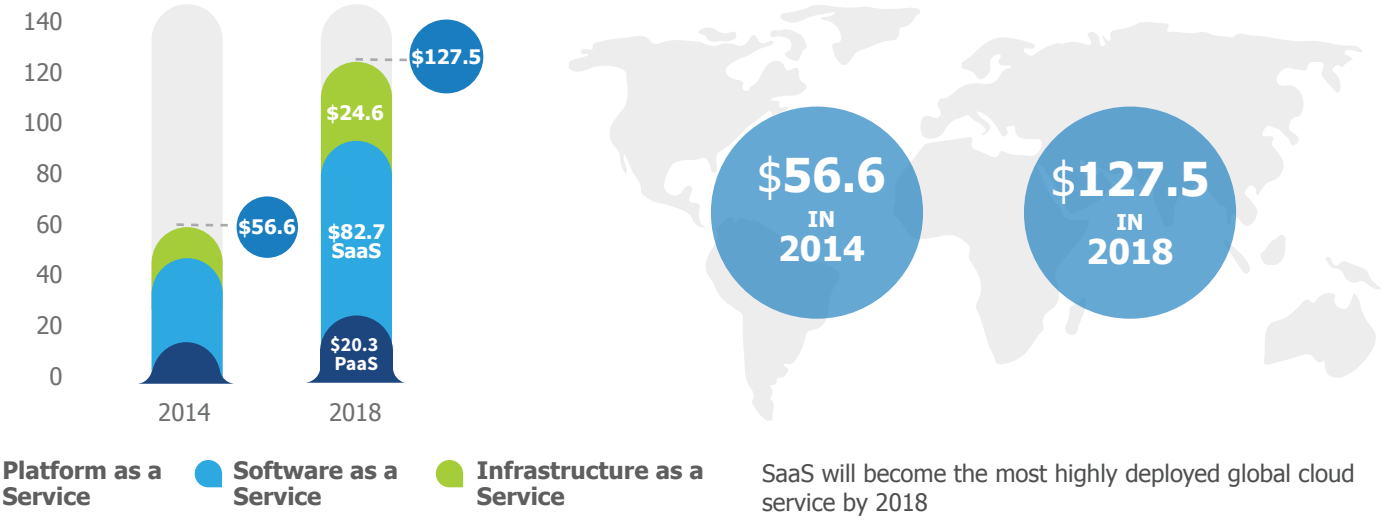
    Organizations are willing to get PaaS for the same reasons. Enterprises desire for speed. They want the server's speed to increase, in order to deploy the applications.

03. **Software as a Service (SaaS) -** Applications, which are hosted by a provider on a cloud infrastructure. These applications are accessed over the network or they are accessed over a program interface, for instance, web services.

According to Gartner, the worldwide SaaS market would grow at an astounding yearly growth rate of 20.2%. This, clearly, means that the market will be expanding from a number of $18.2 billion in the year 2012 to $45.6 billion in 2017.

The growing cloud technology

Worldwide public IT cloud services spending by segment (In $ Billions)



SaaS will become the most highly deployed global cloud service by 2018

Mobile Backend as a service (MBaaS), Storage as a service (STaaS) and Communications as a service (CaaS) are three variants which emanates from the above service models.

For more details on MBaaS, please read the whitepaper, 'How MBaaS is changing Enterprise Mobility Landscape'

"Cloud technology has changed the way we use the Internet. It offers the right solution for developers to build, test, secure and deploy applications, cost-effectively and supports quick go-to-market strategy. Even, our customers are moving towards the cloud approach. Mainly because of two reasons - It allows their employees, fast access to data from any location from any device and also supports seamless scalability. Enterprises, planning to enable millions of app users, in phases, must seriously consider migrating their IT infrastructure, systems and applications to the cloud.

- Rinish Nalini, CTO, RapidValue Solutions

Examples - Use cases, Reasons for Migration and Popular Cloud Technology Providers

CIOs are trying to craft out well-planned strategies that include cloud technology services. Hence, more and more companies have started to adopt cloud services. The increased competition in the cloud space will pave the way for better products, efficient services and greater innovation. It is expected that, as cloud services gain more popularity and continue to get adopted by the organizations, a large number of application developers will be seen as developing for the cloud.

This section illustrates some of the ways 'the cloud' is being implemented by enterprises and the global cloud technology providers.

Service Deployment Model	Use Cases	Reasons for Migration	Popular Platform/ Service Providers
IaaS	• Enterprise Infrastructure • Virtual Datacenters • Data Warehousing	• Location agnostic • On-Demand scalability • Effective resource management • No hardware investment • Highly redundant - no single point of failure	• Amazon • Citrix • Microsoft • VMware • IBM • Google
PaaS	• Tools for design and development • Scripting environment • Operating Systems • Virtual Databases • Hosting Servers • Data Processing	• In-built tools and frameworks for easy application development • Faster deployment time • Centralized platform and app management • No investment in physical infrastructure • High security for data and backup and recovery	• Amazon • Google • Microsoft • Cisco • HP • EMC
SaaS	• Content Management System (CMS) • Social Media Sites • Enterprise Websites • Customer Relationship Management (CRM) Apps • E-Commerce	• Device agnostic • Anytime, anywhere access of applications • No initial setup costs • Subscription based payment model • Adding new users is easily scalable • Seamless update of new features releases	• Salesforce • Google (Gmail) • Shopify • Zoho • Yahoo! • Dropbox • Box

Technology Deployment Model	Popular Technology Providers
• Private Cloud	• RackSpace, Amazon, Microsoft, Citrix, Google
• Public Cloud	• RackSpace, Amazon, Microsoft, Dell
• Hybrid Cloud	• VMWare, HP, IBM

Note: Most players have offering in all three – Private, Public and Hybrid.

Feature Comparison - AWS, Microsoft Azure and Google Cloud

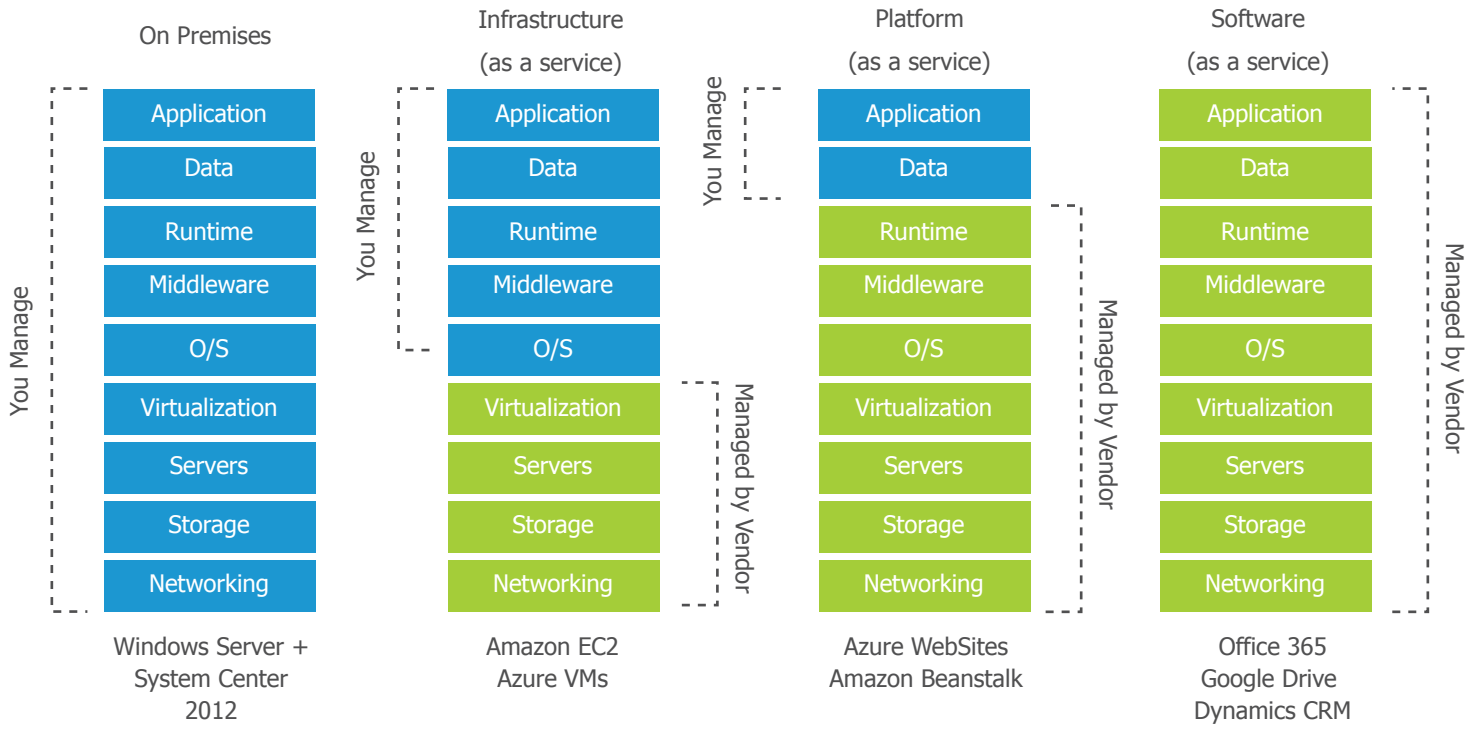
There are several technology players offering cloud computing platform and services. The three most popular global providers are Amazon, Microsoft and Google, in the IaaS and PaaS categories. This section explains some of the key features available in these three cloud platforms.

Sno.	Parameter	Amazon Web Services (AWS)	Microsoft Azure	Google Cloud
1	Definition	Comprises large collection of remote computing services and products	Enables enterprises to move faster, save cost and integrate on premises apps and data	Enables developers to build, test and deploy applications on Google's highly-scalable and reliable infrastructure. Comprises computing, storage and application services for your web, mobile and backend solutions
2	Deployment Model	IaaS, PaaS	IaaS, PaaS	IaaS, PaaS
3	User Segment	Large Enterprises, SMEs, Start-ups	Large Enterprises, SMEs	Large Enterprises, SMEs
4	Key Stack Components	• Amazon EC2 • Amazon RDS (Database management) • Amazon S3 (Storage) • AmazonVPC (Virtual Private Cloud) • Amazon CloudFront • ElastiCache • Elastic Load Balancing • Elastic MapReduce	Large Enterprises, SMEs	Large Enterprises, SMEs

Features				
5a	Compute	Resizable compute capacity - auto scaling to manage automatic resources computing	• Provision Windows and Linux Virtual machines and applications • Create highly available and infinitely scalable apps and APIs • Deploy windows client apps to run on any device	• Provision Windows and Linux Virtual machines and applications • Create highly available and infinitely scalable apps and APIs • Deploy windows client apps to run on any device
5b	Container Service	Provides automatic cluster management	Information not Available	• Provision and maintain the underlying virtual machine cluster • Scaling your application • Operational logistics like logging, monitoring, and health management
5c	Networking	Supports creation of virtual network, customization of network configuration and multiple layers of security, including security groups and network access control lists	Provision virtual and private network, to optionally connect to data centers	• Reliable, resilient, low-latency DNS, serving from Google's worldwide network of Anycast DNS servers • Connect your network to Google's directly or via your carrier or VPN • Network connects the company's data centers, resulting in high performance (queries responded in milliseconds) • Allows Google to offer 3D maps and translation APIs
5d	Load Balancing	Automatic distribution of incoming application traffic	Traffic manager balances the incoming traffic for high performance and availability	Balances load between compute engine instances, using either HTTP or Network (TCP/UDP)
5e	Storage	• For backup, archiving, and disaster recovery, as well as block, file, and object storage • Highly redundant data storage infrastructure for storing and retrieving any amount of data	• SQL database • NoSQL database • Highly Durable, massively scalable, available storage • High throughput, low latency data access • Search option available	• Handles replication, patch management and database management to ensure availability and performance • Store and manage data using a fully-managed, relational MySQL

		• Secure, low cost storage with high durability and availability	• Better security and lowers cost	database • NoSQL, schemaless database for storing non-relational data • Durable and highly available object storage service • Highly Redundant - Multiple points of presence across the globe. Data is, automatically, mirrored across storage devices in multiple locations
5f	Content Delivery	• Easy way to distribute content to end users • High data transfer speeds, and no commitments • Caches copies of your static content close to viewers, with low latency	• Delivers content through global network of data centers • Supports media files - encode, store, stream video and audio at scale	• App engine acts as a dynamic content delivery network • Faster response time, with quick image loading
5g	Analytics	Processes and analyzes any volume of data, for managing Hadoop clusters, real-time streaming data, data warehousing, or orchestration	• Machine learning for predictive analysis • Real-time stream processing • Provision Hadoop clusters management • Orchestrate and manage data transformation	• Analyze Big Data in the cloud with BigQuery • Large scale data processing scenarios such as Extract, Transform, Load (ETL), analytics • Real-time computation, and process orchestration
5h	Deployment and Management	• Management of credentials for access to AWS services • Monitor the applications, to create and update stacks of AWS resource • Deploy applications • Log API activity	• Visual Studio online to plan, build and deploy apps • Application Insights to resolve issues • Preview portal • Process automation • Operational Insights • Seamless integration of enterprise and cloud • Synchronize on premise directories and single sign-on	• Allows developers to design, share, deploy and manage complex cloud platform solutions using a simple, declarative templates • Google Cloud SDK contains tools and libraries that allow you to create and manage resources on Google Cloud Platform • Connect Google Cloud to application using Android Studio IDE

				• Provides tooling, API support and easy deployment • Gain insight into the performance and availability of your applications • Manage all logs such as data syslog, Apache request logs, activity logs, and logs from more than two-dozen other preconfigured open-source packages
6	Security	• Distributed denial of service (DDoS) protection • Built-in firewalls • Password brute-force detection • Multi-factor authentication • Identity and Access Management (IAM) tool allows to control the level of access your own users have to your AWS infrastructure services • Private Subnets • Encrypted data storage • Dedicated connection option • Security logging	• Intrusion detection and DDoS • 24 hour monitored physical security • Centralized monitoring, correlation, and analysis systems • Patch management processes for virtual machines • Zero standing privileges • Network isolation to prevent unwanted communications between deployments, and access controls block unauthorized users • Option to choose to assign multiple deployments to an isolated virtual network • Encrypted communications. Built-in SSL and TLS cryptography • Wide range of data encryption capabilities	• App Engine leverages Google's highly secure, reliable infrastructure • App Engine's Datastore accommodates growth in user data and OpenID/Single Sign-On • Patch management and database management to ensure availability and performance
7	Administration	• 24x7x365 customer service • Support forums etc.	• 24x7 technical support • 99.95% compute SLA	• Single console to view and manage all the applications • View the performance of your applications and manage your account and billing with a simple interface • Access trained experts 24x7 over the phone, in English or Japanese with gold support package



Source: Presentation published by Software University

Case Study: CMS Driven Self-Service Application

About the Customer

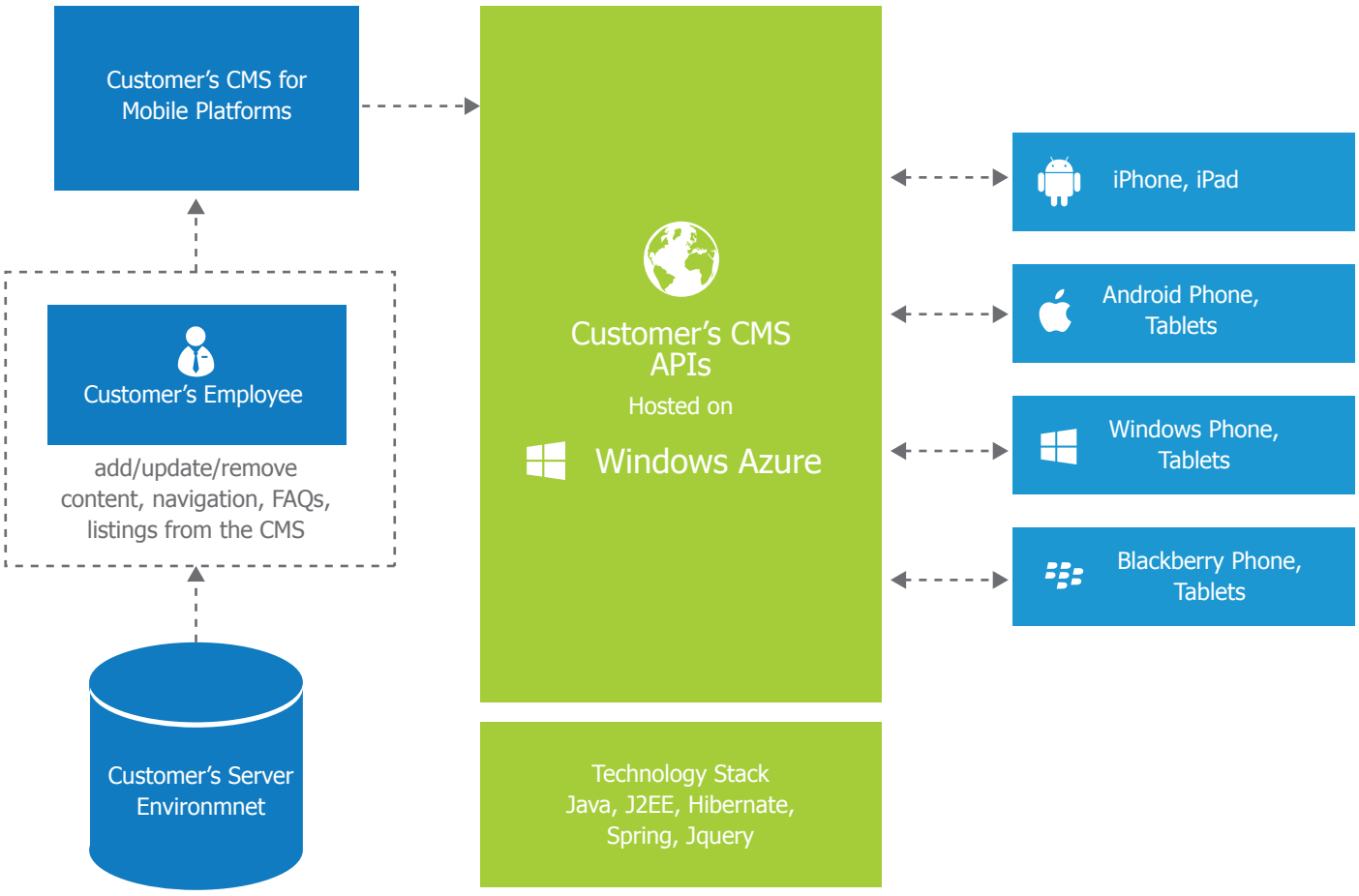
The customer is one of the leading telecom service providers in U.A.E. They provide mobile, telephony, Internet, IPTV services to homes, individuals and businesses.

The Situation

The customer had a web presence and wanted to build a mobile presence. They wanted to enhance multiple self-service functionality for their mobile & application subscribers. The customer wanted a high performance architecture set-up for faster data access from the CMS, hosted on the cloud.

Delivering Multi-Channel Solution

RapidValue has partnered with this customer, on their mobile initiatives. We have provided end-to-end services (UI design, app development, testing, integration and deployment). We developed functionalities like live events, latest offers on handsets and plans, credit usage and recharge cards etc. across all device platforms. RapidValue also, built the backend Content Management System (CMS) along with the API development and Integration, hosted on Microsoft Azure. The solution is tested on multiple browsers for performance, system, integration and load.



Key Results

- Increased consumer-base by providing app on multiple device platforms
- Improved end-user experience, with rich UI, easy access to their account balance information and better app performance
- Enhanced the performance, data accessibility and security by integrating and hosting the CMS APIs on Microsoft Azure

The Future of Cloud

If, by now, businesses do not run their computing systems in the cloud, then they are likely to adopt cloud computing in future and that too, pretty soon. It is forecasted that by 2017, two-thirds of all the business processes and procedures will be processed in cloud data centers. Cloud adoption is growing rapidly.

There will be more application availability on the Cloud. With the new software, being built for cloud, it is predicted that, by 2016, over a quarter of all applications, which is around 48 million, will be available on the Cloud. There will be an increased growth in the market for Cloud. According to Gartner, the Cloud is accelerating, globally. Based on Gartner's forecast for 2011-2017, 50% of enterprises will have hybrid clouds by 2017 and SaaS market will be $45.6 billion in 2017.

Enterprises, worldwide, are increasingly relying on Cloud for developing, marketing and selling their products. Other essential tasks like managing the supply chains, and much more, are also streamlined in a better way, with the help of cloud.

What to Expect?

We can expect to experience much more, with regard to moving workloads to the cloud. We can, also, expect to witness more utilities, running against data, to be managed in the cloud. This includes antivirus, enterprise search, file auditing. The Enterprise architects will need to contemplate on how to enable this transition and, that too, in a secure, reliable, and cost-efficient manner.

It is reported, by industry experts, that one of the biggest challenges, this year, has been the proliferation of development platforms in the cloud. Enterprises are, no more, looking for only servers, storage or computing. Organizations are looking for the specific cloud services that they will be able to incorporate into their applications. This will lead to some additional complexity, with regard to the application. This makes performance testing much critical, not only for the application, but for the APIs, too. It needs to be ensured that they are robust enough to manage the load, that is placed on them, by the multiple applications.

The business challenges for the organizations, that lie ahead, are perceived as unpredictable. Therefore, it is the right time for the enterprises to consider cloud computing as their savior.

This whitepaper is written by RapidValue's Marketing team (Nairita Goswami and Kavyanidhi Narayan).

If you'd like more information on cloud technology, you can please contact Shahjahan Tapadar, Cloud Expert/ Technical Architect at shahjahan.tapadar@rapidvaluesolutions.com or Kavyanidhi Narayan, Sr. Manager – Marketing at kavyanidhin@rapidvaluesolutions.com

RapidValue has a team of domain experts and consultants to help you build innovative and comprehensive cloud solutions for your enterprise. If you need guidance on building your first cloud application, please write to contactus@rapidvaluesolutions.com, we'll be happy to hear from you.

About RapidValue

RapidValue is a leading provider of end-to-end mobility and cloud solutions to enterprises worldwide. Armed with a large team of experts in mobility consulting and application development, along with experience delivering global mobility and cloud projects, we offer a range of services across various industry verticals. RapidValue delivers its services to the world's top brands and Fortune 1000 companies, and has offices in the United States and India.

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