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Cloud Computing Simplified: The Thoughts on Cloud Way

A selection of posts published on the IBM Thoughts on Cloud blog

IBM Thoughts on Cloud bloggers team

Cloud

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Abstract

This IBM® RedBlook™ publication is a collection of selected posts published on the IBM Thoughts on Cloud (http://thoughtsoncloud.com) blog. Thoughts on Cloud is IBM's official cloud blog, contributed by hundreds of cloud computing specialists worldwide from IBM and IBM Business Partners. Most of the authors have hands-on experience implementing cloud solutions for various industries. The goal of the blog is to provide readers with a forum to discuss and debate various cloud computing topics.

Starting with the basic building blocks of cloud computing, we cover a wide range of cloud topics in this book. We do not go into details of specific cloud products on the market, so this book serves as a cloud primer for readers who are new to this exciting technology. If you are already familiar with the fundamentals of cloud computing and would like to explore more advanced cloud topics, you can still benefit from this book. Each section is independent of the others, so it is OK to skip the sections you are familiar with and go directly to the section you'd like to read first.

This book has the following sections. After reading this book, you will have a good understanding of all these concepts.

- Fundamentals of cloud computing
- The promise of cloud: How cloud is reshaping our world
- Cloud taxonomy: Deployment and service models
- Going deeper into the cloud: Cloud computing internals, dynamic clouds and composable business
- Cloud and your career
- Considerations for moving to cloud
- Cloud and friends: DevOps, mobile, big data, patterns, software-defined environments, software-defined networking and Internet of Things
- A brief look at the Cloud Open Standards and IBM Cloud Offerings
- What lies ahead for the future of cloud?

Each of these topics is explained using one or more blogs posts that are published on the IBM Thoughts on Cloud blog (http://www.ThoughtsOnCloud.com). Table 1 on page 2 shows the complete list.

Table 1 Blog posts that are featured in this book

Name of the post	Authored by	Other great posts from these authors
“What is cloud computing?” on page 5	Erik Anderson	http://thoughtsoncloud.com/author/eanderson/
“How to explain cloud to your spouse” on page 6	Erik Anderson	http://thoughtsoncloud.com/author/eanderson/
“I am a cloud architect—but how do I explain this to my young son?” on page 8	Diego Andres Sonvico	http://thoughtsoncloud.com/author/dsonvico/
“Five ways cloud computing is like Las Vegas” on page 9	Gary Zeien	http://thoughtsoncloud.com/author/gzeien/
“A brief history of cloud computing” on page 11	Maximilliano Destefani Neto	http://thoughtsoncloud.com/author/mneto/
“Cloud computing basics” on page 12	Shamim Hossain	http://thoughtsoncloud.com/author/shossain/
“The pros and cons of cloud computing” on page 14	Frank Bauerle	http://thoughtsoncloud.com/author/fbauerle/
“Overcoming institutional fears of cloud computing” on page 16	Allan Tate	http://thoughtsoncloud.com/author/atate/
“Cloud computing, data center automation and services on demand: What’s the difference?” on page 17	Rossella De Gaetano	http://thoughtsoncloud.com/author/rdegaetano/
“Top 7 most common uses of cloud computing” on page 19	Maamar Ferkoun	http://thoughtsoncloud.com/author/mferkoun/
“How cloud computing is impacting everyday life” on page 20	Maamar Ferkoun	http://thoughtsoncloud.com/author/mferkoun/
“Can the cloud save a life?” on page 22	Manzoor Farid	http://thoughtsoncloud.com/author/mfarid/
“Nest: A small company and a big disruption enabled by cloud” on page 24	Gerardo Menegaz	http://thoughtsoncloud.com/author/gmenegaz/
“Cloud innovation allows Fitbit to bend the insurance cost curve” on page 25	Gerardo Menegaz	http://thoughtsoncloud.com/author/gmenegaz/
“How to explain private, public and hybrid cloud to your spouse” on page 27	Erik Anderson	http://thoughtsoncloud.com/author/eanderson/
“What is hybrid cloud?” on page 28	Marcus Erber	http://thoughtsoncloud.com/author/merber/
“Cloud computing delivery models explained” on page 30	Sujith Pillai	http://thoughtsoncloud.com/author/spillai/
“What is infrastructure as a service (IaaS)?” on page 31	Michael Fork	http://thoughtsoncloud.com/author/mfork/
“What is platform as a service (PaaS)?” on page 32	Sunil Joshi	http://thoughtsoncloud.com/author/sjoshi/

Name of the post	Authored by	Other great posts from these authors
“What is software as a service (SaaS)?” on page 35	Tristram Warkentin	http://thoughtsoncloud.com/author/twarkentin/
“How does cloud computing work?” on page 36	Dominique Vernier	http://thoughtsoncloud.com/author/dvernier/
“How I explained dynamic cloud to my kids” on page 38	Stewart Hyman	http://thoughtsoncloud.com/author/shyman/
“What is a composable business?” on page 41	Matt Lobbes	http://thoughtsoncloud.com/author/mlobbes/
“How the cloud is revolutionizing roles in the IT department” on page 42	Sam Garforth	http://thoughtsoncloud.com/author/sgarforth/
“How is cloud computing affecting employment?” on page 45	Francesco Pedulla, Vincent Abbosh, and Thanh Lam	http://thoughtsoncloud.com/author/fpedulla/ http://thoughtsoncloud.com/author/vabbosh/ http://thoughtsoncloud.com/author/tlam/
“Do you have a cloud computing career plan?” on page 46	Marcio Andre Ribeiro Guimaraes	http://thoughtsoncloud.com/author/mguimarae/
“Migration to cloud: It is all about workloads” on page 47	Luis Aguilar Mateo	http://thoughtsoncloud.com/author/laguilarmateo/
“Migrating applications to cloud isn’t so simple” on page 49	Sergio Varga	http://thoughtsoncloud.com/author/svarga/
“Is cloud computing secure?” on page 50	Turgut Aslan	http://thoughtsoncloud.com/author/taslan/
“5 key success factors for cloud implementation” on page 52	Gerardo Menegaz	http://thoughtsoncloud.com/author/gmenegaz/
“It’s all about the speed: DevOps and the cloud” on page 54	Sam Garforth	http://thoughtsoncloud.com/author/sgarforth/
“What is mobile cloud computing?” on page 55	Shamim Hossain	http://thoughtsoncloud.com/author/shossain/
“Big data and cloud go together like strawberries and chocolate” on page 56	Franz Freidrich Liebinger Portela	http://thoughtsoncloud.com/author/fliebinger/
“What’s next in cloud: Software Defined Environments” on page 58	Gerardo Menegaz	http://thoughtsoncloud.com/author/gmenegaz/
“What is software-defined networking?” on page 60	John Tracey	http://thoughtsoncloud.com/author/jtracey/
“Cloud and the Internet of Things: Inextricably linked” on page 62	Diego Andres Sonvico	http://thoughtsoncloud.com/author/dsonvico/
“What is OpenStack?” on page 63	Sujatha Perepa	http://thoughtsoncloud.com/author/sperepa/
“IBM SoftLayer: Your cloud home away from home” on page 65	Sreekanth Iyer	http://thoughtsoncloud.com/author/siyer/

Name of the post	Authored by	Other great posts from these authors
“What is IBM Bluemix?” on page 66	Shamim Hossain	http://thoughtsoncloud.com/author/shossain/
“Five things you should know about IBM Cloud marketplace” on page 68	Vasfi Gucer	http://thoughtsoncloud.com/author/vgucer/
“What lies ahead for the future of cloud?” on page 71	Eric Kern	http://thoughtsoncloud.com/author/ekern/

We tried to use a conversational, easy reading style that reflects the personalities of our bloggers. The posts included in this publication are only a small subset of all the posts you can find on http://thoughtsoncloud.com. For a full coverage of cloud computing, you can visit the Thoughts on Cloud blog.

Your feedback is important for us. If you have comments on the blog or want to become a contributor, contact Kevin Allen (kjallen@us.ibm.com). If you have any comments on this book, contact Vasfi Gucer (vasfi@us.ibm.com). If you have questions for our bloggers on any of their posts or want to add a comment, use the links at the end of each post to open the post and submit your questions or comments.

We hope that you enjoy our bloggers and join the conversation on http://thoughtsoncloud.com!

Fundamentals of cloud computing

If you are new to cloud computing, this is a perfect place for you to start. Our bloggers have explained cloud computing to their spouses, kids, and more. (no one has tried the grandpas yet!), but the common thread in these posts is that they explain cloud computing in simple terms and using analogies. Let's start with the following "Cloud 101" post by Erik Anderson.

What is cloud computing?

So you've seen the commercials and heard the buzz and finally decided to search "What is cloud computing?" Well, welcome—you've come to the right place! Stick around for three short minutes and you will have a much better idea of what cloud computing really is, and more importantly, how your business might be able to take advantage of it.

What is cloud computing. Let's start with the basics. At the technical level, cloud computing is not magic, but from the user's perspective, it can sometimes seem that way. If we stay with the magic theme, take a minute and imagine the cloud as a genie. When you tell the genie your wish, all you care about is whether your wish is granted or not. You don't care about the process that happens behind the scenes to fulfill your request. In a lot of respects, this is just like cloud computing.

Let's say for instance you wish to play a game of Draw Something with your friend on your smartphone. You go to the app store, download the app, log in, find your friend and less than five minutes later, you're having fun. This ability to request services for yourself when you need them in cloud computing terms is known as on-demand self-service. You didn't need to go to a physical store, you didn't need to call someone to place an order and you didn't need to sit on hold or wait for anyone else to do anything for you.

Think for a minute what little else is required. You don't need to go out and buy a computer, or write any code or set up a network. You don't care that Draw Something is running on IBM public cloud, known as SoftLayer. All you care about is that the service offered is available and reliable. As more users join the game, the cloud is able to quickly grow or shrink to meet the change in demand—elasticity in techie terms. This is possible because a cloud provider, like IBM, has a massive number of servers pooled together that can be balanced between its various customers. But ultimately, you don't care as long as it's available for you.

Now I realize this is a simple example more at the consumer level, but I think that is actually a good thing when thinking about what cloud computing really is. Whether they realize it or not, most people likely already use bits and pieces of cloud in their daily lives as individual consumers. They like the fact that cloud services are available regardless of where you are (broad network access). It doesn't matter if you're at home, or at work or vacationing at the beach (well, most beaches).

But the cloud is more than downloading apps and streaming music. Cloud computing presents a huge opportunity for businesses as well. The employees of these businesses see the value in their personal lives and ask, "Why I can't have these same types of benefits at work?" This is prevalent inside and outside of the IT department. Some people refer to this as the consumerization of IT.

There are several positive side effects that come along with this. Businesses or departments within businesses can focus on their core competencies as opposed to worrying about how some technology works. Smaller companies can get access to technologies and services in the cloud that were only available to the biggest firms a mere five years ago. And the fact that almost all cloud services are pay as you go (PAYG) makes it very easy and economical to adopt this model.

So getting back to my genie: can I get everything that I want in the cloud with my three wishes? Maybe or maybe not, but the vast capabilities available and the attractive pricing models certainly make it worth asking.

Originally posted at http://thoughtsoncloud.com/2014/03/what-is-cloud-computing/

See also “How I used the cloud to understand the cloud” at http://thoughtsoncloud.com/2014/03/used-cloud-understand-cloud/

Next, let’s see how Erik explains cloud to his wife.

How to explain cloud to your spouse

I love my wife, but sometimes she drives me crazy. She is an elementary school counselor with a Master’s degree, so you know that she is a good listener, is intelligent, and is also very patient. Yet somehow when it comes time for me to talk about my day or what I work on for a living, that patience and those listening skills suddenly diminish. So when I sat down to write a blog today, I thought to myself, “What could be a better topic than explaining something from work in a way she could more easily understand?”

Whenever I try to explain a new topic to someone, I like to use analogies. In this case, I chose rental cars. I’ll spend the rest of the post describing the four ways that rental cars are like cloud computing in a way that even my wife would be willing to read.

Rental cars are available when and where you need them

When we fly somewhere to go on vacation, we usually rent a car. It is very easy to do, and in most areas in the United States, you need a car in order to get around. When we go skiing in Colorado, we rent a car. When we go to Michigan in the summer, we rent a different one. It doesn’t matter if the cars are provided by different rental car companies; they serve the same purpose and are designed to do the same thing. Very similar in cloud computing, we can access the computing resources we need when and where we need them.

When you rent a car, you pay only for the time you use it

When we travel to these various cities, obviously it doesn’t make sense to buy a car in each one of them. We don’t need the car all the time, so we don’t want to own it all the time. When we have these temporary needs, we rent a car for the location and time that we need it, without being required to buy and maintain it permanently. In a typical cloud computing environment, it works the same way; companies pay only for what they actually use. Instead of saving the cost of buying and maintaining a car, they are saving the money required to buy large computers.

Booking a rental car is easy to do by yourself

Before we go on a trip, we never actually call and talk to a person at the rental car company to reserve a rental car. All of the rental car companies have websites designed for you to enter the type of car you need, where you want to pick it up, and for what time period you want to use the car. This same self-service method is used for cloud computing. Companies can log into websites to request the specific computer resources that they need.

The rental car company has a large number of vehicles that it can rent, and can buy more cars to rent if there are consistently many requests

Car rental companies have many types of cars that they rent out, but effectively, the cars all serve the same purpose: they get you from point A to point B. However, there is a difference

between a compact car and a luxury SUV. To account for this, rental car companies have the flexibility to offer various prices for various car sizes. They also have the ability to provide a higher class car than reserved. This allows them have a smaller total number of cars than what would be needed if they had to keep a specific number of each class of car. This practice is like grouping a large number of computers together to form a cloud. The computers might be different models or have different sizes of hardware, but when you group them all together into a resource pool, you ensure you have enough power to go around.

You can rent a different type of car for different situations

When you go to the beach, you rent a convertible. When you go skiing, you rent something with all-wheel drive and a ski rack. When you are driving a long distance, you select something that gets good gas mileage. Each one of these vehicles would likely have a different cost associated to them. Similarly, in cloud computing, you can select different cloud services to fit your various needs. You could select a cloud service with a lot of resources behind it for a very processing intensive task, or you could select a cheaper cloud service if you needed fewer resources. In cloud terminology, this is sometimes referred to as being "Fit for Purpose."

You aren't responsible for maintaining a rental car

Oil changes, tire rotations and changing the spark plugs are all things that you don't have to worry about when you are renting a car. The rental car company handles all of these maintenance issues so you don't have to. Realistically, this is built into the price of renting the car, but for the renter it is worth it to have that piece of mind. Just as rental car providers maintain their fleet, cloud providers maintain the hardware and software running the cloud platform, so that the cloud consumers don't need to worry about it.

If your rental car breaks down or you have an accident, the rental car company will bring you a new car

They would also take care of driving or towing the original car away. Something similar happens in a cloud environment. If something happens to your cloud instance, the cloud provider can very quickly and easily create a new instance for you. This ability to quickly stand up new services after a problem is referred to as disaster recovery.

If you are traveling with a big group you can rent multiple cars

Sometimes my wife and I go on vacation with a group of friends. Between all the people and luggage, there isn't enough room in one car (even a big one). Fortunately, rental car companies have many cars available to rent, and when we have this increased demand, we can rent multiple cars. In cloud computing, this is referred to as elasticity. When we need additional resources (or cars) we can rent them. When we no longer need the additional space, we can return the car to the provider and no longer need to pay for it.

Originally posted at
http://thoughtsoncloud.com/2013/02/how-to-explain-cloud-to-spouse/ and
http://thoughtsoncloud.com/2013/08/how-to-explain-cloud-to-your-spouse-part-2/

See also "Five ways cloud computing is like Las Vegas" at
http://thoughtsoncloud.com/2014/05/five-ways-cloud-computing-like-las-vegas/

We are glad that Erik's first attempt to explain cloud to his wife went reasonably well; she made it to the end of the analogy without losing interest. Maybe you can accomplish the same with your spouse after reading this book!

If you thought explaining cloud to your spouse was difficult, try explaining it to your children! Diego Andres Sonvico is a cloud architect and in the next post he does his best to explain cloud computing to his son.

I am a cloud architect—but how do I explain this to my young son?

Explaining what a cloud architect is can be a little frustrating; you will always take at least 15 minutes to introduce the idea, and when the other person says to you that he understands, he really doesn't—he just isn't willing to lose any more time discussing it.

If the concept of cloud design is difficult to explain to an adult, imagine how difficult it would be to explain it to your young son. It might go something like this:

Son: Dad, every day you go to work, but what do you do?

Dad: I am a cloud architect.

Son: Mm OK! And what does that mean?

Dad: It means that I design clouds that others build.

Son: YOU ARE GOD!

Dad: No, I'm not God.

Son: But Mother told me that the clouds in the sky were made by God.

Dad: Um, it is difficult to explain. The clouds I design are not the real clouds in the sky. They are called "clouds" because, as with real clouds, you can't touch them, but they are still there.

Son: I can touch clouds.

Dad: No, you can't; they are very high in the sky.

Son: Last year when we traveled to see Grandma, we took a plane and when we were rising into the air, the airplane crossed the clouds.

I started thinking, wow, I am in big trouble now.

Dad: That's true, you can touch a cloud but it is very difficult. Let's just say the clouds I design are processing and storage systems connected to a big network that serves a lot of customers at the same time. They share resources that could be placed anywhere in the world and pay only for the time and the quantity that they use.

Son: That doesn't sound like clouds.

Dad: Now that you say it, these clouds are not really similar to regular clouds.

Son: But you said you were designing clouds!

Dad: OK, I lied. I really drive a Zamboni.

Son: Ooh, that's great, Dad! I love Zambonis!

It is definitely very difficult to explain the concept of cloud computing to someone that is unfamiliar with the concept. Try to explain that you are a cloud architect, and you will have a hard time. In the end, as I showed you in this blog post, the other person probably won't

understand. I might start saying that I drive a Zamboni or that I sell hot dogs, just to make my life easier.

Originally posted at
http://thoughtsoncloud.com/2014/07/cloud-architect-explain-young-son/

See also “Explaining cloud with PLAY-DOH” at
http://thoughtsoncloud.com/2013/07/explaining-cloud-with-play-doh/

Wow! That was fun. Try this at home with your child at your own risk! Let’s hope Diego will have a better luck explaining what he does for living to his son next time.

Thoughts on Cloud contributors have come up with lots of clever analogies to explain cloud computing. On a trip to Las Vegas, Gary Zeien was inspired to write about how cloud computing is like the Sin City. Let’s hear his story.

Five ways cloud computing is like Las Vegas

How can using and working with “the cloud” be like Las Vegas? You’re probably thinking I’ve lost my mind, but bear with me! At a recent conference, while I was looking out of my hotel room window, I began to see some similarities between Vegas and what is happening in business and IT as we all move to the cloud.

Things seem to appear out of the desert

If you have been to Las Vegas over the last decade or so, you have seen large transformations in how the city runs. Now, I’ve had the “opportunity” to be in Vegas many times over the last few years, and there is always something new. For most people that “consume the services” of Vegas, these things just seem to appear.

This is also how those of us working with cloud providers feel. Gone are the days where extensive roadmaps are published for consumers. Instead, work usually happens behind the scenes to bring out the new and exciting capabilities that are offered by infrastructure-as-a-service (IaaS) or platform-as-a-service (PaaS) providers. Then, almost magically, these services just appear. Whether it’s a new infrastructure service (think load balancing as a service) or a platform service (such as a new supported runtime), like those of us who have visited Vegas know, it just seems to appear out of the desert.

What happens in the cloud stays in the cloud

OK, I may be stretching the slogan a bit here, but my point is this: after people and organizations get comfortable with using the cloud and storing data in the cloud, it’s difficult to go back. Yes, there are security issues and things to consider, but the fact is these are short term issues and they are being addressed.

This is especially true for analytics, because it is the dynamic, scaling nature of the cloud that really opens up the ability to store structured and unstructured data in the cloud. Just look at the recent big data and NoSQL offerings that IBM has put out (IBM Platform Computing Cloud Service and Cloudant, an IBM company).

It seems like chaos, but it’s managed

This was the one that really struck me as I looked out my window. When you look at Vegas, it appears to be just one big party (especially on weekends, I discovered—remember, what happens in Vegas stays in Vegas). However, what is really amazing is the coordination of flights, deliveries, taxis and more. Watching this from 26 stories up, one can really see the

ecosystem at work. What you can't see are the invisible communication channels at work that must be orchestrating all of this.

Now look at cloud and, especially, at hybrid cloud. There can be a lot of moving parts in the cloud ecosystem with different service providers doing their part to orchestrate the movement of workloads, service requests and data to different components in a hybrid cloud. And just like in the early days of Vegas, it's not all there yet, but things are happening! We will see big changes appear from the desert soon that will truly enable a modular, managed, dynamic cloud ecosystem.

Risks: you get what you pay for

Vegas is all about risks. But as you watch (and repeatedly watch) the activity on the gambling floor, you can see the systems in place for the casinos to manage their risk. There are cameras and locks and big dudes with sunglasses. The consumer in this case also needs to manage his or her risk. This is pretty similar to the cloud. The cloud providers are doing their part to manage their risks and to make sure they are covered. The consumers of cloud services must also do their part. If you don't want to pay for a firewall, then the cloud provider isn't going to make you have one, and they certainly aren't going to give it to you for free. Just like if you were working in your own data center, you will still need to consider the fundamentals of running complex IT systems. There's no real major revelation here. If you don't want to invest in protective measures to reduce your risk, then, just like if you were going to a shady casino, you may want to watch your wallet (or business).

You pay more when you rent by the hour

OK, so lesson learned: don't tell your colleagues that you want to write about this kind of topic while you are in Vegas. Mine took it entirely the wrong way. What I'm trying to get at is this: look at the hotels and the rate you pay per day. Have you ever multiplied out what that little hotel room would cost you for a month? There is a lot of infrastructure here that has been put in place to support daily billing. I mean, it all has to be paid for somehow!

When working with clients, I often see that there is an attraction to the daily or hourly rates. As a consumer of cloud services, I do understand the attraction. But remember this is Vegas—metaphorically speaking—so make sure you do some calculations if you are looking to stay awhile. You may find that the monthly rates are actually better for your bottom line.

We all like the idea of the quick trip to Vegas: do some work—yeah right—and then leave. However, based on an analysis of the workloads that clients are looking to deploy to the cloud, your trip to the cloud will most likely be longer than your stay in Vegas.

So, as the old TV show line goes, "Be careful out there."

Originally posted at
http://thoughtsoncloud.com/2014/05/five-ways-cloud-computing-like-las-vegas/

See also "Cloud computing in the real world" at
http://thoughtsoncloud.com/2013/10/cloud-computing-in-the-real-world/

Now let us go into the origins of cloud computing. This technology did not come from nowhere. Several developments and technologies paved the way for cloud computing, so it makes more sense to call it evolution rather than a revolution. In the next post Maximilliano Destefani Neto takes us back in time to the origins of cloud computing.

A brief history of cloud computing

One of the first questions asked with the introduction of a new technology is: “When was it invented?” Other questions like “When was it first mentioned?” and “What are the prospects for its future?” are also common.

When we think of cloud computing, we think of situations, products and ideas that started in the 21st century. This is not exactly the whole truth. Cloud concepts have existed for many years. Here, I will take you back to that time.

It was a gradual evolution that started in the 1950s with mainframe computing. Multiple users were capable of accessing a central computer through dumb terminals, whose only function was to provide access to the mainframe. Because of the costs to buy and maintain mainframe computers, it was not practical for an organization to buy and maintain one for every employee. Nor did the typical user need the large (at the time) storage capacity and processing power that a mainframe provided. Providing shared access to a single resource was the solution that made economical sense for this sophisticated piece of technology.

After some time, around 1970, the concept of virtual machines (VMs) was created.

Using virtualization software like VMware, it became possible to execute one or more operating systems simultaneously in an isolated environment. Complete computers (virtual) could be executed inside one physical hardware which in turn can run a completely different operating system.

The VM operating system took the 1950s’ shared access mainframe to the next level, permitting multiple distinct computing environments to reside on one physical environment. Virtualization came to drive the technology, and was an important catalyst in the communication and information evolution.

In the 1990s, telecommunications companies started offering virtualized private network connections.

Historically, telecommunications companies only offered single dedicated point–to-point data connections. The newly offered virtualized private network connections had the same service quality as their dedicated services at a reduced cost. Instead of building out physical infrastructure to allow for more users to have their own connections, telecommunications companies were now able to provide users with shared access to the same physical infrastructure.

The following list briefly explains the evolution of cloud computing:

- Grid computing: Solving large problems with parallel computing
- Utility computing: Offering computing resources as a metered service
- SaaS: Network-based subscriptions to applications
- Cloud computing: Anytime, anywhere access to IT resources delivered dynamically as a service

Now, let’s talk a bit about the present.

SoftLayer is one of the largest global providers of cloud computing infrastructure.

IBM already has platforms in its portfolio that include private, public and hybrid cloud solutions. The purchase of SoftLayer guarantees an even more comprehensive infrastructure as a service (IaaS) solution. While many companies look to maintain some applications in data centers, many others are moving to public clouds.

Even now, the purchase of bare metal can be modeled in commercial cloud (for example, billing by usage or put another way, physical server billing by the hour). The result of this is that a bare metal server request with all the resources needed, and nothing more, can be delivered with a matter of hours. In the end, the story is not finished here. The evolution of cloud computing has only begun.

Originally posted at
http://thoughtsoncloud.com/2014/03/a-brief-history-of-cloud-computing/

See also “A future historian tells us the path to cloud computing” at
http://thoughtsoncloud.com/2012/06/a-future-historian-tells-us-the-path-to-cloud-computing/

Up next is Shamim Hossain, who is going to take us through the characteristics of cloud and explain two important cloud concepts: Cloud service and deployment models.

Cloud computing basics

Cloud has often been used as a metaphor for Internet in the network diagram. Cloud computing is a new IT delivery model accessed over the network (Internet or intranet). It is definitely not formed in one day by a “Big Bang.” This revolutionary style of computing emerges from evolutionary changes, maturity, development and advancements of technologies over the last 50 years.

In this post, I will present the very essentials, attributes, differentiators and benefits of cloud computing that a beginner needs to know.

From a plethora of cloud definitions online, I prefer to use the definition by the National Institute of Standards and Technology (NIST). According to NIST:

“*Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.*”

It demonstrates five essential characteristics, three services models and four deployment models of cloud.

The five characteristics that define cloud computing are:

1. **On-demand self-service.** This means provisioning or de-provisioning computing resources as needed in an automated fashion without human intervention. An analogy to this is electricity as a utility where a consumer can turn on or off a switch on-demand to use as much electricity as required.
2. **Ubiquitous network access.** This means that computing facilities can be accessed from anywhere over the network using any sort of thin or thick clients (for example smartphones, tablets, laptops, personal computers and so on).
3. **Resource pooling.** This means that computing resources are pooled to meet the demand of the consumers so that resources (physical or virtual) can be dynamically assigned, reassigned or de-allocated as per the requirement. Generally the consumers are not aware of the exact location of computing resources. However, they may be able to specify location (country, city, region and the like) for their need. For example, I as a consumer might want to host my services with a cloud provider that has cloud data centers within the boundaries of Australia.

4. **Rapid elasticity.** Cloud computing provides an illusion of infinite computing resources to the users. In cloud models, resources can be elastically provisioned or released according to demand. For example, my cloud-based online services should be able to handle a sudden peak in traffic demand by expanding the resources elastically. When the peak subsides, unnecessary resources can be released automatically.
5. **Measured service.** This means that consumers only pay for the computing resources they have used. This concept is similar to utilities like water or electricity.

Three main service models of cloud computing are:

1. **Software as a service (SaaS).** Applications hosted by a provider on a cloud infrastructure are accessed from thin or thick clients over the network or a program interface (for example, web services). Examples are Google Docs, IBM SmartCloud™ Docs, IBM SmartCloud Meetings, Saleforce.com's CRM application and so on.
2. **Platform as a service (PaaS).** Providers deliver not only infrastructure but also middleware (databases, messaging engines and so on) and solution stacks for application build, development and deploy. IBM SmartCloud Application Services and Google App Engine are two examples of PaaS.
3. **Infrastructure as a service (IaaS).** It is the delivery of computing infrastructure as a service. IBM SmartCloud Enterprise+, SoftLayer cloud and Amazon EC2 are some examples of IaaS.

There are others services emanating from these main services. Storage as a service (STaaS) and communications as a service (CaaS) are two such variants.

Now let's look at the cloud deployment models.

Public cloud. This is where computing resources provided by a cloud provider are used by different organizations through public Internet on a pay as you go (PAYG) model. Cloud providers ensure some sort of separation for resources used by different organizations. This is known as multitenancy.

Private cloud. This is where cloud infrastructure is solely owned by an organization and maintained either by this organization or a third party and can be located on site or off-site. Computing resources are behind the corporate firewall.

Community cloud. Here, cloud infrastructure is owned and shared by multiple organizations with a shared concern.

Hybrid cloud. It is the combination of any type of cloud model mentioned above connected by standardized or proprietary technology.

Companies stopped generating their own electricity using steam engines and dynamos as the electric grid provided a better means of getting electricity. Similarly, organizations these days can rely on the cloud service providers to get computing resources on-demand and in an automated fashion. Organizations only pay for the resources they have used and relinquish unnecessary resources using a self-service portal. This eliminates the need for expensive capital investment. However, cloud is not just about lowering the cost.

The benefits of cloud computing are agility, scalability and economies of scale, sustainability, reliability, faster time to market and developing prototypes with increased efficiency. You can look at the series of my blog posts highlighting the benefits of cloud computing for more information.

Originally posted at http://thoughtsoncloud.com/2014/02/cloud-computing-basics/

See also “Cloud computing defined: Characteristics & service levels” at http://thoughtsoncloud.com/2014/01/cloud-computing-defined-characteristics-service-levels/

“Cloud computing has a lot of benefits but it also comes with some downsides,” says Frank Bauerle in the next post.

The pros and cons of cloud computing

Every place you look, you read about cloud computing. It’s coming. It’s here. You need it. If you don’t take advantage of it, you could be left behind.

Some folks believe it’s the future. They point to the explosion of mobile computing as a catalyst for cloud computing. They talk about the growth of born on the cloud developers and applications.

Others look at it as part of the information technology circle of life—a fad that will eventually go away. They point out what they perceive as potential performance issues as well as concerns with the security of a shared infrastructure.

Is the hype valid? Or is cloud computing simply another fad that will die out in another year or so?

As I was thinking about this, I thought it would be useful to put together my view of the pros and cons of cloud computing.

The benefits of cloud computing

Here are the benefits of cloud computing:

Cloud computing allows you to focus more on your business and not on managing data centers

Managing data centers is not the core focus of most businesses. Using cloud computing frees IT to focus on developing applications that have business value and not on managing the data center.

By leveraging the elastic capabilities of infrastructure as a service (IaaS), your IT infrastructure can grow to support increased demand.

You can develop new applications faster

By leveraging platform as a service (PaaS), your company will be able to imagine a product or new application, provision the infrastructure and develop the new application much quicker than they ever have been able to do in the past.

Leveraging your cloud provider’s API can help you automate many of your operational tasks

Application programming interfaces (API) provided by the cloud provider are an important part of moving to a DevOps model. The APIs can be used to automate provisioning, monitoring and scaling operations. Using your cloud provider’s API, you can access most, if not all, of the functionality available on your console. SoftLayer, an IBM company, states that

the API is the basis for everything done within their environment. The API methods are developed first and then used to build out required functionality in the portal.

Cloud computing is scalable

By leveraging infrastructure as a service (IaaS), you can quickly build out new infrastructure to support new applications. Assuming your application is architected appropriately, as the load on your application grows you can scale horizontally by provisioning new servers. If you need to increase the size of your servers to support loads that cannot scale horizontally, you can provision larger servers to support the increased demands.

Financially, cloud computing makes a lot of sense

Renting your infrastructure can make good financial sense. The pay as you go (PAYG) model is especially attractive to the limited cash flow of small and startup businesses.

No capital procurement is needed. You can account for your computing expenses as operational expenses. Additionally, if your infrastructure ages, you no longer need to procure new hardware to replace it. You can simply provision new servers to replace the aging hardware.

Cloud computing allows you to expand your global presence

Cloud computing allows you to quickly expand your global presence. SoftLayer has cloud data centers and points of presence (POPs) located across the globe. Each of these data centers is connected through high speed fiber allowing you to coordinate your global infrastructure.

(Related: Seven benefits of cloud from an enterprise architect point of view)

The downside of cloud computing

Let's see the downside of cloud computing:

Performance on shared infrastructure can be inconsistent

It's a given that when you share infrastructure with others, you might be impacted by noisy neighbors. Performance on shared infrastructure can be inconsistent. Within SoftLayer (See "IBM SoftLayer: Your cloud home away from home" on page 65), you do have options to mitigate this. SoftLayer allows you to provision private cloud servers or dedicated bare metal servers as a means of mitigating performance concerns.

People believe that cloud infrastructure is not secure

Your cloud infrastructure is only as secure as you make it. SoftLayer offers industry standard firewalls, network gateways, antivirus and compliance scanning capabilities to help you secure your solutions. Businesses are looking to bring more workloads to the cloud, including those workloads that may be regulated including any application that manages personal identifying information, financial information or contains healthcare information.

At IBM, we understand these requirements and how to architect solutions that are governed by specific government regulations.

Cloud computing may not be the right fit for all workloads

Not all workloads are ready for the cloud (See "Migration to cloud: It is all about workloads" on page 47). Some workloads have very specific performance and security requirements. You need to evaluate your workloads carefully to determine whether they are appropriate for the cloud.

SoftLayer does offer solutions for specific workloads, including high performance computing, big data and regulated workloads including HIPAA.

Originally posted at http://thoughtsoncloud.com/2014/05/pros-cons-cloud-computing/

See also “Seven benefits of cloud from an enterprise architect point of view” at http://thoughtsoncloud.com/2014/03/seven-benefits-of-cloud-from-an-enterprise-architect-point-of-view/

People tend to fear change, and businesses that are shifting toward cloud computing are no exception. In the following post, Allan Tate lists four of the institutional fears of cloud computing and the reasons behind them. Business leaders need to jump a psychological barrier to overcome those fears.

Overcoming institutional fears of cloud computing

In my previous post “Three reasons you shouldn’t fear the cloud” (http://thoughtsoncloud.com/2014/05/overcoming-inner-fears-cloud-computing/), I addressed some of the inherent fears that some organizations have regarding cloud computing. Today, I’d like to take a look at why these institutions, and the people who lead them, might fear the cloud. I propose that it comes down to four basic concerns:

Fear of the unknown

What is cloud computing? Is it just a place to store music files? If you asked a room full of ten IT specialists, you’d get ten different answers. Further, if you searched the web, you’d find answers, but many of them would be wrong. Cloud is a concept that is quickly evolving, and behind this concept are hardened data centers that follow best practices for security and regulatory compliance. Both shared and dedicated machines are available to be provisioned at a moment’s notice. You can decide where your data resides, how it is protected and how it is accessed. Like electric power, the cloud provides access to compute power on demand. Unlike electric power, the source can be specified down to the exact physical machine dedicated to running your workloads.

Fear of losing control

People think that using the cloud means losing control of their applications and data. Who is responsible if something goes wrong? Banks can get robbed, but laws, policies and practices have evolved to make the banks a safe choice for storing money. This is the same with the cloud. Today, you can choose the center that will host your data. You can keep your data within national boundaries. You can encrypt your data in transit and at rest. You can monitor your servers on your computer or mobile device. You can be sure that regulatory and security best practices are being followed. Working with a partner like IBM, that has just invested $1.2B dollars to build 15 more state of the art data centers, bringing the worldwide total to 40, gives you as much or more control and security than building a data center on your own.

Fear of being violated

Who can view my data if it is stored on the cloud? Recent revelations about NSA data collection have elevated this concern. Much of this discussion, however, was centered on phone and email metadata, not file or database contents. Also, a side effect of this episode was that cloud hosting providers increased efforts to ensure data security. After all, cloud computing is a growth area and poor security is bad for business. Just like no vault, either in your home or in a bank, is 100 percent safe, no server is either, whether in your data center or in the cloud. That being said, there is a good argument that the safest option is a server

hosted by a trusted provider in a hardened data center. The safest option can be found in the cloud.

Fear of becoming obsolete

Horses yielded to cars, typewriters to word processors and slide rules to calculators. None of these changes happened overnight and all the older technologies maintained a niche, however diminished. Cloud technology is a paradigm shift that is absorbing many workloads that used to be run in a traditional data center. Needless to say, this is unsettling to many people who must now update their skills or risk becoming obsolete. No longer can IT departments tell the business that their demands are too complex or too expensive—the cloud has changed the rules.

Do you store diamonds at home or in a safe deposit box? Do you store data in your data center or in the cloud? IT executives today are faced with exploding data volumes, rapidly changing technologies, lack of skills, duplicate systems due to acquisitions and the need to deliver more value to their business at lower cost. While fears of cloud computing are understandable, they will dissipate as the technology matures. The pace of technological change is accelerating, so this will happen very quickly. Those that don't adjust to this changing reality will be left behind.

Originally posted at
http://thoughtsoncloud.com/2014/05/overcoming-institutional-fears-cloud-computing/

See also "Three reasons you shouldn't fear the cloud" at
http://thoughtsoncloud.com/2014/05/overcoming-inner-fears-cloud-computing/

Are you still unclear about how cloud computing differs from other similar services? In the next post, Rossella De Gaetano digs into the details and explains her point of view on what distinguishes cloud.

Cloud computing, data center automation and services on demand: What's the difference?

Being a software engineer, I often end up talking about cloud computing. I think there is still a lot of confusion about what cloud computing actually means. For a lot of people, it is nothing more than embracing virtualization. For others, it is just data center automation. Where's the truth? I'll take the chance in this post to share my view on that.

The National Institution for Standards and Technology (NIST) states that the following characteristics are the key components of cloud computing:

- On demand self service
- Broad network access
- Resource pooling
- Rapid elasticity
- Measured service

Taking these into consideration, you may notice that services on demand are just one aspect of cloud computing. With this aspect, you can access resources and services only when you need them and for the time frame you need them. In cloud computing, the actual request for a resource or service is done directly by the consumer (self service), with no direct interaction with IT personnel. Of course, this comes with a good investment in automation.

Why is cloud computing not just data center automation? Well, data center automation just means you're delegating some tasks to a system with no human interaction. Typically, these automatic tasks are initiated by a scheduler and managed by a provisioning tool. There is no focus on the consumer of the service, so there is no idea of a self-service user interface. Data center automation doesn't imply any resource pooling across different set of users. Rapid elasticity is not a must and neither are metering resources (even though this last one is very popular, typically to ensure adherence to service level agreements).

Looking at the deployment models (public, private, community, hybrid), data center automation spans the on-premises aspect of cloud computing, while on demand is location agnostic.

In the end, on demand and data center automation share some cloud computing characteristics, but not all of them.

The interesting thing I would like to underline, looking at the five key characteristics, is that the idea of virtualization does not come directly into the game. Of course, supporting rapid elasticity and resource pooling are just so easily achieved with virtualization that it has become a must in many cloud computing implementations. But there can be, in theory and in practice, a cloud computing environment that runs on bare metal.

To summarize, the key aspect that differentiates data center automation and on demand is self service. The capability offered to the user to access and consume services tailored for his skills and needs, at any time and place he wishes, is switching the gravity center from IT people and processes towards service consumers. Cloud computing puts the user experience first and foremost. Neither data center automation nor virtualization do that. This is a revolution that from the social point of view is breaking any age, education, geography and skill constraint, potentially identifying any human being on planet Earth as a service consumer.

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http://thoughtsoncloud.com/2014/08/cloud-computing-data-center-automation-services-demand-whats-difference/

See also "I have a virtualized infrastructure. Do I have cloud?" at
http://thoughtsoncloud.com/2013/05/i-have-a-virtualized-infrastructure-do-i-have-cloud/

The promise of cloud: How cloud is reshaping our world

So far we have explained the fundamental concepts of cloud computing with several analogies and case studies. But what are the most common uses of cloud computing? What is the promise of this technology? This is the topic of our next section.

Here are the top 7 most common uses of cloud computing, according to Maamar Ferkoun.

Top 7 most common uses of cloud computing

Cloud computing has been credited with increasing competitiveness through cost reduction, greater flexibility, elasticity and optimal resource utilization. Here are a few situations where cloud computing is used to enhance the ability to achieve business goals.

1. Infrastructure as a service (IaaS) and platform as a service (PaaS)

When it comes to IaaS, using an existing infrastructure on a pay-per-use scheme seems to be an obvious choice for companies saving on the cost of investing to acquire, manage and maintain an IT infrastructure. There are also instances where organizations turn to PaaS for the same reasons while also seeking to increase the speed of development on a ready-to-use platform to deploy applications.

2. Private cloud and hybrid cloud

Among the many incentives for using cloud, there are two situations where organizations are looking into ways to assess some of the applications they intend to deploy into their environment through the use of a cloud (specifically a public cloud). While in the case of test and development it may be limited in time, adopting a hybrid cloud approach allows for testing application workloads, therefore providing the comfort of an environment without the initial investment that might have been rendered useless should the workload testing fail.

Another use of hybrid cloud is also the ability to expand during periods of limited peak usage, which is often preferable to hosting a large infrastructure that might seldom be of use. An organization would seek to have the additional capacity and availability of an environment when needed on a pay-as you-go basis.

3. Test and development

Probably the best scenario for the use of a cloud is a test and development environment. This entails securing a budget, setting up your environment through physical assets, significant manpower and time. Then comes the installation and configuration of your platform. All this can often extend the time it takes for a project to be completed and stretch your milestones.

With cloud computing, there are now readily available environments tailored for your needs at your fingertips. This often combines, but is not limited to, automated provisioning of physical and virtualized resources.

4. Big data analytics

One of the aspects offered by leveraging cloud computing is the ability to tap into vast quantities of both structured and unstructured data to harness the benefit of extracting business value.

Retailers and suppliers are now extracting information derived from consumers' buying patterns to target their advertising and marketing campaigns to a particular segment of the population. Social networking platforms are now providing the basis for analytics on behavioral patterns that organizations are using to derive meaningful information.

5. File storage

Cloud can offer you the possibility of storing your files and accessing, storing and retrieving them from any web-enabled interface. The web services interfaces are usually simple. At any time and place you have high availability, speed, scalability and security for your environment. In this scenario, organizations are only paying for the amount of storage they are actually

consuming, and do so without the worries of overseeing the daily maintenance of the storage infrastructure.

There is also the possibility to store the data either on or off premises depending on the regulatory compliance requirements. Data is stored in virtualized pools of storage hosted by a third party based on the customer specification requirements.

6. Disaster recovery

This is yet another benefit derived from using cloud based on the cost effectiveness of a disaster recovery (DR) solution that provides for a faster recovery from a mesh of different physical locations at a much lower cost that the traditional DR site with fixed assets, rigid procedures and a much higher cost.

7. Backup

Backing up data has always been a complex and time-consuming operation. This included maintaining a set of tapes or drives, manually collecting them and dispatching them to a backup facility with all the inherent problems that might happen in between the originating and the backup site. This way of ensuring a backup is performed is not immune to problems such as running out of backup media, and there is also time to load the backup devices for a restore operation, which takes time and is prone to malfunctions and human errors.

Cloud-based backup, while not being the panacea, is certainly a far cry from what it used to be. You can now automatically dispatch data to any location across the wire with the assurance that neither security, availability nor capacity are issues.

While the list of the above uses of cloud computing is not exhaustive, it certainly give an incentive to use the cloud when comparing to more traditional alternatives to increase IT infrastructure flexibility, as well as leverage on big data analytics and mobile computing.

Originally posted at
http://thoughtsoncloud.com/2014/02/top-7-most-common-uses-of-cloud-computing

See also “Cloud computing in the real world” at
http://thoughtsoncloud.com/2013/10/cloud-computing-in-the-real-world/

Cloud is everywhere and has already started affecting our lives. Here are some more examples from Maamar.

How cloud computing is impacting everyday life

Cloud computing is changing our lives in many ways. While the technology has been described and commented on at length technically, very few studies have focused on its impact on everyday life. We are, as never before, seeing cloud technology impact our world on many levels. I want to reflect on the effects of these systemic changes to our lives by highlighting some of these areas in this blog post.

Social Impact

The likes of YouTube and Google are testimony to a shift in how people are now interacting with others. From remote locations to the global center stage, an event can reach the four corners of the planet by going viral. Global has reached its true significance, and we’ve seen the emerging of the “citizen journalist” on this global stage. Anyone can turn into an instant reporter, and live news feeds are constantly streaming the media, at times sparking social upheavals.

It has never been as easy to look out for long forgotten friends and classmates with the explosion of social networks and websites proposing ways to connect and relate through online communities. Facebook is of course a primary example.

Public figures and politicians, too, are now turning to engines such as Twitter to get a feel of the community and convey their views while bearing the pressure and influence from the groups they are looking at leading.

Taking advantage of developments in cloud technology and the social media space has allowed these different actors access to sophisticated analytical abilities. As an example of that, businesses are now increasingly using data from social media platforms in combination with cloud-based information resources to get better insights on potential services, innovations and customer requirements.

Education

Educational institutions have been quick to realize the advantages of cloud technology and have been eagerly adopting it for several reasons, including:

- Ability for the students to access data anywhere, anytime, to enroll in online classes and to participate in group activities
- The value of combining business automation processes to streamline subscription, class enrollments and assignment tracking, thus reducing expenses significantly
- Ability for the institutional body to leverage the storage cloud to store the daily 2.5 quintillion bytes of data securely and without the need to cater to a complicated infrastructure
- The benefit of process billing and charging for education and non-education related activities

While these are probably most obvious in a mature and developed market, cloud computing technology also offers benefits to students from developing countries. Access is now instantly available and in many instances free thanks to the proliferation of websites dispensing educational material and cloud knowledge-sharing communities. A simple internet connection can go a long way.

Development

Cloud technology also offers other benefits to developing countries since they no longer have the burden of investing in costly infrastructures and can tap into data and applications that are readily available in the cloud. I briefly mentioned the education sector above, but the same applies to other areas, such as banking, agriculture, health and science.

Take as an example the telecom industry, whereby these developing countries have been fast embracing the smart mobile technology that accelerated development by leaping over the traditional wire and copper infrastructure.

Health

There are many reasons why using cloud technology in the healthcare industry is gaining pace. Some examples include: managing non-siloed patient data and sharing it among different parties such as medical professionals or patients checking their own status and treatment follow-ups; reducing operational costs such as data storage; accessing this data through pervasive devices such as mobile phones and going beyond the traditional intranet; implementing a quick solution in a secure environment that is compliant with the Health Insurance Portability and Accountability Act regulations.

While there may be challenges in integrating old or current tools with new technologies and the corresponding level of services, the benefits will outweigh the inhibition to move to the

cloud. According to the industry, healthcare will be a growing market in the coming years, running into the billions.

Originally posted at
http://thoughtsoncloud.com/2013/12/how-cloud-computing-is-impacting-everyday-life-2/

See also “Five reasons why cloud is the right pill for healthcare providers” at
http://thoughtsoncloud.com/2014/10/five-reasons-cloud-right-pill-healthcare-providers/

Ok. Cloud can do many things, but can it save a life? Manzoor Farid certainly thinks so.

Can the cloud save a life?

I was recently asked to share my vision for the future of the cloud. As I considered this question, it dawned upon me that the innovations and advances I most wanted cloud to be associated with, that I was most likely to exult and cheer for, would be the ones where cloud computing was directly influential in profoundly changing the human condition.

Cloud technology is now hewing closely with accelerated innovation, analytics and collaboration through its inherent scalability and rapidity of deployment. The cloud is also fulfilling its potential in expediting and enabling medical professionals to leapfrog technology and infrastructure limitations and bring about a sea change in medical innovation.

Many technology visionaries have already started this journey and I’d like to share two cloud-enabled efforts in the medical field that are addressing the burning question at hand: Can the cloud save a life?

IBM Watson in healthcare

It’s estimated that around 20 percent of all the information doctors use for diagnoses is evidence-based. Each year, one in five diagnoses are incorrect or incomplete, and nearly 1.5 million medication errors are made just in the United States alone.

IBM Watson™ in healthcare
(http://www.ibm.com/smarterplanet/us/en/ibmwatson/implement-watson.html) seeks to change this state of affairs. It is empowering medical practitioners by:

- Supporting doctors with faster and more accurate diagnostics
- Enabling better defined patient treatment plans
- Aiding medical researchers to quickly wade through a growing mountain of data

In my view, Watson has unparalleled impact on the future of health care. It has the potential to drive correlation and analytics of disparate and difficult situations to consolidate medical information, clinical trial data and diagnostic approaches to empower the global medical community and allow them to take a quantum leap in combating and eradicating illnesses such as cancer and AIDS.

In a recent blog post
(http://asmarterplanet.com/blog/2013/10/md-anderson-cancer-center-plans-to-use-ibm-watson-to-help-eradicate-cancer.html) highlighting the University of Texas MD Anderson Cancer Center’s pilot of Watson, Dr. Courtney DiNardo described how access to timely diagnostic knowledge was not prevalent in most community hospitals today.

She reinforced how critical Watson's cognitive computing abilities were in assisting medical practitioners to glean valuable insight from vast amounts of information to provide the best outcome for their patients. She highlighted a particular case where Watson provided her with an early diagnosis of a patient suffering from complications arising from chemotherapy. She asserted that Watson's early and quick diagnosis in this case potentially saved her patient's life!

OPENPediatrics

- UNICEF estimated that globally, nearly seven million children under the age of five died in 2011 from preventable diseases.
- Another 19,000 children under the age of five are dying every day.
- Currently, most developing countries average under 10 physicians for every 10,000 people, whereas most developed nations can boast having nearly three to six times as many.

These sobering facts have compelled many in the medical field to actively engage and look for solutions to tackle this challenge head-on.

OPENPediatrics (http://openpediatrics.org/) is a beta program that provides a cloud-based platform to deliver education and information across a global community of medical practitioners who treat critically ill children. It is sponsored by Boston Children's Hospital in collaboration with the World Federation of Pediatric Intensive and Critical Care Societies and IBM Interactive (http://openpediatrics.org/).

As I delved more deeply into the literature and eye-opening, informative YouTube videos on the site, I began to realize the innovative approach embraced by OPENPediatrics will go a long way towards mitigating the global medical knowledge gap.

Some of the key features that made this solution highly interactive and effective in disseminating information were:

- A social network to connect pediatricians worldwide to exchange ideas and diagnoses
- An on-demand curriculum and medical literature on pediatric specialty care
- Training videos of advanced and complex procedures
- Simulations that give practitioners a means to test comprehensive treatments in virtual settings

"*All around the world there are children who are critically ill, and unless you provide the right care at the right time in the right way, these children will die.*" says OPENPediatrics' Associate Program Director, Traci Wolbrink, MD, MPH.

Dr. Wolbrink's profound words stunned me to my core. OPENPediatrics is trying to directly meet this essential need and stood out as an example of the cloud fulfilling its potential to be something beyond technology, by allowing us to fulfill one of humanity's basic responsibilities—to protect our next generation and potentially save lives.

I know we have a long road to travel before we finally overcome disease and the ongoing needless loss of life due to lack of timely medical advice and access. But these cloud-enabled efforts are accelerating us towards that goal by harnessing the breadth of knowledge and fueling innovations in medical practice. And they are already saving lives today.

Originally posted at http://thoughtsoncloud.com/2014/01/can-the-cloud-save-a-life/

See also "Five ways the healthcare industry benefits from cloud computing" at http://thoughtsoncloud.com/2014/05/five-ways-healthcare-industry-benefits-cloud-computing/

It is interesting to see how cloud is disrupting business as usual. No wonder people call cloud a disruptive technology! For example, without cloud the real life scenarios that Gerardo Menegaz wrote about in the next two posts would not have been possible.

Nest: A small company and a big disruption enabled by cloud

Innovation means being able to spot a trend or opportunity as well as being nimble enough to quickly adjust course to take advantage of the opportunity. It does not matter whether you were formally focused on extracting insights through analytics or simply had a flash of an idea.

Some companies are familiar to many of us but have an aspect to their story that we may not know. In a previous post, I talked about Starbucks and their new service allowing you to tweet a coffee. What these companies have in common is that they were able to see an opportunity, innovate in some way and change an industry. In fact, I was utterly surprised by how the cloud facilitated the next level of innovation.

The Nest Learning Thermostat started off as a $99 device that could learn your temperature preferences. The problem they were looking to solve was the frustration associated with overly complex home thermostats. According to Nest's founder Tony Fadell (https://nest.com/blog/2011/10/25/thermostats-yes-thermostats):

"*Turns out you change the temperature in your house 1500 times a year. 1500! Our thermostat learns what temperatures you like so it can program itself. It senses when you're out and turns itself down. And we started from scratch with design, so it's beautiful. Gorgeous hardware, easy install, fully integrated software, remote control from your smartphone.*"

The Nest thermostat will create a profile based on your behavior and, in about a week, the thermostat will anticipate your needs and self adjust. Plus there is a cool mobile application integration component that can allow you to make manual adjustments.

What you may not have known was that Nest collects your information, removes your personally identifiable information and sells it to power companies. This way, the power companies better understand their clients' needs and are better able to adjust their supply chain to serve their customer base.

Understanding customer usage patterns when the cost of coal and natural gas are only going up and ninety percent of electric power is fueled by nonrenewable coal, natural gas or nuclear power is good information for a power company to have, especially when you consider that renewable sources today will not cover the growth in demand. There is no excess in the system, according to Forbes (http://www.forbes.com/forbes/2008/0630/038.html).

Now consider a situation where a power company can accurately predict demand and adjust the supply chain, right down to the schedule of the trucks carrying the coal. In just a couple of years, Nest was able to do just that and change how the power companies did business.

It helps to understand what's going on behind the scenes. According to the FastCompany article "Next For Nest: Building Out The Smart Grid, One Home At A Time," (http://www.fastcodesign.com/1672408/next-for-nest-building-out-the-smart-grid-one-home-at-a-time) power companies had a government mandate to find ways to be more efficient and were getting nowhere.

"*The energy companies have a handful of options for meeting that demand when these periods inevitably occur, but they're all exceedingly expensive, and their various efforts to curb demand during these periods have been ineffective.*"

After recently purchasing Nest, Google added language to the license agreement that allowed them to reduce or increase their users' temperature settings by a few degrees (up or down).

"*…informs your thermostat of demand response events. After that, your schedule may be automatically adjusted to reduce energy usage during the event.*"

As part of an opt-in program, Nest users can opt to have the power company automatically adjust their temperature settings in return for credits. Now, imagine a hot summer day in Southern California with no excess in the system and suddenly a demand response event occurs (a dangerous increase in demand). It has the power company on the verge of a rolling brown out.

However, the power company now has the ability to change the temperature setpoint for the air conditioner in your home or business on that day, as well as your neighbors who have Nest thermostats, and is able avoid the rolling brownout. That is huge!

What would the ability to stop rolling brownouts be worth to a power company?

According to Independent System Operator (ISO), the cost savings in Southern California alone is in the tens of billions per year. Imagine the savings if the entire country joined in!

A small company has the potential to not only redefine an industry's supply chain and help it meet a government mandate, but is also able to put an end to events that occur yearly and cost the power companies tens of billions of dollars.

As you may have noticed, I have not mentioned the cloud. However, without the cloud, in isolation, Nest would not have been able to collect and sell customer usage patterns back to the power companies and would not have been in a position to help the power companies overcome a problem and satisfy a government mandate. Without the cloud, Nest would just be a cool little thermostat company.

Originally posted at
http://thoughtsoncloud.com/2014/07/nest-small-company-big-disruption-enabled-cloud/

See also Top ten ways cloud computing drives innovation at
http://thoughtsoncloud.com/2014/04/top-ten-ways-cloud-computing-drives-innovation/

Cloud innovation allows Fitbit to bend the insurance cost curve

Like my last articles on the innovative companies Starbucks (http://thoughtsoncloud.com/2014/06/starbucks-service/) and Nest (http://thoughtsoncloud.com/2014/07/nest-small-company-big-disruption-enabled-cloud/, this blog post is a profile of a company that you likely know and maybe even patronize. However, there is an aspect of this company's story that is not so well known and involves innovation on the cloud.

I came to Fitbit because of my friend Steve Levy. His birthday was upon us and we needed to purchase a gift for a smart techie type. After thinking a bit on what to get him, we came to activity trackers—the wearable, wireless-enabled devices that measure data such as the number of steps walked, quality of sleep and other personal metrics.

Fitbit, like any new company, started out not thinking to change an industry, but wanting to make the best widget; in this case, the best pedometer. Like many startups, Fitbit chose the cloud to enable its product development. And in late 2009, Fitbit shipped its first pedometer.

According to a recent article on Inc., Fitbit started slowly by selling its product only on its website and then gradually added retailers. Today, its application is one of the top downloads from the Apple Store, according to Fitbit CEO James Park in the Forbes article, “How Fitbit Survived As A Hardware Startup” (http://www.forbes.com/sites/roberthof/2014/02/04/how-fitbit-survived-as-a-hardware-startup/):

“Fitbit is the No. 1 app for fitness in Apple’s AAPL -0.87% App Store, which he said is amazing because you need a $100 device to use it. NPD now says Fitbit has 77% of the market for full body activity trackers…”

Did you know that there is another side of the pedometer business?

Like Nest, Fitbit has found a lucrative side business as a data broker. Fitbit discovered that your data combined with the data of thousands of other people can tackle bigger problems—just as we saw with Nest. This time, the problem is cutting your company’s health care budget rather than sparing the local electric company from having to build another power plant.

The new data broker model

Fitbit sells the information that it collects about your health to insurance companies. This way, insurance companies will be able to compare rates and activity levels in different regions and adjust their rates appropriately. This is similar to the way that some auto insurance companies know how you are driving and provide discounts for driving safely. The key is in getting enough people to participate.

Bending the insurance cost curve

Fitbit is in a position to be a consumer-oriented product, given its leadership position. It can potentially “bend the cost curve” by as much as 13 percent (year-over-year reduction in medical trend, what insurers charge employers based on the risk profiles of their employees) according to the PWC article “Factors affecting 2014 Medical Cost Trend.” (http://www.pwc.com/us/en/health-industries/behind-the-numbers/factors-affecting-medical-trends.jhtml)

While this is very exciting, it will take a few years before we can categorically state that Fitbit devices and analytics are responsible for lowering health care costs. What we know today is that our data is being mined and shared across a growing web of connected things and the cloud is behind the scenes empowering the innovation engine.

Innovation means being able to spot a trend or opportunity as well as being nimble enough to quickly adjust course to take advantage of the opportunity. It does not matter whether you were formally focused on extracting insights through analytics or simply had a flash of an idea.

Some companies are familiar to many of us but have an aspect to their story that we may not know. In a previous post, I talked about Starbucks and their new service allowing you to tweet a coffee. What these companies have in common is that they were able to see an opportunity, innovate in some way and change an industry. In fact, I was utterly surprised by how the cloud facilitated the next level of innovation.

Originally posted at
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See also “Starbucks as a service” at
http://thoughtsoncloud.com/2014/06/starbucks-service/

A good understanding of cloud service and deployment models, in other words cloud taxonomy, is essential for a good grasp of cloud computing. This is our next topic.

Cloud taxonomy: Deployment and service models

Let’s turn to the Anderson family again. Erik is still talking with his spouse on cloud computing - this time explaining private, public, and hybrid clouds using a transportation example. Maybe we can also benefit from the discussion!

How to explain private, public and hybrid cloud to your spouse

In this blog post, I’ll share my most recent attempt to explain the various cloud delivery models to my spouse. As I’ve described before, I like to use analogies when conveying a topic that’s completely foreign to someone. I’ve found that it’s a lot easier to see how things are related that way. I’ll stick to a transportation example, but this time, I won’t be using rental cars. In the next three points, I’ll describe the difference between a private cloud, a public cloud and a hybrid cloud.

You may not realize it, but you might have a private cloud in your garage

If you are like most people in the non-urban world, you likely own a vehicle. If you have two drivers in your household, you might even have two vehicles. Each of you likely drives the vehicle you need when you need it. My wife and I each have our own vehicle, but if I need to transport something bigger, I’ll take her SUV. If I want better gas mileage, I’ll take my car. I’m able to use the right resource (a vehicle in this case) to meet the particular need I have at that time.

But what happens when you have a teenager? Do you need to buy a second or third car? Although some people would say yes, the truth is that most families would be able to address their needs just fine by sharing the existing vehicles they have. This is a great analogy to what companies do when they build a private cloud.

Companies own all of the hardware and software that runs the private cloud, just as you own the cars in your garage. Companies have different users that share this hardware so that they each don’t need to buy their own hardware, just like you share the cars that you own among all of your drivers. There may be some rare instances that you aren’t able to use a car, but as a trade-off, you are in full control over the type of car that you own and drive. Companies that build a private cloud have this same advantage.

There’s no shame in using the bus

Maybe your car is in the shop. Maybe you don’t own a car. Maybe you don’t want to own and maintain a car. Whatever the reason, some people and some companies would rather use public transportation (or a public cloud) to address their needs. You might be a little restricted by the bus schedule, but you only pay for what you use. If you work from home and don’t need to ride the bus that day, you save the money that you would have spent.

The same thing goes for companies using a public cloud. They don't need to buy any hardware or software up front (sometimes referred to as spending CAPEX or capital expenditure), and they just pay for what they use as they use it (OPEX or operational expenditure). For many people and companies, having a smaller recurring expense is easier to budget for than a large one-time expense.

Sometimes you need to rent a trailer

Your car works for you most of the time, but for a big road trip you might need more space. So what do you do? You rent a trailer. It works with your existing car but gives you the added capacity you need for this temporary situation. You don't own the trailer, but you are able to use it. This is exactly like what companies do when they build a hybrid cloud. As the name implies, this is a mix between private and public cloud. Companies do the majority of their work on hardware that they own (your car), but if they have a temporary need for more capacity, they are able to rent it from a public cloud provider (the trailer). Just like the trailer securely connects to your car's hitch, the hybrid cloud securely connects the public cloud to your private cloud.

Originally posted at
http://thoughtsoncloud.com/2014/07/explain-private-public-hybrid-cloud-spouse/

See also "Cloud computing: Your solutions in motion" at
http://thoughtsoncloud.com/2013/10/cloud-computing-your-solutions-in-motion/

Hybrid clouds are becoming the most dominant deployment model these days. As in Erik's analogy, many companies prefer to do their mission critical work on hardware that they own (the car they own). However, if they have a temporary need for more capacity or for certain types of workloads, they rent it from a public cloud provider (the rental trailer). Of course, there are some challenges to implementing hybrid clouds, such as network connectivity and manageability. Let's see what our hybrid cloud expert Marcus Erber has to say about hybrid clouds and what you should consider when implementing such environments.

What is hybrid cloud?

The National Institute of Standards and Technology defines hybrid cloud as "a *composition of two or more clouds (private, community or public) that remain unique entities but are bound together, offering the benefits of multiple deployment models*." Although this definition sounds very reasonable, it does not cover all aspects of hybrid clouds.

Let's discuss possible deployment models first. As shown in Figure 1, there are five defined cloud deployment models, from a private cloud on-premises to a public cloud service with a cloud service provider.

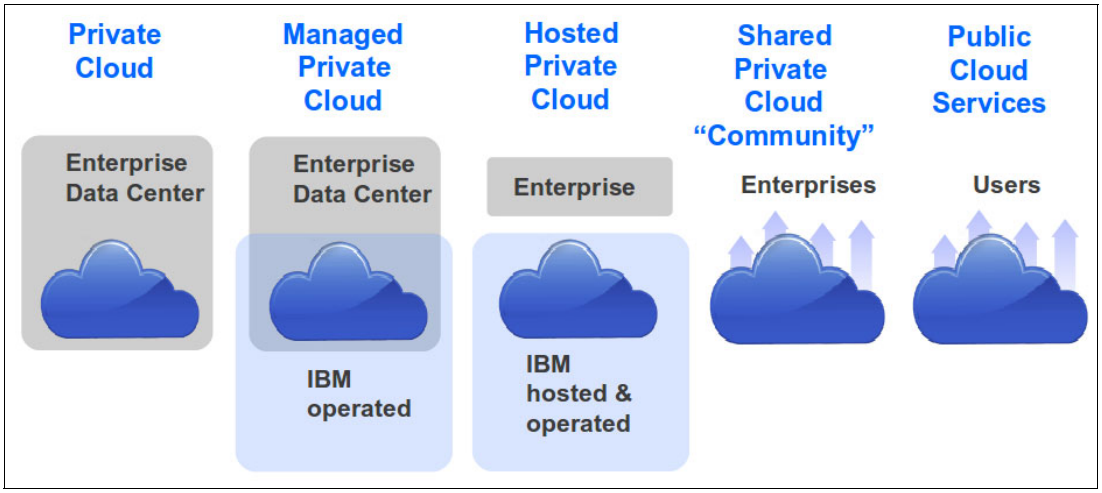

Figure 1 Hybrid clouds

Often, hybrid cloud refers to a combination of a public cloud service and a private cloud on-premises; however, hybrid clouds could also consist of two public clouds provided by different providers or even a combination of a cloud and traditional IT. Actually, a setup where existing systems on a traditional IT infrastructure are combined with a public cloud service is currently the most frequent use case of a hybrid cloud.

Any hybrid cloud setup has some challenges that need to be considered during the planning and design phase:

The most obvious challenge is network connectivity, especially if remote cloud services like a public cloud or a hosted private cloud are involved. Not only must bandwidth, latency, reliability and associated cost considerations be taken into account, but also the logical network topology must be carefully designed (networks, routing, firewalls).

Another huge challenge is the manageability of different cloud services. When different cloud services are used, every service provider will have its own management and provisioning environment. Those environments can be considered completely independent from each other. By having instances in different cloud services, there is no complete picture available showing the number of totally deployed instances and their statuses. An orchestration layer can be a possible solution for this problem. This layer provides a single interface for all cloud-related tasks. The orchestration layer itself communicates with the different cloud services through application programming interfaces (APIs). The big advantage of an orchestration layer is the ability to track and control activities on a central point to maintain the big picture.

Today, plenty of cloud service providers maintain their own proprietary set of APIs. This makes the use of orchestration very complex as the orchestrator requires some kind of a driver component for each proprietary API set. However, the trend of standardized APIs is clearly seen in the industry. OpenStack seems to be the future cloud industry standard.

Hybrid clouds mainly work on an infrastructure and application level. On the infrastructure layer, a hybrid cloud means the combination of virtual machines from different cloud services. On the application or software as a service (SaaS) layer, a hybrid cloud describes an application setup with components in different SaaS offerings or existing applications within the data center of an enterprise. The challenge on an SaaS-based hybrid cloud is mainly the

exchange of data between the different services and applications. Like orchestration works on the infrastructure level, data integrators work on the application layer.

Summary

A hybrid cloud is a combination of different clouds, be it private, public or a mix. The biggest challenge is the integration of the different cloud services and technologies. Standardized APIs such as OpenStack seem to solve most of those issues.

Originally posted at http://thoughtsoncloud.com/2014/01/what-is-hybrid-cloud/

See also “Benefits and challenges of hybrid cloud: Use cases for System z” at http://thoughtsoncloud.com/2014/08/benefits-challenges-hybrid-cloud-use-cases-system-z/

Now we delve into the details of service models, which are infrastructure as a service (IaaS), platform as a service (PaaS) and software as a service (SaaS). Other services are derived from these main services, such as Storage as a service (STaaS), Business Process as a service (BPaaS), and communications as a service (CaaS). However, we will focus on the main services (IaaS, PaaS, and SaaS), which are also called the cloud layers.

Let’s start peeling back these layers. In the next post Sujith Pillai explains the cloud computing delivery models, this time with an ice cream analogy!

Cloud computing delivery models explained

Let me explain the cloud computing delivery models each one in detail, using a scenario of having ice cream for some guests in your home.

Infrastructure as a service (IaaS)

You could buy milk from the grocery shop, add the ingredients, put it in the ice cream maker and after few hours the ice cream would be ready! Here, you bought the basic ingredient (milk) from the store and processed it. Similarly, if you want to host a email service for your company, you could buy “computing power” from a cloud vendor, then install databases and applications to run your email service. So you are buying the basic infrastructure as a service from a cloud vendor. You get the basic infrastructure from the cloud vendor, and it’s up to you to decide what to do with it. Half of the milk that you bought from the shop can be used for ice cream and you could drink the rest. You get the flexibility to do whatever you want! The ice cream is completely up to you.

Platform as a service (PaaS)

For the same set of guests, you could also choose a different approach! You could buy an ice cream mixture which has milk powder and all the other ingredients except water (and the toppings, of course). All you have to do is mix it with water and add it to the ice cream maker. Soon, your ice cream is ready. Similarly, for your email hosting, you could buy application servers and databases as a service directly from the cloud vendor, and then set up your email service. You save lot of time in installing and configuring the databases and applications. Also, you don’t have to worry about the burden of operating system maintenance. All you have to think about is the email service that you are providing. Here you got the platform to operate directly from the vendor, as a service—platform as a service. You still have the flexibility to deploy the applications that you want, and the data you want to put in the database. The flexibility is limited, but you saved lot of time and burden. You’re still making the ice cream, but you were able to skip a few steps.

Software as a service (SaaS)

Again for your same guests, you could always just buy ice cream directly from the shop and serve it! This would save you a huge amount of time and effort. Similarly, you can get an email service directly from a cloud vendor, as a service—software as a service. Just start using the service as-is. Here you get less flexibility, because you are bound to what the service provider is giving you (the ice cream is already made; you're just using it). However, you saved lot of time and burden in setting up an email service.

Originally posted at
http://thoughtsoncloud.com/2014/03/cloud-computing-delivery-models-explained/

See also "Business Process as a Service (BPaaS) delivered from the cloud" at
http://thoughtsoncloud.com/2011/12/business-process-as-a-service-bpaas-delivered-from-the-cloud/

Now we turn to Michael Fork, who asked the question "What is IaaS?" to four IBM cloud leaders. Not surprisingly the answers he got back were heavily influenced by their world view, including where they came from and where they are today.

What is infrastructure as a service (IaaS)?

"What is IaaS?" seems like a simple, innocuous question. However, as with most technical topics, things are never as they appear. IaaS is no different. To illustrate this, I reached out to four IBM cloud leaders and posed that simple question. What I got back were answers heavily influenced by their world view—where they came from and where they are today.

First I asked Distinguished Engineer (DE) Christopher Ferris, CTO for Cloud Interoperability in IBM Software Group (SWG). Chris has responsibility for IBM engagements in cloud-related standards and open source, and is a long-time participant in standards bodies. Unsurprisingly, he went with a standards-based definition:

"*Given that I collaborated on behalf of IBM with the National Institute of Standards and Technology (NIST) and others in the open standards community to help NIST shape their formal definition of cloud, I'll let what has become the generally accepted definition of IaaS, from a standards perspective, speak for itself.*"

Here's how NIST defines IaaS: "*The capability provided to the consumer is to provision processing, storage, networks and other fundamental computing resources where the consumer is able to deploy and run arbitrary software, which can include operating systems and applications. The consumer does not manage or control the underlying cloud infrastructure but has control over operating systems, storage and deployed applications; and possibly limited control of select networking components (e.g., host firewalls).*"

Next, I asked another Distinguished Engineer, Matt Hogstrom. As Chief Technical Officer (CTO) for software-defined environments (SDE) in Systems and Technology Group (STG), Matt has responsibility for defining the SDE strategy covering IBM hardware and systems software. Prior to his current job, Matt played a significant role in the development of the IBM solution for automated application delivery on an IBM expert integrated system, IBM PureApplication™ System. Rooted in his experience sitting on both sides of the IaaS application programming interface (API) boundary (consuming in PureApplication System, exposing in SDE), Matt's definition is very practical:

"*Infrastructure as a service is the ability to programmatically create, manage and consume infrastructure elements which include images, storage volumes, network and compute resources.*"

Third, I asked yet another Distinguished Engineer, Mac Devine. As CTO for Cloud Services in IBM Global Technology Services® (GTS), Mac is responsible for the technical direction of IBM public cloud services. Fittingly, his answer is heavily influenced by the public cloud characteristics of paying for what you need, when you need it:

"*Infrastructure as a service means that you are obtaining cloud infrastructure (i.e. servers, storage and networking) in an on-demand, elastic fashion and in a pay-as-you-go model.*"

Finally, I asked Nathan Day, Chief Scientist at one of IBM's latest acquisitions, SoftLayer. As Chief Scientist, Nathan is responsible for managing and overseeing the product portfolio. SoftLayer is a service provider that prides itself on "One platform. Endless possibilities. Virtual or bare metal. Public or private. All deployed in real time." and Nathan's answer reflects his focus on automating those infrastructure building blocks and making them available as a service:

"*Infrastructure as a service is providing raw materials (compute, storage, network) to users on-demand so that they can execute their workloads in a flexible, scalable environment without the overhead of obtaining and operating physical gear.*"

Of course, I cannot end this post without sharing my answer to the question. Having spent a significant amount of time the last two years educating teams across IBM on cloud, infrastructure as a service and OpenStack, my answer is a simple statement illustrating the capabilities:

"*Infrastructure as a service is the ability to programmatically do all those things that historically took a call to someone in the data center.*"

As you can see above, answers to "What is IaaS?" vary widely, but all share the common theme of programmatic access to the basic building blocks of IT: compute, storage and networking.

Originally posted at
http://thoughtsoncloud.com/2014/02/what-is-infrastructure-as-a-service-iaas/

See also "Choosing between managed and unmanaged IaaS" at
http://thoughtsoncloud.com/2014/08/choosing-managed-unmanaged-iaas/

As Mike said, programmatic access to the basic building blocks of IT (compute, storage, and networking) is the essence of IaaS. Now, let's turn our attention to the second cloud layer: Platform as a service (PaaS). In the following post, Sunil Joshi says that the biggest added value of PaaS is that development environments are abstracted from the lower-level details of the environment. Being an ex-developer myself, I appreciate this value statement!

What is platform as a service (PaaS)?

To answer the question, "What is PaaS?" let's start with a basic definition: Platform as a service (PaaS) is a cloud-based computing environment designed to support the rapid development, running and management of applications. It is integrated and abstracted from the lower-level infrastructure components.

For a more official version, you can refer to the National Institute of Standards and Technology (NIST) definition of PaaS: *The capability provided to the consumer is to deploy onto the cloud infrastructure consumer-created or acquired applications created using programming languages, libraries, services, and tools supported by the provider. The consumer does not manage or control the underlying cloud infrastructure including network,*

servers, operating systems, or storage, but has control over the deployed applications and possibly configuration settings for the application-hosting environment.

While the NIST definition is a good start, it doesn't tell the whole story. Let's take a look at the cloud stack as a pyramid (Figure 2) to better understand PaaS:

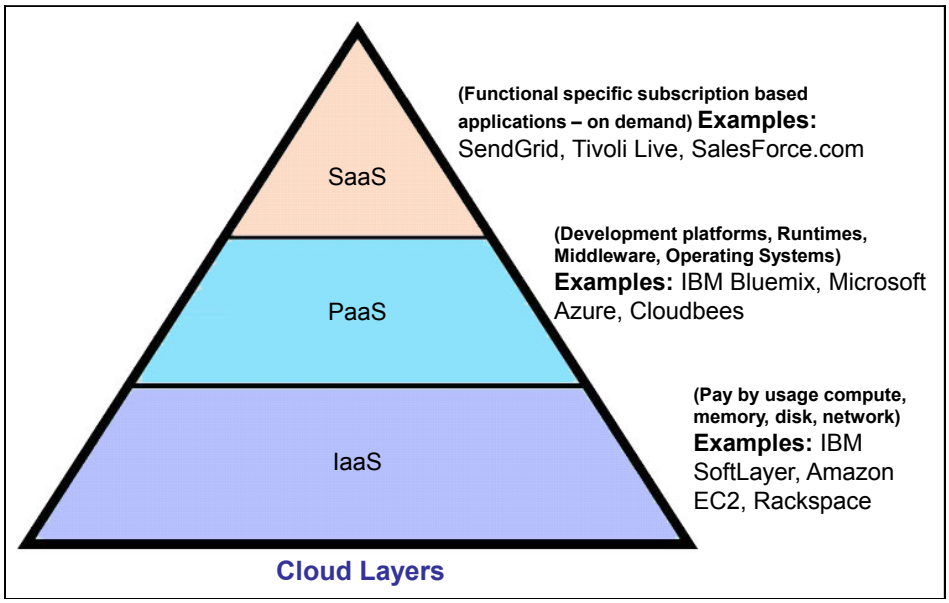

Figure 2 Cloud layers

Infrastructure as a service (IaaS) refers to the underlying hardware resources such as network, storage and compute resources, usually with some virtualization technology. While the advent of IaaS opened new territory for businesses to better manage IT hardware costs, it put developers in a challenging situation. Developers are now responsible for more of the operational work during development and test. They have to develop skills to provision, configure, manage and update hardware resources that they would have never needed in a traditional model.

In a PaaS environment, the service provider not only is responsible for provisioning and managing the lower level infrastructure resources, but also for providing a fully managed application development and deployment platform. PaaS provides the developers with the appropriate flavors of operating systems, databases, middleware, software tools and managed services, usually in a multitenant environment. The biggest added value of PaaS is that developers are completely abstracted from the lower-level details of the environment, so they can fully focus on what there are really good at (rapid development and deployment) and not worry about things like scalability, security and more that are fully managed by PaaS.

Software as a service (SaaS) refers to the actual functional applications consumable on-demand by application developers, usually made available through PaaS as a catalog or a marketplace.

Over the past few years, several vendors have come up with their PaaS offerings, including IBM Bluemix, Cloud Foundry and Microsoft Azure.

So what's the right PaaS solution for an enterprise? Let's take a look at some the characteristics of a PaaS offering to answer that.

Figure 3 shows the PaaS characteristics.

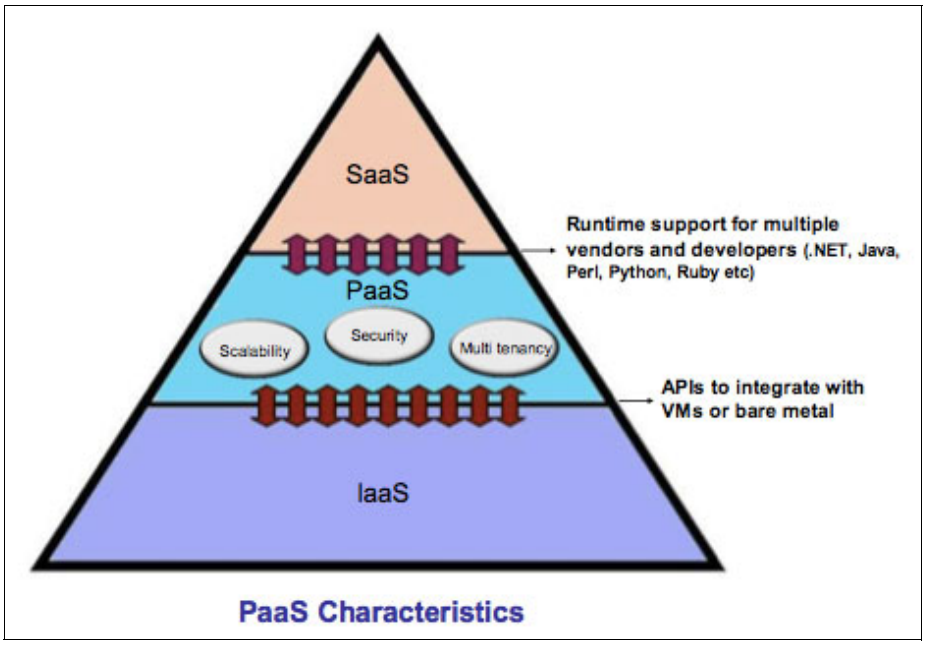

Figure 3 PaaS characteristics

There are two basic integration points that any PaaS solution has to support. Integration with the underlying IaaS makes it seamless for developers to get access to hardware resources. Developers simply don't need to concern themselves with the where and how these resources are provisioned; they just let the PaaS do it for them. Usually such integration is accomplished through application programming interfaces (APIs) that the IaaS stack makes available to the PaaS vendors.

The second integration point is with the SaaS layer or application vendors that want to develop value added generic functional services and make it available for developers to consume in an on-demand manner. This is usually accomplished by PaaS by supporting a variety of runtimes that applications can be deployed in, and a marketplace or catalog where these services can be published for consumption.

Enterprises should consider if they want to work on a public PaaS offering or a private PaaS. A public PaaS can be more easily available than a private for small or medium business, while large enterprises may consider building their own PaaS environments.

Some of the PaaS vendors use open source platforms (Cloud Foundry) while other vendors have a more proprietary implementation. An open source implementation may have the benefits of portability, whereas a vendor specific offering may have a better support model. Enterprises should evaluate these considerations before picking a PaaS strategy. Portability is very important because many enterprises may want to move between cloud implementations as their maturity and strategy evolves (for example, public domain to private or proprietary IaaS model to OpenStack).

Finally, it is worthwhile to note that most PaaS implementations align well with cloud-based development such as mobile applications and new web applications more so than the traditional applications. PaaS helps businesses to minimize operational costs and increase productivity through a quicker time to market. There is tremendous cost and time savings to be had with a PaaS approach, and with the right strategy, PaaS can be a game changer for businesses.

Originally posted at
http://thoughtsoncloud.com/2014/02/what-is-platform-as-a-service-paas/

See also “Why I’m thankful for PaaS” at
http://thoughtsoncloud.com/2013/11/why-im-thankful-for-paas/

Software as a service (SaaS) is the topmost layer in the cloud stack. Tristram Warkentin starts his post with “Even if you’ve never heard the term SaaS before, you know what it is already”. Let’s hear the rest of the story.

What is software as a service (SaaS)?

Even if you’ve never heard the term software as a service (SaaS) before, you know what it is already. You’re using it right now, and I’d wager that you have at least a couple of other software as a service programs open in another tab (or another window). It’s everything from Google search to Facebook to the Thoughts on Cloud blog.

What makes these SaaS? They’re all cloud applications, which means that most of the storage and processing takes place on computers, called servers, owned by Google, Facebook or IBM. Then, when you connect to them, you use a fairly simple and common client (often a web browser) to access the service and interact with it. It often doesn’t matter if that browser is on a PC, a Mac, iPhone, Pebble smartwatch or any other kind of computer; SaaS makes the same cloud-based services available on a multitude of devices.

What makes SaaS so great?

It seems simple enough: do most of the application’s work in the cloud, then provide access through a web browser or thin client and you’ve got SaaS. So what makes SaaS powerful? Well, if you use YouTube or Craigslist, you already know. When everything is stored and processed on the cloud, thousands (or even millions) of people can interact with the same bit of information at once. While you’re liking your friend’s Facebook post in Boston, her friend in Singapore might be commenting on it.

And even better, software as a service means you don’t have to have a powerful computer to do truly powerful things. In IBM Enterprise Marketing Management group, we’ve harnessed the power of SaaS to answer questions like “How would my overall profits for North Carolina be impacted next week if I lowered the price of these three beer 12-packs by two dollars?” With SaaS, you can kick off that analysis from your phone, tablet, or computer—and recruit dozens of servers in the cloud to calculate the answer for you. Until recently, you could even Google search over text message. That means you could have used a phone made 20 years ago to perform a computing task utilizing thousands of servers!

What SaaS means for enterprise

Consumers aren’t the only winners with SaaS; enterprise SaaS was worth $14.5 billion in 2012, a number that is expected to grow by more than 50 percent in just two years. From Salesforce.com to NetSuite, SaaS is starting to reshape the way we work in the same way it changed how we play and connect. If you’re like me, you use dozens of applications for work, each more clunky and less useful than the last. Why can I load that viral video in half a second by googling “ketchup robot,” but can’t find that one e-mail from last week?

IBM has spent the last century helping businesses run better, and it’s turning that juggernaut to enterprise SaaS. Wikipedia’s history of SaaS shows how deep those roots go—IBM was one of the first companies in the world to centralize computing resources. And now we’re working on the next step in enterprise SaaS: collecting the power of human resources. The

problems we face today require collaboration on a scale humans have never seen before, and it's time for our tools to catch up to a globe that's already connected. We've already built over 120 SaaS applications to address the changing needs of businesses worldwide, with more on the way.

Originally posted at
http://thoughtsoncloud.com/2014/03/what-is-software-as-a-service-saas/

See also "SaaS: Lightening the load, one backpack at a time" at
http://thoughtsoncloud.com/2014/09/saas-lightening-load-one-backpack-time/

Going deeper into the cloud: Cloud computing internals, dynamic clouds and composable business

We have seen the main building blocks of cloud computing, but how does this whole thing work? Dominique Vernier has the answers.

How does cloud computing work?

I was challenged to describe how cloud computing works in 500 words. It was such an interesting challenge that I had to take it.

First, you have to know what cloud computing is to understand the advantages of this new way of providing computing resources in the cloud. Second, you have to understand the different types of cloud offerings, including infrastructure as a service (IaaS), platform as a service (PaaS), software as a service (SaaS) and business process as a service (BPaaS). Each service is built on top of the other.

Now, how does it work? The Cloud Computing Reference Architecture (CCRA) is a great place to start. I don't mean that the CCRA is the Holy Grail and should always be fully applied, but it gives you material to design your own solution and understand the architecture. You can find some questions and answers in this article: "What is CCRA?" at
http://thoughtsoncloud.com/2013/05/ibm-cloud-computing-reference-architecture-v3-stefan/

The CCRA (Figure 4) defines multiple components, and each component fulfills a given functionality.

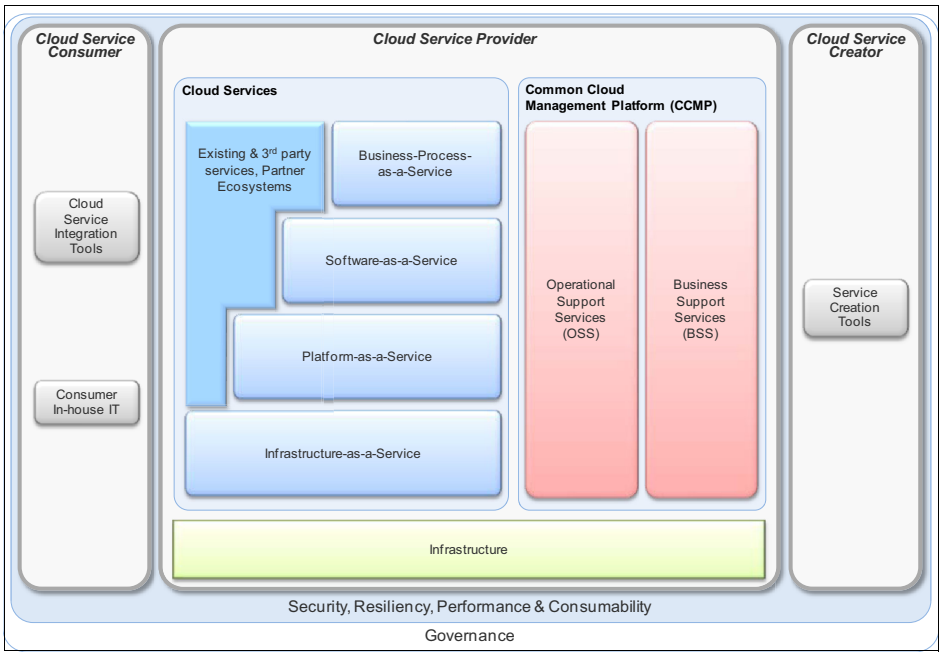

Figure 4 Cloud Computing Reference Architecture (CCRA)

The first building block is the infrastructure where the cloud will be implemented. Some people make the assumption that environment should be virtualized, but as cloud is a way to request resources in an on-demand way and if you have solutions to provide on bare metal, then why not? The infrastructure will support the different types of cloud (IaaS, PaaS, SaaS, BPaaS).

To be able to provide these services you will need Operating System Services (OSS), which will be in charge of deploying the requested service, and Business System Services (BSS), mainly used to validate the request and create the invoice for the requested services. Any metrics could be used to create the invoice (for example, number of users, number of CPUs, memory, usage hours/month). It is very flexible and depends on the service provider.

A cloud computing environment will also need to provide interfaces and tools for the service creators and users. This is the role of the Cloud Service Creator and Cloud Service Consumer components.

Now, let's see how it works in reality.

Generally, you log in to a portal (enterprise or public wise) and you order your services through the Cloud Service Consumer. This service has been created by the cloud service provider and can be a simple virtual machine (VM) based on an image, some network components, an application service such as an WebApp environment and a service such as MongoDB. It depends on the provider and type of resources and services.

The cloud provider will validate, through the BSS, your request and if the validation is okay (credit card, contract), it will provision the request through the OSS.

You will receive, in one way or another, the credentials to access your requested services and you will usually receive a monthly invoice for your consumption.

Hopefully now you understand a bit more about how cloud computing works. Did I successfully complete my challenge?

Originally posted at
http://thoughtsoncloud.com/2014/02/how-does-cloud-computing-work/

See also “Cloud Computing Reference Architecture (CCRA): A blueprint for your cloud” at
http://thoughtsoncloud.com/2014/06/cloud-computing-reference-architecture-ccra-blueprint-cloud/

Dynamic cloud is another area that is gaining traction. Think of it as the foundation of the composable business, providing choice and flexibility. By using dynamic clouds, businesses can pick the best application for the job, regardless of delivery platform. Now, that is the easy part. The challenge is to explain this to your kids, which is what Stewart Hyman did in the following post.

How I explained dynamic cloud to my kids

“Daddy, what do you do?”

Ugh, there’s that dreaded question again.

Honestly, there are days I wish I’d gone into medicine, teaching or even astrophysics, if only so I could more easily explain what I do. My saving grace is that kids today understand more about computers than I do; my seven and eight year olds can easily pick up concepts that even I sometimes struggle with.

It was simple for them to pick up the concepts of outsourcing, managed services, process choreography and even cloud computing. We use cloud storage services to share pictures with family and friends around the world, so the concepts were in no way foreign. But when I started explaining how I design cloud solutions for large companies and started delving into the concept of composable services and dynamic cloud, it made me pause and try to think in terms they could understand.

It quickly dawned on me that this struggle to understand dynamic cloud is one that only really plagues adults, that it was my struggle (yet again) and not theirs. Adults tend to live with more rigid rules, consuming pre-built services from pre-built systems, and generally have very few options to choose from. But kids are urged to use their imagination and instead build fit for purpose solutions out of numerous different building blocks. For example, LEGO has 2200 different types of pieces, so if you compare the scope of options that kids deal with compared to adults it becomes easy to frame dynamic cloud in terms kids will understand.

Here’s how I explained it:

- **Dynamic cloud services are like LEGO blocks**, each with their own features and costs. Some blocks are bigger and simpler while other blocks are smaller and more complex, but each block serves a specific purpose. At IBM we have been creating managed services “blocks” to provide different capabilities on top of servers, like backup and restore, storage tiering, patching or anti-virus scanning. We can sell these blocks separately and they can be integrated into existing or newly-built capabilities in our company. Luckily IBM has been doing services management for years, so we have a lot of existing capabilities we are wrapping into blocks. We also have a lot of smart people who are working on building newer and better blocks that are more automated or have lower cost.

- **You only pay for the blocks you use while you use them**, and when you are done you throw the block back into the bin and stop paying for it. This part is extremely important because it provides a mechanism for customers to save a lot of money on things they aren't using. In existing managed services you usually sign two to ten year contracts that overestimate how much you have to spend or how much you need to use. Dynamic cloud gets rid of this problem by allowing you to only pay for the services you use. In order to do this, the system has to be capable of automatically turning on and off services you want. This is no small order because many of these services existed before cloud, so updating them to be automated and to fit into this dynamic new world requires heavy thought and redesign.
- **You can save money by using cheaper blocks or leaving blocks out entirely**. This was never an option in a traditional outsourcing contract; we would use fixed teams, tools and services for all servers at all times. These services cost what they cost and you were paying a standard high price service fee whether you needed those services on each server or not. In dynamic cloud, this is no longer the case. You could dynamically tailor the services per server, allowing a whole new paradigm of flexibility and cost reduction options. Perhaps you might use disaster recovery services on production servers but leave them off development servers. Maybe you'd use file level backups on production servers and full system image backups on test servers, but no backups at all on development servers. Any given service might cost the same or more than it actually did before dynamic cloud (backup and restore likely will not be cheaper now than it used to be), but the combined costs and features can be tailored greatly to suit your specific need per server, and therefore you can be confident that costs always align with your use case.
- **Some people use Krazy Glue to lock blocks together in a pattern**, so they act like a single compound block. Sometimes blocks work better together when combined in a specific way and can offer features or costs savings that only apply when combined in that way, so we create a pattern to remind us of that special combination. Until now patterns have really only focused on infrastructure configurations (servers, storage, networks, operating systems and more) or application configurations (application nodes, platform per node, applications and so on), but dynamic cloud can introduce the concept of service patterns to this as well (groups of services that should be combined together for best practice, or to achieve new compound service levels or cost reduction).

Figure 5 shows an example of dynamic cloud with service composition and patterns.

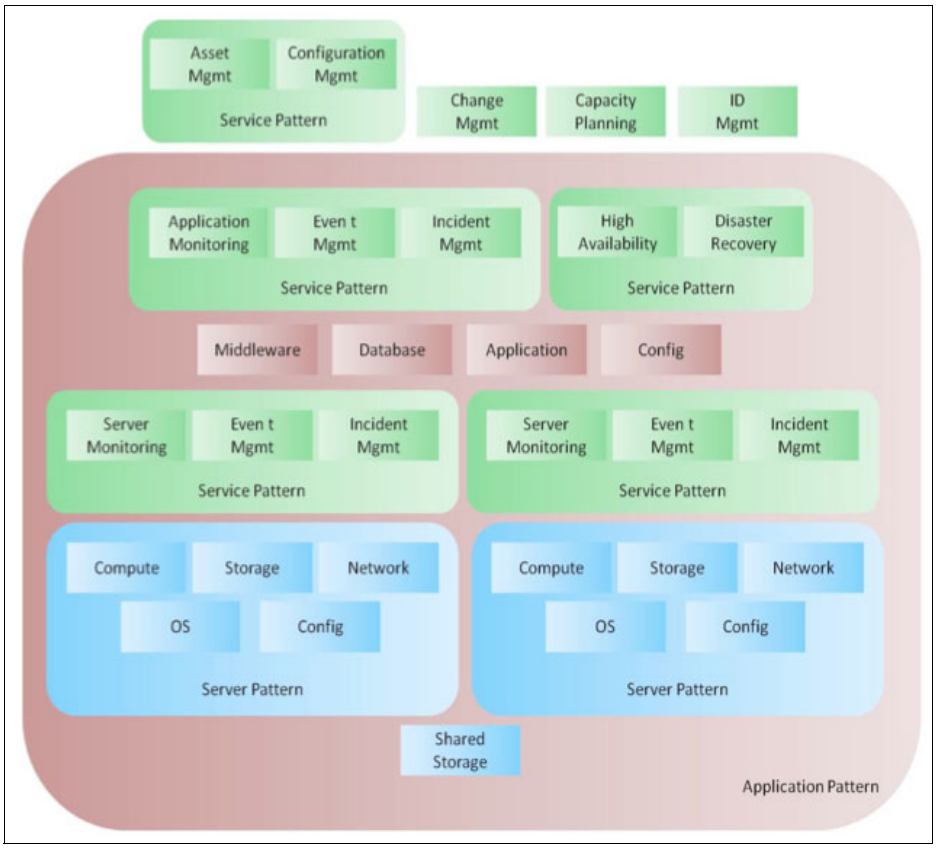

Figure 5 An example of dynamic cloud with service composition and patterns

- **Anyone must be able to contribute new building blocks and patterns**. If you make the mistake of centralizing the development of building blocks in a "closed" development model, then you run the risk of creating bottlenecks and limiting community contribution or adoption of the model. There are a lot of people out there with skills, time and money to contribute, and you have to enable them rather than stifle them or try to control them. Linux is a great example of an open approach to community contribution fostering more rapid growth and adoption. It allows the entire enterprise to start contributing and allows for distributed projects to prioritize and fund their own additions. It even allows other vendors or customers to contribute as well.
- **But they have to comply with certain standards**. Even LEGO blocks have standard connectors with standard measurements, so any new block must comply with these standards in order to be useable and helpful and snap on easily. The same is true for dynamic cloud; a framework is required to make sure everyone is developing assets in a common, reusable, best practice-oriented way, with good documentation and so on. Examples are easy to find. Each service needs to be billed, be presented from a single "store front" for purchase, define standard service level agreements (SLAs), present owner and contact details and so on. You don't want to bill customers 100 different ways if they use 100 different services. You don't want the customers to look in 100 places to find the services. They need to know who to contact if a service breaks. You need to centralize and standardize certain features and define clear guidelines for contribution, but once you do this you effectively allow a community of experts, each in their own area, to begin adding capabilities to the mix and grow together.

After listening intently to all this, my boys seemed excited, so I was sure I'd gotten through until almost in unison they said: "Daddy, now I understand what you do! Can you buy me some new LEGO?"

Sigh.

You can't win them all.

Originally posted at
http://thoughtsoncloud.com/2014/05/explained-dynamic-cloud-kids//

See also "What is dynamic cloud?" at
http://thoughtsoncloud.com/2014/02/what-is-dynamic-cloud/

I liked the LEGO analogy in Stewart's post. Now let's talk about a related concept, composable business. A composable business is a business that's made up of a combination of multiple parts or elements. Dynamic cloud is a fundamental building block of composable business. Some say dynamic cloud and business is a match made in heaven. Matt Lobbes explains the composable business from the perspectives of IT managers, developers, and business leaders.

What is a composable business?

First, let's focus on the word composable. Is it even really a word? A quick search of the Merriam-Webster dictionary doesn't provide much help. Fortunately, Dictionary.com does return some promising results. Composable is listed as a form of the word compose which is defined as "to make or form by combining things, parts or elements." Now we're starting to get somewhere. A composable business must be a business that's made up of a combination of multiple parts or elements.

Businesses today are made of numerous constituents all coming together to help the company thrive and grow. Each area has their own specific needs when it comes to best serving the business. Let's look at a few of the elements of a composable business and see how they benefit from a dynamic cloud.

IT managers

IT Managers are constantly evolving to meet the needs of their business constituents. When it comes down to it, the purpose of IT is to serve the business. IT managers are particularly interested in the flexibility and agility that dynamic clouds provide. Being able to host an on-premises private cloud, connect the enterprise to a public cloud or get the best of both worlds with a hybrid cloud gives IT managers the scalability and elasticity that the business requires.

Developers

Developers are more and more on the front lines today, being held accountable for helping drive real business results. In today's business climate, speed is of the essence. In order to keep up with the speed of business, developers are now closely partnering and working with their IT management counterparts through DevOps. Another option developers are finding increasingly more valuable is platform as a service offerings (PaaS). With PaaS options such as Bluemix at their disposal, developers can have their code up and running and providing business value in a matter of minutes.

Business leaders

According to a recent study from the IBM Center for Applied Insights, over the next three years, cloud's strategic importance to business users is expected to double from 34 percent to 72 percent, even surpassing their IT counterparts at 58 percent. With business agility being a key differentiator between the pacesetters and the chasers, business leaders are increasingly turning to software as a service (SaaS) offerings to help them meet their business objectives. Frank Bauerle discusses the role that cloud computing plays in helping achieve business agility. In his blog post "Does cloud computing drive business agility?" (http://thoughtsoncloud.com/2014/02/does-cloud-computing-drive-business-agility/) he comes to the conclusion that cloud computing does not by itself make a business agile. Cloud computing, however, does move a company significantly along the path to business agility.

Originally posted at http://thoughtsoncloud.com/2014/04/composable-business/

See also "Cloud powers the future of composable business" at http://thoughtsoncloud.com/2014/04/cloud-powers-composable-business-future/

Cloud and your career

As is usually the case with the disruptive technologies, cloud is changing the dynamics of the job market. Cloud is here to stay, but are YOU ready for cloud? This section talks about the effects of cloud computing on the job market and what you can do make yourself "cloud ready" in this new era! Let's start with Sam Garforth. He talks about the effects of cloud on IT jobs.

How the cloud is revolutionizing roles in the IT department

Many people see cloud as an evolution of outsourcing. By moving their traditional information technology (IT) resources into a public cloud, clients can focus on their core business differentiators. Cloud doesn't nix the need for the hardware, software and systems management—it merely encapsulates and shields the user from those aspects. It puts IT in the hands of the external specialists working inside the cloud. And by centralizing IT and skills, a business can reduce cost and risk while focusing on its core skills to improve time to market and business agility.

But where does this leave the client's IT department? Can they all go home, or do some of the roles remain? Are there actually new roles created? Will they have the skills needed for this new environment?

Let's look in more detail at some of these roles and the impact that the extreme case of moving all IT workloads to external cloud providers would have on them (See also Figure 6 for a summary).

	IT Strategy	IT Administration	Service Delivery & Support
Strategic	Business Technology & Governance Strategy	IT Business Modeling	Service Delivery Strategy
	Portfolio Management Strategy		
	Enterprise Architecture		Service Support Strategy
	Service Management Strategy		
Control	IT Management System Control	Financial Control & Accounting	Service Delivery Control
	Portfolio Value Management	Site & Facility Administration	Infrastructure Resource Planning
	Technology Innovation	Human Resources Planning & Administration	Service Support Planning
		Sourcing Relationships & Selection	Service Delivery Operations
Operational	Project Management	Procurement & Contracts	Infrastructure Resource Administration
	Knowledge Management	Vendor Service Coordination	Service Support Operations
		Customer Contracts & Pricing	

Figure 6 Summary of the IT roles and the impact that moving all IT workloads to external cloud providers would have on them

IT strategy

Strategic direction is still important in the new environment. Business technology and governance strategy are still required to map the cloud provider's capabilities to the business requirements. Portfolio management and service management strategies have increased importance to analyze investments, ascertain value and determine how to get strategic advantage from the standardized services offered by cloud. However, the role of enterprise architecture is significantly simplified.

Control is still needed although the scope is significantly reduced. IT management system control retains some budgetary control, but much of its oversight, coordination and reporting responsibilities are better performed elsewhere. Responsibility for portfolio value management and technology innovation is mainly handed to the cloud provider.

At the operational level, project management is still required. Knowledge management has reduced scope, but best practices and experiences will still need to be tracked.

IT administration

The scope of IT business modeling is reduced, as many of the functions in the overall business and operational framework are no longer required.

There are changes in administration control. Sourcing relationships and selection are critical for the initiation and management of relationships with providers. Financial control and accounting will continue to manage all financial aspects of IT operations. Human resources planning and administration are still required, but the number of people supported is reduced. Site and facility administration is no longer needed.

All of the operational roles in IT administration have increased importance. IT procurement and contracts as well as vendor service coordination are needed to manage the complex relationships between the enterprise and cloud provider. Customer contracts and pricing is needed for the allocation of cloud costs to internal budgets as well as providing a single bill for services from multiple cloud providers.

Service delivery and support

The main casualties of the move to cloud are the build and run functions. The service delivery strategy will remain in house, although it becomes largely redundant once the strategic decision has been made to source solely from the cloud. Responsibility for the service support strategy moves to the cloud provider.

Service delivery control and service support planning move to cloud provider. Infrastructure resource planning functions are likely to be subsumed into the customer contracts and pricing administration role.

Responsibility for service delivery operations and infrastructure resource administration moves to cloud provider. The help desk and desk-side support services from service support operations remain essential activities for initial level one support, but beyond this, support will be offered by the cloud provider.

Further observations

Governance is a critical capability, particularly around maintaining control over software as a service adoption. Integration of services will be a challenge, but perhaps this will also be available as a service in the future. Relationships with partners and service providers in all guises will become increasingly important.

There is a potential issue with skills. With many of the traditional junior roles in development and operations moving outside the enterprise, it's hard to see how candidates for these new strategy and coordination roles will gain the experience they need. Academia has an important part to play in ensuring that graduates are equipped with the right skills.

In summary:

- Most current job roles remain, although many have reduced scope or importance.
- Fewer strategic roles are impacted than control or operational ones.
- Build and Run are the main functions which move to the cloud providers.
- Planning and commercial skills are key, linking the IT department more closely to the business.

Originally posted at
http://thoughtsoncloud.com/2014/11/cloud-revolutionizing-roles-department/

See also "Job roles to consider when moving to the cloud" at
http://thoughtsoncloud.com/2014/06/job-roles-consider-moving-cloud/

Next, a trio of bloggers, Francesco Pedulla, Vincent Abbosh, and Thanh Lam discuss the effects of cloud computing on employment.

How is cloud computing affecting employment?

At a recent social media workshop on cloud, we discussed the effect of cloud computing on employment and decided to write a joint blog post addressing this topic. A few months ago, one of us read "*Race Against the Machine*" by Brynjolfsson and McAfee (http://raceagainstthemachine.com/). The authors argue that digital innovation has "changed how the economic pie is distributed, and here the news is not good for the median worker. As technology races ahead, it can leave many people behind. Workers whose skills have been mastered by computers have less to offer the job market, and see their wages and prospects shrink." Their statement is not an opinion. It is the conclusion of a long, thorough study of empirical data. For the sake of discussion, we will assume it is correct.

Since Brynjolfsson and McAfee talk about innovative technologies that enable machines to replace human workers, the first question we asked ourselves was: can we apply that result to the ongoing cloud revolution? After all, the cloud is a matter of optimization through consolidation, not of replacing workers with machines. Still, the net effect of the consolidation is replacing workers with automated mechanisms. So, the real question is: if the results do apply to the cloud, then would the balance between created and destroyed IT jobs make it so that few people would lose their jobs, if any?

Although the balance could be negative when it is restricted to IT jobs that are directly impacted (like system management, database and network administrators), in the short term, the process of moving into a cloud computing economy will preserve most of these positions. This is due to the complexity of the existing systems and the length of time required to migrate to cloud based platforms without disruptions of service.

In the long term, we suspect the balance will be positive if we take into account newly created jobs. In fact, cloud enables most start-ups to implement and sell ideas with a minimum initial investment. Without the cloud, lots of brilliant ideas would never materialize. Furthermore, some of those start-ups will eventually grow into larger enterprises that hire hundreds of people.

The newly created jobs will mostly belong to a new kind of worker. They require new skills, an entrepreneurial approach, flexibility, agility and the ability to learn new skills quickly. These are the trend-setters who bring changes to reality. Take cloud computing skills, for example. You might have felt the effects at your job or read about some of the press discussions. A quick search for jobs with the keyword "cloud computing" on Monster.com yielded us more than 1,000 matches at the time of this article!

Do you think the cloud revolution will have a positive or negative global impact on employment? What about the quality of the jobs? From our perspective, we think the effect is positive as long as training opportunities for the cloud-created jobs are available, and at a reasonable price.

Originally posted at
http://thoughtsoncloud.com/2014/08/cloud-computing-affecting-employment/

See also "Cloud job prospects: did video kill the radio star?" at
http://thoughtsoncloud.com/2013/05/cloud-jobs-video-kill-radio-star/

The effects of cloud computing to the job market will be positive, if there are plenty of cloud training opportunities and you take advantage of them. That brings us to the next post from Marcio Andre Ribeiro Guimaraes, which talks about the Cloud Certification options from IBM.

Do you have a cloud computing career plan?

Each time that something new comes up we can clearly identify a great opportunity to be ahead of our peers by preparing ourselves in the way the market is requiring.

IT Service Providers are running fast to be prepared to deliver the best of breed in terms of technology on cloud computing and to achieve this result they are demanding a high amount of experts to support their complex environments. It is clear that much of the way IT services are being offered now are converging to the cloud model forcing IT professionals to adapt themselves to this new paradigm.

A 2012 study released by IDC (http://www.crn.com/news/cloud/232602048/report-cloud-computing-to-create-14-million-jobs-by-2015.htm) expects nearly 14 million jobs worldwide by 2015 which will be related to IT cloud services. This study also shows that China, India, USA, Indonesia and Brazil will led this growth scenario for new positions able to support public and private clouds solutions.

Technical skills aligned to business perspective

There are three main categories of technical careers on cloud computing:

- IT Architects who will be responsible for defining main solutions
- IT Administrators who will maintain service provider infrastructure
- IT Consultants to evaluate clients' needs and understand how these different offerings can be useful to attend our client expectation

All these professionals must have some level of understanding of how a cloud solution will leverage business strategy on different layers and business segments. C-level decision makers don't expect only technology hype and even early adopters are too focused on achieving high productivity targets aligned with aggressive business growth levels. Answering how cloud will be able to help them achieve those items will be a key element is this equation and even an IT Admin will have many opportunities to influence their client daily contacts about cloud adoption.

Being acquainted with different business verticals is a good start to acquiring business knowledge about different industries segments and some web sites can help with this task by explaining specific features for each industry in the IBM industries and solutions corner.

Certification paths

Being certified by one cloud service provider will define you as an expert if combined with a previous solid technical background. Acquiring a certification will also give you a "formal" recognition as someone prepared to deliver what is expected and increases your chances of employment. Actually establishing a certification commitment date will give you a milestone to be pursed which probably will motivate you to move ahead.

An IBM whitepaper called "*The value of IT Certification*" (public.dhe.ibm.com/partnerworld/pub/certify/valuecert2010.pdf) states that over 80 percent of users place more trust in the partner's advice when working with a solution provider that holds IT Certifications and close to 80 partner are more likely to leverage the partner on other engagements.

IBM and some others companies holds specific certification roadmaps and available training to let you achieve your certification goals even without expending too much money in this path. The following IBM web links will give you excellent description about cloud technical careers and also will offer you some test samples with a few no cost materials for your certification training:

- IBM Cloud Computing Infrastructure Architect V1 at http://www-03.ibm.com/certify/certs/50001201.shtml
- IBM Certified Solution Advisor – Cloud Computing Architecture V3 at http://www-03.ibm.com/certify/certs/50001103.shtml

If you still need additional motives to move you ahead to a cloud certification check some materials on the IBM and Prometric web sites Why IT Certify (http://www-03.ibm.com/certify/process/seethevalue.shtml), which allows you to read hints for different job role perspectives and defines all necessary steps to achieve your certification objectives. This tool is a web-based resource designed to give you information about the value of IT certification from IT Professionals, IT Business Partners to IT Decision Makers.

Cloud computing is expected to generate as much as $1.1 trillion a year in revenue by 2015 so IT professionals have an amazing opportunity to be on the top of this game changer technology. Get your surfboard and go to the pipeline. Are you prepared to surf this big wave?

Originally posted at
http://thoughtsoncloud.com/2013/10/do-you-have-a-cloud-computing-career-plan/

See also “Achieving IBM Cloud Computing Certification” at
http://thoughtsoncloud.com/2013/12/achieving-ibm-cloud-computing-certification-2/

What can I say? Go and get yourself certified and be ready for cloud!

In the next section, we talk about some of the considerations for migrating to cloud. If you have reservations for moving to cloud, this section is for you.

Considerations for moving to cloud

When it comes to deciding what to move to cloud first, a very important consideration is the workloads. Not all workloads are created equal. The following post from Luis Aguilar Mateo sheds light on this topic.

Migration to cloud: It is all about workloads

Five years ago, when everybody started talking about cloud computing, every application and system seemed to be a good candidate to be migrated to the cloud. It was a time when few really understood the implications of migrating business applications and data to the cloud… or maybe the hype of cloud computing eclipsed any possible drawback.

At that time, IBM introduced the concept of workloads in cloud discussions. According to IBM, some workloads were ready for migration to cloud while other workloads were not good candidates for migration yet. It took a while before the majority of cloud providers started making this distinction too. After some years of migrating workloads to cloud computing environments, today a consensus seems to be that workloads “matter.”

The main characteristics that a workload must exhibit to be a good candidate for cloud computing are:

- **Fluctuating demand:** When a workload has a stable and predictable demand, having dedicated and properly sized infrastructure for that workload is probably more efficient than paying hourly charges for VMs in a public cloud or building and using a private and automated cloud.
- **Standard**: Efficiencies in cloud computing are achieved thanks to virtualization and automation. Automation is only cost-effective if there is a limited set of features (in SaaS solutions) or pieces of software (in IaaS in PaaS solutions) available in the catalog.
- **Independent:** If a workload requires heavy communications with other systems, migration of that workload alone to a public cloud environment might affect performance negatively because of issues with latency and bandwidth between the data center and the public cloud environment. Although bandwidth can always be increased, latency is more difficult to reduce below a minimum threshold unless your 1's and 0's can travel faster than light (!).
- **Non-critical:** Workloads with very high demanding requirements (for example, availability, response time, recovery time objective, recovery point objective and security) might not be ready to be hosted in public clouds yet. Service levels offered by public clouds do not usually meet the requirements of critical workloads.

Based on these criteria, some specific workloads seem to be better prepared to be migrated to cloud computing than others. Let's review some of them:

- **Collaboration** is usually regarded as having a big affinity with private and, specially, public clouds because demand is fluctuating (virtual collaboration spaces are created and terminated frequently as projects start and finish), standard (the same features are valid for every project or task force: groups, activities, web meetings, messaging, and others), independent (apart from integration with corporate directory, integration with other systems is not frequently required), and non-critical (virtual collaboration is not usually regarded as a critical workload). This is why many companies have offered collaboration cloud services from the beginning of the cloud era: Google Apps for Business, Microsoft Business Productivity Online, IBM SmartCloud for Social Business and others.
- **Development and Test environments** are usually considered as good candidates for private and public cloud because demand is fluctuating (development and test environments are required by developers and testers often), standard (as long as the organization has standards in place for infrastructure and software), independent (these environments are usually isolated from production systems), and non-critical (for obvious reasons because these are not production environments).
- **Virtual desktops** are regarded as good candidates for private and public clouds because demand is fluctuating (number of users can vary according to, for example, time shifts), standard (as longs as the organization has standard PC images), independent (communication between PCs and servers is usually light) and non-critical (even if PCs are critical, the levels of availability, security, or recoverability offered by a physical PC are much lower than a virtual desktop)

However, workloads that manage sensitive data, highly customized, regulation-sensitive, involving complex transactions, or where virtualization is not supported by third-party providers are not considered as good candidates. A good example could be a core banking application.

Figure 7 shows the affinity of various types of workloads to cloud computing.

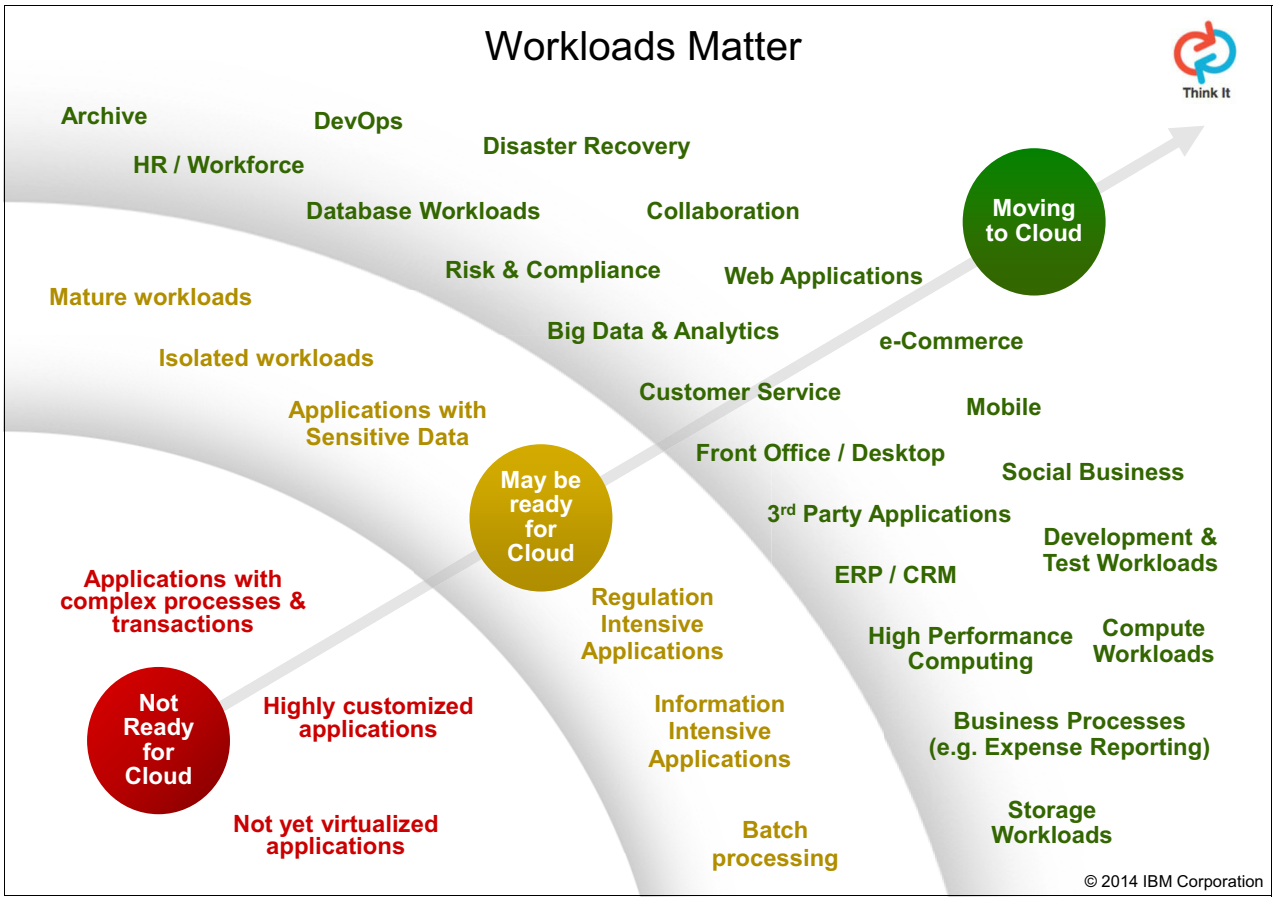

Figure 7 Workloads matter

In fact, IBM performs consulting services to assist customers in choosing the right workloads to be migrated to cloud computing and preparing the business case: strategy and design services for a cloud infrastructure.

Originally posted at
http://thoughtsoncloud.com/2011/12/migration-to-cloud-it-is-all-about-workloads/

See also “How to classify workloads for cloud migration and decide on a deployment model” at
http://thoughtsoncloud.com/2014/01/how-to-classify-workloads-for-cloud-migration-and-decide-on-a-deployment-model/

The title of the post says it all: “It is all about workloads”. What should we consider when analyzing a workload? Sergio Varga explains this in the next post.

Migrating applications to cloud isn’t so simple

Cloud is a technology that is already part of most IT environments today, which means that migrating a distributed environment or application to a cloud environment isn’t like turning it off and moving it to cloud. We need to consider some issues from an application point of view.

Let me go over some of these key points that you need to think about when migrating to cloud.

When we speak about cloud, we usually reference the application as a workload. Depending on the type of workload, the migration effort will be lower or higher than others.

Workloads for development and testing, collaboration and web services will require less work since cloud technologies are in a more mature status. On the other hand, workloads that are highly customized or require extensive manual intervention may be more difficult to move. So the key is to identify which of the workloads it is most beneficial (lower pain and higher gain) to migrate to cloud.

What should we consider when analyzing a workload? I would say the following:

- Standardization—the application must be deployed in a standard way using standard images since this reduces the effort for development.
- Hardcoded dependencies—the application must avoid having hardcoded configurations, since this may inhibit or complicate cloud adoption as it will require specific reconfigurations or prerequisites.
- Maintainability—the application must be deployed in a way that is easy to maintain. Fixes or patches at the OS and application levels must be deployed without requiring manual intervention.
- Manageability—the application must be easy to manage from an operation and administrative point of view.

Another good point when you're deciding about the benefits of migrating an application to cloud is to consider developing a brand new application instead.

Finally, keep in mind that this isn't simply migrating an application to cloud but also leveraging the application's capabilities such as elasticity, multitenancy and broad network access. Being able to get the most out of cloud capabilities can increase the application's benefits.

Worried about moving to cloud? Sergio thinks you shouldn't be. After all he wrote a follow-up post called "Migrating applications to cloud is actually simple"!

Originally posted at
http://thoughtsoncloud.com/2013/07/migrating-applications-to-cloud-isnt-so-simple/

See also "Migrating applications to cloud is actually simple" at
http://thoughtsoncloud.com/2013/07/migrating-applications-cloud-simple

You might have heard that one of the biggest concerns for businesses when moving to cloud is security. There is a feeling that your data is somewhere in the cloud and you don't have any control over it. Is this true? Is cloud computing secure? We asked this question to our cloud security specialist Turgut Aslan.

Is cloud computing secure?

Cloud is everywhere, and it is penetrating our lives and the industry more and more, even if it is not physically visible to us. This fact may contribute to one of the major concerns about cloud: IT security and privacy. News about breaches into server systems, leaks in social media networks, industrial espionage in well-established industries and other security incidents increase the fear that such things can happen to yourself or your company.

More than fifteen years ago, when IT security started to become a concern and firewall technology become popular, a company creating firewall technology got a “splendid” idea. They recognized that selling a piece of firewall software alone did not bring expected earnings. When they started to buy low-end computers that satisfied the minimum requirements to run their firewall software and painted the boxes a fiery red, their product sold splendidly. The customer CEO was not only able to tell that they have a firewall enabled, but also point to the red box and feel more comfortable because he or she had a dedicated physical box.

So when we talk about infrastructure as a service (IaaS) as an abstract cloud service, the customer wants to know how security on cloud compares to the traditional IT environment with firewalls, routers, switches and servers running on dedicated hardware. The answer is: it depends!

How is traditional IT infrastructure secured?

Take the traditional in-house IT infrastructure of a medium-sized company as an example. This infrastructure may be protected by any of the following:

- Physical means
- Firewalls
- Network separation
- Appropriate user ID and password management
- Security patch management
- Harmful code software
- Vulnerability scanning
- System security checking
- Encryption of sensitive data and network traffic
- Intrusion detection and prevention systems
- Unauthorized activity monitoring
- Logging and alerting
- Employee IT security awareness education

Applying a robust security policy, industry best practices and leading edge security tools will contribute to confidence in a high level of IT security. Additionally, this company may seek and receive certifications like the ISO27002 standard. Traditional IT environments can be made very secure depending on how much effort and money you want to spend!

Cloud uses the same approach to security

The same IT security policies, standards and best practices can be applied in the cloud as well! When you think of a cloud offering as an evolution of the traditional IT infrastructure and virtualization of components previously running on dedicated hardware, certain things change for sure. The provisioning or deletion of a standard virtual server happens much faster than doing the same on dedicated hardware, for example. But certain things remain, like your company’s security policy.

The question is regarding how you use the virtual server: Do you want to process sensitive data or business critical processes on it? You can! You have to ask the same IT security, privacy and regulatory questions you would ask in the traditional IT environment. You may have to ask additional questions, such as how to prohibit the possibility of an unauthorized deletion of virtual instances or how to ensure that sensitive data from various sources is encrypted and not being mixed with each other.

Experienced IBMers enable cloud security

Cloud computing can be made, at minimum, as secure as the traditional IT environments. But the IT security gain is not done by painting firewall boxes in bright red, but by enabling the

right level of IT security policies in the cloud infrastructure and the provisioned virtual machines (VMs). IBMers work as security architects, security specialists, developers, testers and auditors to make the cloud even more secure than the traditional IT. They've run their own and customers' traditional IT environments for decades and are best positioned to bring their security experience into the cloud—and they do it continuously. In the end, it's the customer who decides on the level of IT security in the cloud or the traditional IT environment they want to afford based on the risk assessment made.

Cloud is real and you can touch it! Some misconceptions sometimes make us believe that it is less secure than traditional IT.

Originally posted at http://thoughtsoncloud.com/2014/03/is-cloud-computing-secure/

See also "Four security foundations for cloud infrastructure (two part series)" at http://thoughtsoncloud.com/2013/12/four-security-foundations-for-cloud-infrastructure-part-one/ and http://thoughtsoncloud.com/2013/12/four-more-security-foundations-for-cloud/

We conclude this section with findings of a study that was just released by the IBM Center for Applied Insights on key success factors for cloud implementation. Let's see what the business leaders say about their cloud computing journey. Gerardo Menegaz talks about this study in the next post.

5 key success factors for cloud implementation

The journey to the cloud is different for every organization. Some organizations start with a very well thought out strategy, while other organizations may be responding to a request from the business, or to a report by industry analysts such as Gartner or Forrester.

A study that was just released from the IBM Center for Applied Insights found that companies that outsource IT are eager for the benefits that cloud has to offer. And while many have already begun their journey to cloud, many are finding themselves in relationships with multiple outsourcing providers, and the ensuing transitions can be a bit complicated.

I spoke to Marsha Trant who manages worldwide cloud sales for IBM's Outsourcing business, and authored the study, about her study's findings. The study, titled Cloud bound: *Advice from organizations in outsourcing relationships (2014)* (http://www.ibm.com/smarterplanet/us/en/centerforappliedinsights/article/cloudbound.html), gathers advice from those who have traveled the cloud road and provides important insights to organizations making this transition. The authors interviewed IT people, predominantly, and found that in some form or other, many were already using cloud.

I see 5 key takeaways from the study findings.

1. A new due diligence process will be required; you ought to be prepared to invest more time and effort to finding the ideal partner. Explore your options. Look beyond the marketing, explore their development roadmaps, contingency plans, and get client references if possible. In the cloud world, there is an ever-expanding ecosystem from which to learn, so take the time to educate your internal stakeholders and get technical help if there is a skills gap.

   "*Talk to cloud firms about their development process, how they source data centers, and how they manage code and do releases. Really understand these new techniques.*"

   – CIO, Manufacturing

2. Expect to pay more attention to security, as it is a primary concern for many stakeholders. Expect an increased level of internal scrutiny, and questions around data resiliency. Acknowledge concerns, as the cloud is a new technology for many. Get your providers to lend a hand in addressing the concerns of your team. Everyone should be comfortable that the cloud vendor can really mitigate risk and adequately address business requirements.

   "*Our old-school security folks didn't want anything to go to the cloud. But we said, 'Cloud isn't going away – so how do we make sure we're protected? Rather than putting up walls, be part of the solution.*'"

   – Senior IT Director, Pharma

3. The study found many pushing the limits on, or altering the dynamics of their current provider's relations. Cloud services contracts are markedly different than outsourcing contracts – the former are designed to allow change and flexibility over time, while the latter do just the opposite; holding vendors to very strict guidelines. Keep expectations high, but don't expect to reach a steady state with limited change. You will need to cultivate a different type of relationship where you lean on your vendor for strategic guidance, business case development, workload prioritization and more.

   "It's important for vendors to bring innovation, not just deliver what you've signed up for. We require biannual meetings with the provider's senior technical architects to brainstorm technology and platform improvements."

   – Head of Procurement, Consumer Goods

4. Plan to spend more time helping the business adjust to the new technology. Cloud services require a different governance approach, and procurement and contracting processes often need to be altered requiring greater business leader engagement. Everyone needs to be in sync on how solutions are selected and implemented. More time will be required to get business buy-in, and then keep them closely involved during the implementation process to manage stakeholder expectations. It is critical to be transparent keeping business leaders and others informed of outages – timing, impacts, and duration.

   "*We won't do anything without close interaction with our senior clinical officers. They have to know and support the effort. A CIO housed on his or her lone branch is doomed to failure. We have regular meetings to update the President and senior LOBs on where we are.*"

   – CIO, Healthcare

5. Thinking ahead about *an integration plan is critical.* Because the cloud is made for a "best of breed" approach, you should plan for a more diverse vendor base and a hybrid IT environment. The complexities associated with expansive hybrid environments mandates solid planning. The study suggests appointing a single point of contact to manage and set the stage for well-orchestrated and productive interactions within your network of providers.

   "*In the future, we're not going to see one gigantic cloud player. We're not going to put everything in a single basket somewhere in the cloud. I honestly believe it will be a combination, a portfolio of partners.*"

   – CIO, Consumer Goods

One of the CIOs in the study related that they wanted to get the momentum that they required to stay competitive. He wanted to see discretionary dollars spent on moving his company toward the future, rather than anchoring them in the past. This quote really rang true with Trant. The journey will be different for organizations, and while Trant doesn't suggest starting with mission critical systems, she suggests that it may well be that mission critical systems are ultimately where the real value will be found.

Originally posted at
http://thoughtsoncloud.com/2014/10/5-key-success-factors-cloud-implementation/

See also “Are you moving your outsourcing to the cloud?” at
http://thoughtsoncloud.com/2014/10/moving-outsourcing-cloud/

Cloud and friends: DevOps, mobile, big data, patterns, software-defined environments, software-defined networking and Internet of Things

This section covers some important technologies related with cloud computing, in other words, cloud’s buddies! The first one that we are going to meet is DevOps. Sam Garforth covers it in the next post.

It’s all about the speed: DevOps and the cloud

When I first became a professional software developer in the late 1980s, we spent two years designing and writing a software product that our team thought was what the market wanted. We went through a very thorough waterfall process of design (code, unit test, functional verification test, system test, quality assurance) and eventually released the product through sales and marketing. *This cost us millions and eventually sold 14 copies*.

More recently we’ve begun to adopt lean principles in software innovation and delivery to create a continuous feedback loop with customers. The thought is to get ideas into production fast, get people to use the product, get feedback, make changes based on the feedback and deliver the changes to the user. We need to eliminate any activity that is not necessary for learning what the customers want.

Speed is key. The first step was to move from waterfall to a more iterative and incremental agile software development framework. After that, the biggest delay was the provisioning of the development and test environments. Today, we replace that step with infrastructure as a service (IaaS).

The next biggest delays in the software development lifecycle are the handovers. Typically a developer will work in the line of business. He will write, build and package his code and unit test it. He then needs to hand it over to the IT operations department to provide a production-like environment for integration, load and acceptance testing. Once this is complete the developer hands it over completely to the operations department to deploy and manage it in the production environment. These handovers inevitably introduce delay and also introduce the chance for errors as the operations team cannot have as complete an understanding of the solution as the developer. Also there will be differences between each environment and so problems can still arise with the solution in production.

By introducing a DevOps process, we begin to merge the development and operations teams and give the power to the developer to build solutions that are stable and easy for IT operations to deliver and maintain. Delivery tasks are tracked in one place, continuous integration and official builds are unified and the same deployment tool is used for all development and test environments so that any errors are detected and fixed early. With good management of the deployable releases, development can be performed on the cloud for provisioning to an on-premises production environment or the reverse; solutions can quickly

be up and running in the cloud and as their usage takes off it may prove economical to move them on premises.

Of course there is risk in giving the power to the developer. The handover delays happen for a reason—to ensure that the solution is of sufficient quality to not break the existing environment. This is why the choice of tooling is so crucial. The IBM UrbanCode solution (http://www-03.ibm.com/software/products/en/ucdep) not only automates the process but provides the necessary governance.

Figure 8 shows the various stages of Application Release Management.

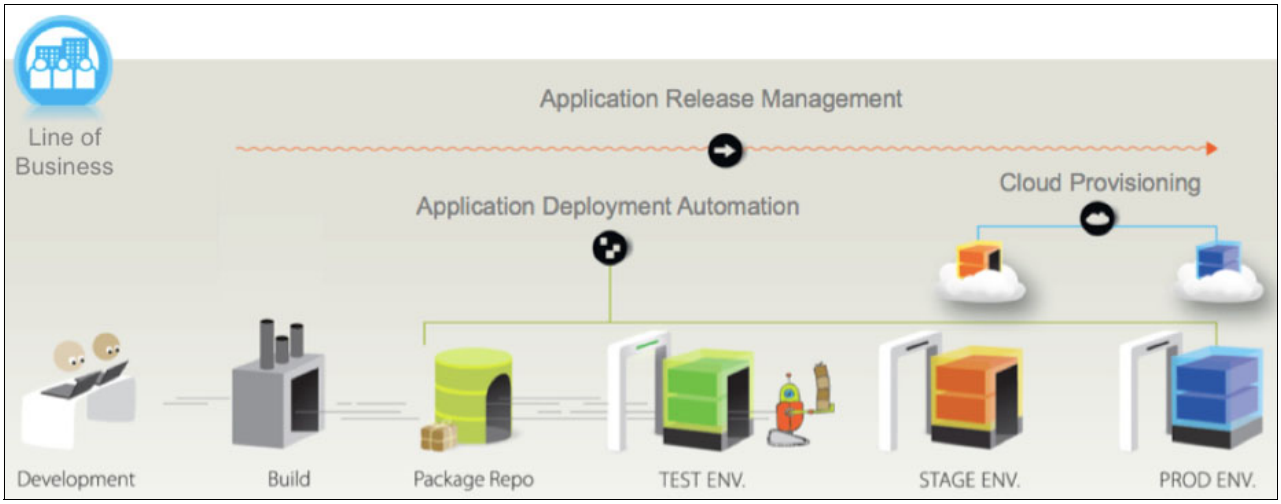

Figure 8 Application Release Management

This means that the role of the IT operations department is reduced. They may still be needed to support the environment, especially if it is a private cloud, but the cloud gives self service to the developer and tester to create and access production-like environments directly. It brings patterns to automatically create and recreate reproducible infrastructure and middleware environments.

Originally posted at http://thoughtsoncloud.com/2014/04/speed-devops-cloud/

See also “Getting the most out of DevOps through cloud computing” at http://thoughtsoncloud.com/2014/03/cloud-computing-enables-devops/

Another important technology trend that is all the rage these days is mobile computing. What exactly is mobile computing and what is its relationship with cloud computing? Shamim says that C-suite executives can unlock opportunities for their businesses, improve productivity, and become competitive by unleashing the combined power of cloud computing and mobile technologies.

What is mobile cloud computing?

We have been observing some significant technology trends for the last few years. Cloud computing and mobile are two such things. Widespread adoption of these two is changing our lives, the way we do business and most of our day-to-day chores.

Research and analyst data show how profoundly these technologies have created a reverberation in the technology landscape around the world. An explosion of mobile and handheld devices is also significantly contributing to world IP data traffic. To support such

data demand, cloud computing seems to be the right choice because of its rapid scalability, ubiquitous network access, on-demand self-service and other features.

We know that mobile devices are constrained by their processing power, battery life and storage. However, cloud computing provides an illusion of infinite computing resources. Mobile cloud computing is a new platform combining the mobile devices and cloud computing to create a new infrastructure, whereby cloud performs the heavy lifting of computing-intensive tasks and storing massive amounts of data. In this new architecture, data processing and data storage happen outside of mobile devices.

Mobile applications leverage this IT architecture to generate the following advantages:

- Extended battery life
- Improvement in data storage capacity and processing power
- Improved synchronization of data due to “store in one place, access from anywhere” policy
- Improved reliability and scalability
- Ease of integration

The following factors are fostering the adoption of mobile cloud computing:

- Trends and demands: customers expect the convenience of using companies’ websites or application from anywhere and at anytime. Mobile devices can provide this convenience. Enterprise users require always-on access to business applications and collaborative services so that they can increase their productivity from anywhere, even when they are on the commute.
- Improved and increased broadband coverage: 3G and 4G along with WiFi, femto-cells, fixed wireless and so on are providing better connectivity for mobile devices.
- Enabling technologies: HTML5, CSS3, hypervisor for mobile devices, cloudlets and Web 4.0 will drive adoption of mobile cloud computing.

Originally posted at http://thoughtsoncloud.com/2013/06/mobile-cloud-computing/

See also “The seismic impact of social and mobile on IT” at http://thoughtsoncloud.com/2014/05/seismic-impact-social-mobile/

Does big data belong to cloud? Many people think so. Franz Freidrich Liebinger Portela makes his case with a “tasty connection.”

Big data and cloud go together like strawberries and chocolate

For me, strawberries and chocolate are foods that are good by themselves or together (my apologies to those who have food allergies and can’t enjoy them!). They complement each other in a wonderful way, and I think the same is true of big data and cloud.Strawberries dipped in chocolate

It is undeniable that there has been a large shift in the way that most enterprises work, and many of us have seen this shift start with moving some basic workloads to the cloud. For example, a company might put its storage or development and testing systems there to try out this new trend. And this can evolve to more complex and important workloads being moved out to the cloud.

Data, data everywhere

Certain workloads, because of their structure, or lack thereof, make wonderful candidates to be moved onto the cloud. I think big data analytics is one of these workloads that was born to be on the cloud.

We can gather considerable knowledge by analyzing the wealth of unstructured data around whatever subject we are studying. For example, we might be looking at what makes our stock price go up or down, or analyzing how a certain demographic feels about the new flavor of our product, or considering how many people just got hungry because of the strawberries and chocolate analogy I used in my title! All of this data is out there, hidden in between millions of Facebook, Twitter and blog posts.

Every person writes in a different manner though, and the data exists in many different languages. So we need to start by understanding that not all of the data out there is relevant, and in some cases the data could even be misleading (for example, a sarcastic comment may be taken as a falsely positive sentiment if you are not careful). Data analysis can be extremely valuable to help us identify how good our data is and build better predictive models and simulations. It can also allow us to enrich our business intelligence with data that was previously beyond our capacity to work with and therefore enable us to better understand our customers and clients.

But let me take a small step back and talk a little about what big data actually is.

What exactly is big data?

Just like in the case of cloud, “big data” has a fuzzy description. Gartner made a good first pass at trying to describe it in its IT glossary (http://www.gartner.com/it-glossary/big-data/):

Big data is high volume, high velocity, and/or high variety information assets that require new forms of processing to enable enhanced decision making, insight discovery and process optimization.

If you are completely lost with this description, here is what it means (to me, at least): it means that we can make use of all the available data (structured and unstructured) from internal data warehouses, databases, forms and other structured systems and enrich it with all of the unstructured data that comes from, let’s say, a social media site (or all of them if you so choose) to gain a better understanding of our customers, services, products and so on.

This sounds simple enough, but when you look at how to use all this data for decision making, you can quickly find yourself overwhelmed by the actual volume of data, the speed at which it changes, the variety of data sources you need to integrate and, finally, the speed at which you need to have the data analyzed so that you can make decisions in a timely manner.

If your infrastructure is not flexible, you will find yourself in a bit of a bind, because the speed of change and volume of data varies (sometimes drastically), and this will affect the speed at which you can convert data into valuable information. This is where cloud makes its entrance. The moment that you enter into the realm of big data, your infrastructure has to scale so that it can support this workload, and here is the link between big data and cloud.

How cloud and big data work together

Cloud provides you with the flexible infrastructure you need to be able to handle fluctuations in workloads effectively (scaling up and down). It also allows for the integration of new workloads in a convenient manner based on changing business needs.

Big data analytics opens up new ways to work with the data around us, and like in the case of strawberries and chocolate, when we pair our big data with cloud, it just works.

Originally posted at
http://thoughtsoncloud.com/2014/07/big-data-cloud-go-together-like-strawberries-chocolate/

See also “Cloud computing and big data: An ideal combination” at
http://thoughtsoncloud.com/2014/02/cloud-computing-and-big-data-an-ideal-combination/

Imagine an entire IT infrastructure controlled not by hands and hardware, but by software. One in which workloads like big data and analytics are serviced automatically by the most appropriate resource. This is the promise of software-defined environments (SDE), which we cover next.

Another important concept related with software-defined environments is patterns, which are abstract models of IT deployments that encapsulate leading practices for installation, configuration, and management of middleware and applications. Gerardo Menegaz explains software-defined environments and patterns in the next post.

What’s next in cloud: Software Defined Environments

Organizations today likely face the same challenges as many of our large complex accounts. Specifically, they would like to be in a position to anticipate market changes and shifts in customer sentiments or preferences while continuing to not only outpace the competition, but also disruptions in their space.

Companies employ strategies to deliver business value by leveraging the following technologies to engage customers:

- Social media
- Mobile – MDM and MADP (mobile device management and mobile application development platform)
- Cloud
- Big data – including NoSQL, which is sometimes referred to as not just SQL
- Analytics
- Traditional sources

The goal is to access applications and data from anywhere, globally. No matter the size of the enterprise, companies want to be nimble (if not the most nimble, at least nimble enough to be able to quickly respond to global business trends as they develop).

To do this, organizations need to tap into vast amounts of both structured and unstructured data to provide a competitive edge. The ability to instantly access information at the right time to make effective decisions means that organizations need to be able to manage larger volumes and greater variety of data at a velocity that allows them to stay ahead of trends. The goal is to move beyond intuition and instinct to gather and act upon information of all types (volume and variety), as well as to gather information that allows us to opportunistically adjust the course and speed of business (velocity).

Today we have new methods of IT service delivery, such as cloud. This simplifies how businesses can act in rapidly changing markets by enabling the quick deployment of services at required levels of services. It also provides access to applications and data anywhere through any device, while providing cost-effective scalability.

Likewise, big data and analytics solutions provide our clients with tools to simplify vast amounts of data, yielding insights for rapid decision-making. Big data and analytics allow clients to deliver insights at the highest point of impact, create insights about customer preferences and use near real-time analysis to predict business outcomes.

Software-defined environments enable these solutions.

So, what exactly does that mean? Software-defined environments employ software patterns that better match the power of contemporary workloads with advanced optimized IT resources.

Software-defined environments drive efficiency by making the connections between workloads and resources more effective (with resources defined as social, mobile, big data, analytics, supply chain, web and more; software-defined infrastructures are defined as compute, storage and network).

Specifically, here are the differences between traditional and software-defined environments:

Traditional environments:

- Workloads are typically manually assigned to resources
- IT operations manually map the resources for applications for software deployment
- Optimization and reconfiguration to reactively address issues are also manual

Software-defined environments:

- Workloads are dynamically assigned
- Resources are dynamically assigned based on application characteristics and availability
- Software maps resources to the workload and deploys the workload
- Analytics-based optimization and reconfiguration addresses infrastructure issues

IBM is working to define the standard for a specific type of software-defined environment: private, on-premises cloud infrastructure on the state of the art IBM PureSystems™ family.

PureApplication System supports private, on-premises cloud environments by offering a built-in platform as a service (PaaS) layer that enables IBM clients to deploy enterprise applications and the underlying middleware within minutes, using the PaaS layer to define topologies and application environments in the form of reusable patterns.

Patterns are abstract models of IT deployments that encapsulate leading practices for installation, configuration and management of middleware and applications. Patterns can be deployed into PureApplication System repeatedly, avoiding the need to provision these environments individually and manually. This allows customers to employ software-defined environments based on years of IBM data and best practices.

It is the implementation of these patterns that will allow your organization to dynamically allocate workloads and resources based on application characteristics, providing cost-effective scalability and the ability to opportunistically adjust the scope, course and speed of business.

Originally posted at
http://thoughtsoncloud.com/2013/11/whats-next-in-cloud-software-defined-environments/

See also “DevOps and software-defined environments: Cloud twins” at
http://thoughtsoncloud.com/2014/03/devops-and-software-defined-environments-cloud-twins/

A related concept is software-defined networking. John Tracey covers it next.

What is software-defined networking?

Many people have heard the term “software-defined networking,” or SDN. Fewer people understand, in practical terms, what SDN can do for them. In this post, I provide a brief introduction to SDN and describe what it can do for you in the cloud.

Perhaps the key advantage of the cloud is that is allows you to provision infrastructure and services quickly. Rather than having to order, install and configure a bunch of servers, you just spin up a bunch of virtual machines (VMs). Some cloud environments, such as IBM SoftLayer, allow bare metal servers to be provisioned as easily as VMs.

Of course, deploying an application requires not only servers, storage and networks (in other words, infrastructure), but also higher-level services. Example services include load balancers, web servers, application servers, databases and monitoring facilities. Automatic provisioning of server, storage and network infrastructure is known as infrastructure as a service (IaaS). Simplified deployment of higher level services is referred to as software as a service (SaaS).

It is common for applications to rely heavily on the network. From a cloud perspective, applications tend to rely heavily on network IaaS and SaaS. In traditional data center environments, provisioning network infrastructure and services is one of the most challenging parts both for deploying a new application and enhancing an established one. Network aspects often account for a lot of the time required to deploy or modify an application. This makes the network a “target rich environment” for improvement. It also maximizes opportunities to simplify deployment by utilizing the cloud.

Typical network infrastructure and services on which applications rely include (Figure 9 on page 61):

- Ethernet switches
- IP routers
- Firewalls
- Virtual private network (VPN) gateways
- Load balancers
- Network address translation
- Intrusion detection and prevention

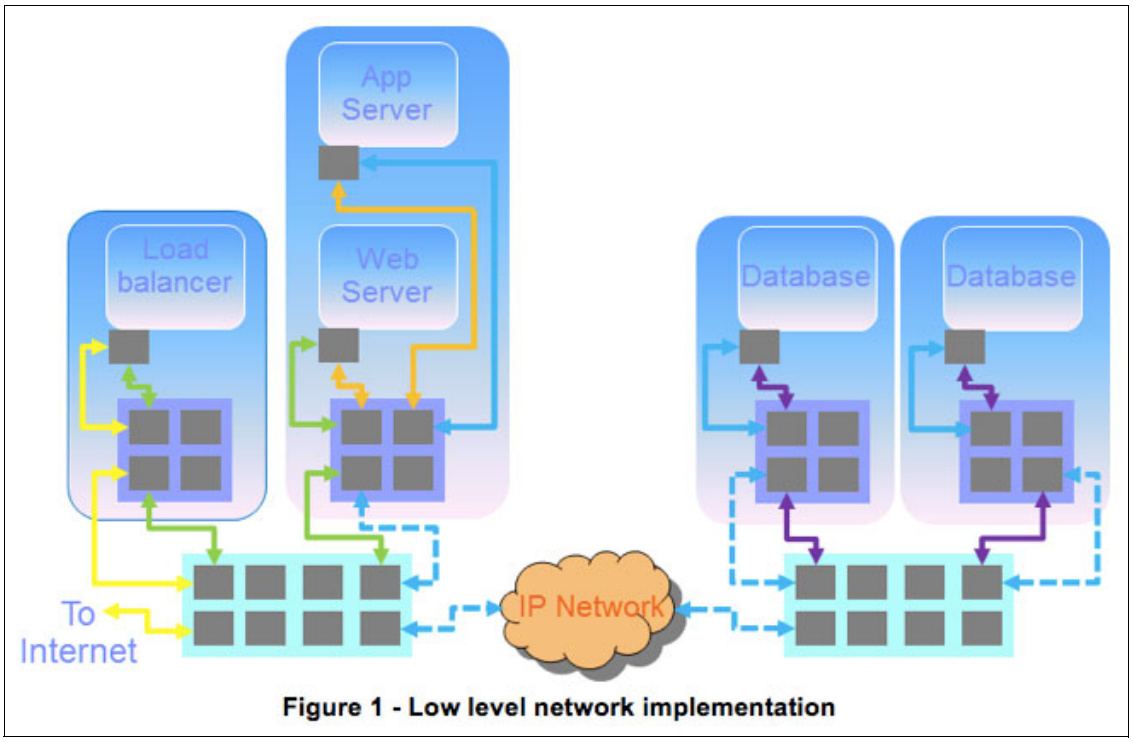

Figure 9 Low level network implementation

Traditionally, network infrastructure and services are provided by hardware devices. This is one reason the network has historically been one of the most time-consuming aspects of application deployment.

With software-defined networking, the network infrastructure and services are provisioned and configured entirely through an application programming interface (API). For example, a network can be provisioned using a REST interface which is typically accessible by both a command-line interface (CLI) and graphical user interface (GUI). Similarly, higher level services including all those listed previously and more can be provisioned by an API. This allows entire application environments to be delivered largely as code. It minimizes extensive manual intervention. See Figure 10.

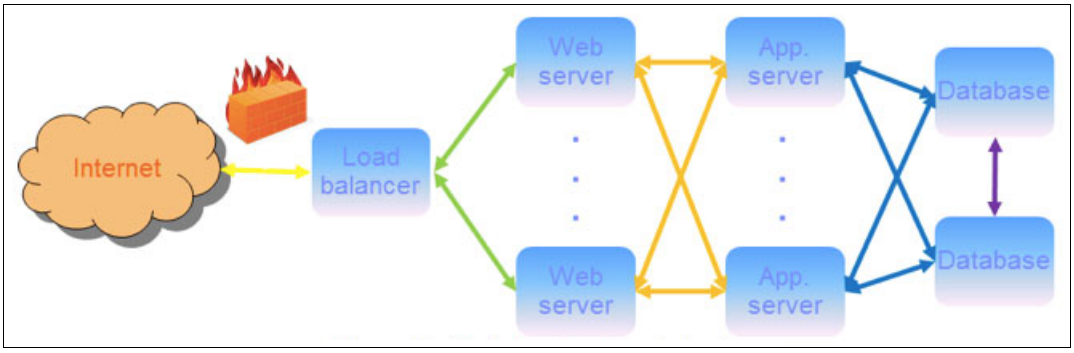

Figure 10 Software-defined networking

Of course, the view just presented is the ideal SDN vision and your experience may vary in practice. Today, typical cloud environments provide only a subset of network infrastructure and services in a software-defined way. Networks and routers are commonly provided, but software-defined firewalls and intrusion prevention are not yet as prevalent.

The trend is unmistakable, though. More and more network infrastructure and services in the cloud are becoming software-defined. As this trend progresses, the time required to deploy even network-intensive applications in the cloud will decrease, at least for those who know how to utilize SDN.

Originally posted at
http://thoughtsoncloud.com/2014/10/software-defined-networking/

See also “Dive into the software-defined network ocean with OpenStack” at
http://thoughtsoncloud.com/2014/10/dive-software-defined-network-ocean-openstack/

Finally, we have a look at Internet of Things, which is quite a popular “thing” these days. Diego Andres Sonvico explains why this is so and why cloud is a good fit for Internet of Things.

Cloud and the Internet of Things: Inextricably linked

Today, the Internet of Things is more than a dream or an idea—it is a reality. The Internet of Things has changed not only the way we interact with each other (humans), but also the way we interact with the “things” in this world. Now you can interact with your car, a security cam at home, wearables and much more. You can even buy a refrigerator that orders food directly from the store when you are running low. Can you imagine this being possible without cloud?

We already have billions of devices connected to the Internet, and there will be billions more in the future. The Internet of Things demands the following capabilities from connected devices:

Consume information

All kinds of devices consume information. You have a GPS navigator that in the past would only listen to satellites to trace a route, but that can now consume online traffic information from traffic services and even from other users.

Smartphones consume and distribute a lot of information; a simple thing like data on today’s weather is consumed by people so they know what to wear and is linked to different exercise gadgets to get better information about health.

Provide information

Back to the traffic example, GPS and smartphones provide online information about the speed the user is moving on a highway or street. The user can even report accidents or problems and send warnings to other users to be aware.

When you wear an exercise gadget to track information, the information is shared with an application on a provider so your track and history can be saved. You can also analyze the information later.

Use analytics

I think the analytics function has been rising in prominence (it has been around for some time, so it is not new) because of the Internet of Things. Now, companies and corporations aren’t the only ones using analytics to track different kinds of patterns and anticipate the future; everyday users want to analyze their own patterns of training, traveling, health statistics and so on. These kinds of new interactions (and others) will become common for users in emerging economies too.

Now that we talked a little about Internet of Things, can you imagine all this occurring in another site other than the cloud?

The role of cloud in the Internet of Things

Users can be anywhere and at any time, day or night; you need to be able to serve them all in a proper way. If you are a worldwide company, you need to be practically everywhere and you can achieve this with cloud computing (if you are a local company, you can use cloud to expand your business).

Cloud computing is the best way to share, receive and manage information for the Internet of Things because:

- Cloud providers usually have various data centers covering different geographies, which is ideal for having increased coverage.
- Public cloud providers offer pay-as-you-go services. This means that you can grow for peaks and then decrease, paying only for this time.
- These providers usually have a great infrastructure to serve millions of user connections and they offer different products for shared load balancing, security and more.

Originally posted at
http://thoughtsoncloud.com/2014/07/cloud-internet-things-inextricably-linked/

See also “Substantiating the Internet of Things (IoT) vision” at
http://thoughtsoncloud.com/2014/09/substantiating-internet-things-iot-vision/

A brief look at the Cloud Open Standards and IBM Cloud Offerings

Now it is time to briefly go over the Cloud Open Standards and some of the IBM Cloud offerings. This book is not meant to be a product guide, so we will not go into details or cover all of the IBM offerings in the market. You can visit our blog for a more detailed coverage of these and other IBM Cloud offerings.

In the next post, Sujatha Perepa gives a brief overview of OpenStack, which is a widely adopted open source software cloud computing software platform that is used primarily as an infrastructure as a service (IaaS) solution. The first official release of OpenStack, code-named Austin (my home town!), was launched in 2010 and it is certainly going strong.

What is OpenStack?

We all agree that security and standards are the top two key elements for any kind of software and hardware deployments, including the ones based on cloud computing technologies.

There are innumerable ways that cloud solutions are currently being deployed that result in inconsistent and incompatible deployments. This not only confuses clients who are looking for reliable cloud solutions but also impedes the development and adoption of cloud. Like all other widespread technologies, cloud computing can also benefit from standards, especially from widely adopted open standards.

We have an incredible body of work done already in this regard by Cloud Standards Customer Council, OpenStack, OASIS, TOSCA (Topology and Orchestration Specification for Cloud Applications), IDCloud (Identity in the Cloud), W3C (Linked Data), OSLC (Open

Services for Lifecycle Collaboration) and others. These standards are applicable for hardware, software and application deployments on cloud.

But OpenStack seems to stand out. Let's take a look at it and see why everyone is talking about it.

High standards and growing numbers

Many organizations and technologists are flocking to adopt OpenStack standards, including IBM, which announced that it would offer its cloud software and services based on OpenStack standards. This is definitely a significant decision.

Originally OpenStack was launched jointly by Rackspace Hosting and NASA as an open source cloud initiative in July 2010. It was an effort to develop a standard hardware platform for cloud computing services. It seems to have taken off slowly but steadily.

Fast forward to the present day and it is now managed by the OpenStack Foundation, a nonprofit corporate entity. There has been an exponential growth and significant market momentum created by OpenStack since its public availability in September 2012. Its ecosystem is growing incredibly—the number of corporate sponsors rose from 150 to over 900 and the number of individual developers to greater than 10,000. OpenStack seems to fit market needs for cloud standards through open cloud architecture.

So, what is OpenStack?

OpenStack is a not-for-profit cloud computing organization that offers an open source cloud computing platform for infrastructure as a service (IaaS) for both public and private clouds of all sizes. OpenStack architecture is modular, focuses on providing the compute, network and storage component resources for customer deployments and monitors all services through a dashboard.

- *OpenStack Compute* helps to provision and manage very large virtual networks.
- *OpenStack Networking* provides network management of cross-pollinated application programming interfaces (APIs) and Internet Protocols (IPs).
- *OpenStack Storage* provides two types of storage options, Object (cost effective and scalable) and Block (performance and integration driven).
- *OpenStack Dashboard* provides a web-based administrative interface for accessing, provisioning and automated orchestration of resources.

It is a simple architecture that can accelerate cloud adoption. It makes no proprietary software and hardware recommendations, which is nice, so clients do not have to suffer a vendor lock-in. They can continue to leverage their cross-vendor investments in software, hardware and existing systems. This flexibility is a much-needed aspect, and I support it.

In my years in the technology industry, I have seen many modular architectures, some very strong and some ephemeral. So why is OpenStack's architecture so significant? It truly seems to have the greatest momentum in the market. It seems to be the shining star of cloud computing! And it seems to have a vision to be truly open to provide true interoperability and portability to cloud computing. I will take that any day!

Right now for cloud computing, it is incredibly important to have a library of design and deployment patterns to refer to, to rely on a supporting community, to evaluate and repeat successful cloud deployments and to have an architecture that is simple to adhere to.

I have joined the thousands of individuals in support of OpenStack in the hope that it will significantly support big data deployments on cloud, which have massive compute, networking, storage and scalability needs.

Originally posted at http://thoughtsoncloud.com/2013/08/what-is-openstack/

See also our other posts in the “OpenStack Category” at http://thoughtsoncloud.com/category/openstack/

In the next post Sreekanth Iyer takes us through IBM SoftLayer, which is IBM’s strategic IaaS platform. Sreekanth calls it “Your cloud home away from home.”

IBM SoftLayer: Your cloud home away from home

I just returned home after multi-city travel and a fantastic year-end vacation. It is always nice to be back home, where we feel comfortable being ourselves and have control of our lives. In our homes, we have the freedom to define the environment the way we like it and decorate it with things that have meaning for us: the people, furniture, food, aroma, lighting, sounds and so on. You love your home because it gives you a well-defined space that is stress free with the security and privacy you need. Even if hotels offer many modern-day luxuries, you’d still prefer home because of its comfort, control and flexibility.

Similarly, the cloud offers many luxuries, but one of the biggest objections to cloud is that people fear losing control and visibility of their infrastructure. If we look closer at these concerns, we can see it is not so much about security as it is about transparency. I’ve been doing some projects with SoftLayer, an IBM company, in the last couple of months, and this post is an attempt to make you feel at home with the SoftLayer cloud offerings.

The cloud you need, the way you need IT

People look for choice and flexibility of services while building their cloud. SoftLayer provides three different approaches to hosting workloads (details here): (dedicated) bare metal, private (dedicated) cloud, and public, multitenant (shared) cloud environments.

I can choose dedicated bare metal instances with cloud agility as well as CloudLayer Computing Instances with predictable performance.

With SoftLayer, I have the option to run my workloads on a dedicated infrastructure, meaning I have assurance that nobody else is sharing it. With most vendors, you don’t have a choice or don’t even know with whom you are sharing your cloud, but SoftLayer’s dedicated bare metal instances ensure that no one else is accessing my environment.

Variety of options

SoftLayer provides extreme granularity within a compute environment that can be customized based on application requirements. Apart from specifying the amount of CPU, memory and storage, I can also select the data center and add-ons for OS, security and management needs when ordering my servers.

I can also decide whether to take a monthly or an hourly instance. For example, a few of the servers I used for my project were bare metal servers that we ordered on a monthly billing basis, since we knew that we were going to need them for some time. But others for running tools or products needed during only few phases of the project were run on hourly cloud computing instances. We could easily switch between the options to make sure that we were within the budget and at the same time delivering the performance, availability and functionality using our IT infrastructure.

Originally posted at
http://thoughtsoncloud.com/2014/02/ibm-softlayer-your-cloud-home-away-from-home/

See also “So, you have a SoftLayer account. Now what?” at
http://thoughtsoncloud.com/2014/07/softlayer-account-now/

Welcome back Sreekanth! Now let’s have a quick look at IBM Bluemix. Shamim says this is something that you should not “PaaS up”.

What is IBM Bluemix?

Bluemix is a PaaS offering from IBM based on open standards and cloud to build, deploy, manage and run omni-channel applications like web and mobile, big data and other smart services.

There are currently 50 services available on Bluemix to help developers rapidly create and deploy innovative solutions.

Benefits of IBM Bluemix

Now, let’s look at some of the features of Bluemix:

- Bluemix is the new development environment built on Cloud Foundry for the cloud era to build applications rapidly and incrementally composed from services.
- Open standards allow developers to avoid vendor lock-in, leveraging the open and flexible cloud environment using a variety of tools from IBM, third party or open technologies.
- Bluemix offers more than 200 software and middleware patterns available from IBM and IBM Business Partners to help enterprise and born-on-the-cloud developers develop portable and compatible applications for hybrid cloud. Pre-built services make application assembly very easy.
- It provides an integrated experience for the developers with DevOps in the cloud and thus helps them build enterprise and mobile applications quickly and more efficiently.
- Bluemix DevOps provides:
  - Facility to store and manage code by means of Git repository
  - A built-in web integrated development environment (IDE)
  - Easy integrations with popular development tools like Eclipse and Visual Studio
  - Agile planning, tracking and team collaboration
  - Services for automatic application deployment
- Bluemix DevOps allows developers to transform an idea to an application faster.
- It hides the complexities associated with hosting and managing cloud-based applications so that developers can just focus on development.
- Bluemix can automatically scale a deployed application up or down based on application usage.

More Bluemix features

A variety of popular programming languages and frameworks like Android, iOS, HTML/JavaScript, Java, Ruby and PHP are offered in Bluemix environment.

Figure 11 shows a high level architecture of Bluemix environment.

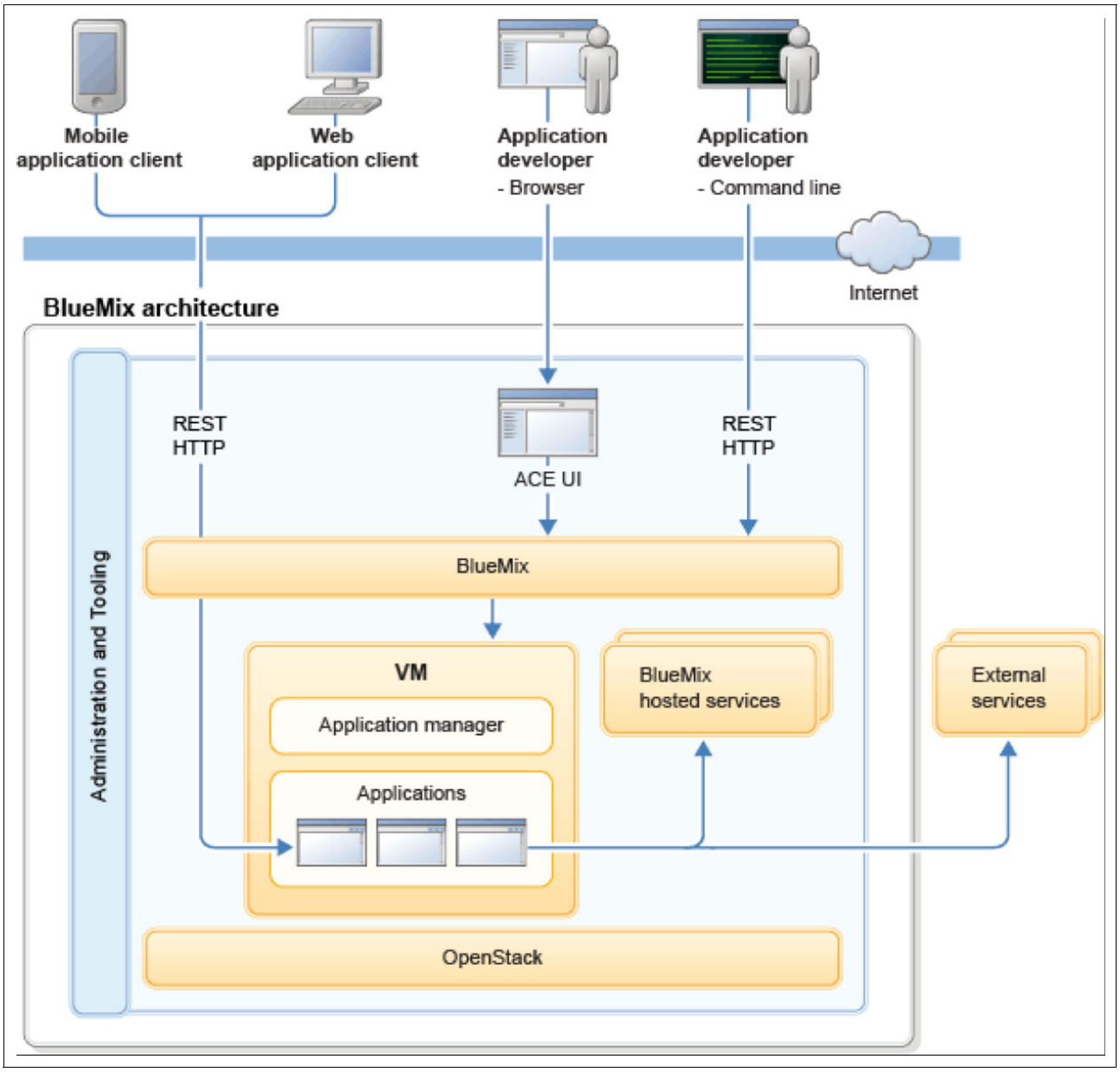

Figure 11 Bluemix architecture

Bluemix deploys virtual containers utilizing OpenStack to host deployed applications as indicated in the diagram.

- Users interact with the infrastructure by Bluemix user interface, a web-based user interface (UI).
- A command line tool cf is used to deploy web applications.
- Clients (mobile applications or web applications hosted externally or on Bluemix or human users using web browsers) can use REST/HTTP application programming interfaces (API) to interact with the hosted applications.

Bluemix ushers in a new era of application development in the cloud and expedites the process of converting an idea to an application faster using built-in services and the power of DevOps.

Originally posted at http://thoughtsoncloud.com/2014/04/ibm-codename-bluemix/

See also “You’ve deployed your application in IBM Bluemix—now what?” at http://thoughtsoncloud.com/2014/07/youve-deployed-application-ibm-bluemix-now/

Now Vasfi Gucer (that is me!) takes you to the technology farmers’ market: The IBM Cloud marketplace.

Five things you should know about IBM Cloud marketplace

Imagine the ability to explore hundreds of IBM and Business Partner services in one place. Sounds intriguing, right? This is the promise of IBM Cloud marketplace. In this post, I will talk about the top five things you should know when heading off to the market.

You can find the right solutions without being overwhelmed

Cloud computing is here to stay; there is no denying it. But when you are moving to a new platform with a whole set of new capabilities, there is always a challenge in where to start. Just remember the day you bought your first smartphone. If you were confused about which app to use, you are not alone!

One of the key questions enterprise IT managers and business leaders ask is “How do I find the cloud services I need to create an enterprise grade cloud application?” I believe this a great feature of IBM Cloud marketplace. It can help you find the right cloud solutions from IBM and Business Partners by providing a wide selection to choose from.

IBM Cloud marketplace is like a technology farmers’ market

I love farmers’ markets. I truly enjoy browsing and tasting all kinds of fruits, vegetables and meats sold by different farmers and vendors. I can buy the ones that I like most. I like the fact that I can experience the product before buying it. IBM Cloud marketplace has a similar concept. There over 200 cloud services in the IBM Cloud marketplace both from IBM and Business Partners. You can discover, learn about and try all these services before making a decision. IBM Cloud marketplace offers multiple opportunities for this. For example, you can get the product details, read articles that explain how the service can be used in a real life scenario, ask an expert questions, watch an interactive how-to demo or even start using the service with a no-charge trial.

IBM Cloud marketplace has something for everyone

IBM Cloud marketplace provides a catalog of enterprise services under a single URL. These services span three categories: software as a service (SaaS), platform as a service (PaaS) and infrastructure as a service (IaaS).

- SaaS, or business apps, is for line-of-business unit users that are looking to tap into business applications in the cloud. There are multiple roles in this category as shown in Figure 12. By clicking on a role, you can see which applications are available for it.

Figure 12 SaaS roles

- PaaS, or dev platform, is for developers. Here you can peruse two types of services that cater to developers:
  - First you can see traditional application topologies, provided as patterns. For example, if you go to the IBM Cloud marketplace dev platform site and click on **IBM WebSphere® MQ Hypervisor Edition for Red Hat Enterprise Linux** (`http://www.ibm.com/cloud-computing/us/en/products/WebSphere-MQ-Hypervisor-Edition-for-Red-Hat-Enterprise-Linux.html`), you can see the “WebSphere MQ messaging in virtualized environments“ pattern. You can deploy this pattern using either IBM Workload Deployer or IBM PureApplication System.
  - The second type of PaaS services in this area are related to new applications on cloud that typically talk to the traditional systems. Most of these services are available through IBM Bluemix and will take you to the Bluemix site (for example, MongoDB). Others are not yet available through Bluemix (such as Load Impact, which takes you to the product overview page).
- IaaS, or infrastructure, is targeted primarily for the support of IT operations. Here you can find IBM SoftLayer self-service and IBM fully managed virtual infrastructure and environments.

IBM Cloud marketplace is your key for smarter shopping

How many times have you visited a shopping website and gotten lost browsing hundreds of products in the catalog? If I go to a farmers’ market to buy meat, I just want to go to the meat section. Similarly, when I visit a shopping website, I want the website to give me some kind of guidance on where I should look. In a sense, I want the website to speak my language. For

example if I am DevOps developer, I am only interested to see the solutions in this area instead of browsing the whole catalog of services or products.

One of the powerful elements of IBM Cloud marketplace is featured solutions. Featured solutions are a set of services brought together to help customers solve a business problem. You can call them repeatable use cases. You will see eight different types of featured solutions (Figure 13).

Figure 13 Featured solutions

When you click on these links, you see the descriptions of different types of solutions in each area. In the near future I expect more categorization here; for example, industries or geography-focused solutions.

IBM Business Partner services are a key part of the IBM Cloud marketplace

Today you can find a lot of services from IBM Business Partners on the IBM Cloud marketplace, and this number is growing. IBM has an intensive program for Business Partners to become a part of the program. A key selection criterion for these partner services is appropriateness for enterprise buyers, which is the target market for IBM Cloud marketplace. Most of these services run on SoftLayer, and are integrated with Bluemix or deployed through pattern technology. Although the services are provided by Business Partners, billing is done by IBM, so it is a one stop shopping experience.

You can also harness the power of IBM Cloud marketplace alongside the expertise of IBM Redbooks® publications at `http://www.redbooks.ibm.com/Redbooks.nsf/pages/cloudmarketplace?Open`.

Give the IBM Cloud marketplace a try. I need to drive 18 miles to go to the nearest farmers' market. For this market, you don't need a car!

Originally posted at
http://thoughtsoncloud.com/2014/09/five-things-know-ibm-cloud-marketplace/

See also “Your new favorite local market: IBM, as a service” at
http://thoughtsoncloud.com/2014/09/new-favorite-local-market-ibm-service/

This discussion would not be complete if we did not talk about the future of cloud computing. Our final post is from Eric Kern, who asks the same question in his post’s title: “What lies ahead for the future of cloud?”

What lies ahead for the future of cloud?

I often ask myself, where is cloud computing headed? What will products and services in the IT industry look like two years, five years or even 10 years from now, and how will cloud computing affect this industry? Will companies still have their own data centers or will everything become a utility model?

The storage of the future

Will compute and storage become invisible to everyone, or will the individual users still need to think about how much storage is left on their devices?

As an analogy, do I currently think about how much power is available in my house when I buy a new TV or appliance? Do I run power calculations on how much this new device will cost to own and run? I don’t really think about power in my house; things just get plugged in. When I built my house and was finishing the electrical myself I thought about maximum power load for a circuit and how many outlets per 15 amp circuit I could attach, but there were common rules and formulas to guide me. Since I have a master’s degree in electrical engineering, I thought it was important to validate these rules of thumb with some equations and math, but I doubt the average electrician goes this far. It turned out those rules of thumb work just as well as my fancy equations.

Back to cloud computing. Will we still be calculating how much storage is needed for a movie we want to download, or will it just work? I think it will be the latter, and I can point to Netflix and Amazon video services as proof. Purchasing a movie on Amazon just provides you the rights to stream that movie whenever you want. I own several movies on Amazon and love the fact that I no longer worry about scratched DVDs or crashed hard drives. Storage space is a lesser concern when content is kept in the cloud.

This concept has already been extended to iPods and music as well. My iTunes collection may live temporarily on my iPad, iPod or computer, but I have no problem resetting these devices to factory defaults and losing all of the data because I can simply download it again. In the old days, if we lost the CD or even the record we lost the ability to play the music until we purchased it again.

How might data centers be affected?

So why are companies still buying storage for their data centers? Why are they still building their own data centers? Why not just purchase a hardware device that provides local storage, or a cache for their locally running servers that automatically attaches to cloud storage? Backup and disaster recovery are just services. Why don’t people just buy this? Oh yeah, no one has developed such a technology yet. No one has figured out the details behind building a storage system that automatically caches cloud storage.

Well, that's not totally true. I've been thinking about this and have been trying to figure out how best to make it work. It turns out I work for a company that sells storage hardware and cloud storage services, so matching the two would be a snap—or so you would think.

I see a future in which this cloud computing stuff will be automatically embedded into the devices you buy. Not just consumer electronics devices but every device you buy. From iPods, to movies to large mainframe storage there will be public cloud storage automatically backing up your data—keeping track of your songs, your movies and even your company's critical financial records.

It's a new world out there. Welcome to it.

Originally posted at
http://thoughtsoncloud.com/2014/03/what-lies-ahead-for-the-future-of-cloud/

See also "The future of cloud computing: 5 predictions" at
http://thoughtsoncloud.com/2014/05/future-cloud-computing-5-predictions

Summary

This is the end of our cloud journey for now. We tried to cover the most important building blocks of cloud computing in an easy to read format. I hope this book serves as a cloud primer for you.

Your feedback is important to us. If you have comments on the blog or want to become a contributor, contact Kevin Allen (kjallen@us.ibm.com). For comments on this book, contact Vasfi Gucer (vasfi@us.ibm.com).

If you have questions to our bloggers on any of their posts published in this book or want to add a comment, use the links at the end of each post to open the post and submit your question or comment.

We hope that you have enjoyed our bloggers and will join the conversation on http://thoughtsoncloud.com!

Other resources for more information

For more information about cloud computing, visit the following websites:

- IBM cloud computing website:

  http://www.ibm.com/cloud-computing/us/en/

- ITSO Cloud Computing portal:

  http://www.redbooks.ibm.com/portals/cloud

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