

# Cloud Computing: What IT Professionals Need to Know

Cloud computing promises new career opportunities for IT professionals. In many cases, existing core skill sets transfer directly to cloud technologies. In other instances, IT pros need to develop new skill sets that meet the demand of emerging cloud job roles.

Companies that consider moving to cloud computing will want to educate their IT professionals about the potential opportunities ahead so that they can build staff capabilities and skills ahead of the change. Chief Information Officers (CIO) who want to generate more business value from IT by necessity have to be in the front line of cloud skills education — both for themselves and to build training capacity for their IT staff.

The emerging cloud world offers those with the capability to build and grow their portfolio of skills. This paper explores the advantages of moving to the cloud and outlines the delta skill sets IT pros will want to acquire. It describes what the cloud offers and how it applies to and impacts existing infrastructure, including such issues as cost, security, data control, and integrity.

The bulk of an IT professional's skills remain relevant in a cloud environment. System configuration tasks such as creating routing rules, configuring archiving, and managing policies are still necessary. The change is moving from building and supporting local IT infrastructure to managing IT services in the cloud, which requires an extension of skills and capabilities. For example, many IT professionals have the capability to manage virtual storage and the virtualization of servers, but will need to adjust their skill sets to function within a private or public cloud. IT professionals with the flexibility to adapt their technical skills while retaining and growing their business skills will be the highest in demand.

One way IT professionals become more essential in the cloud era has to do with their ability to implement public cloud services like Microsoft® Office 365 and Windows Azure®. Office 365 offers enterprises the capability to move key collaboration products and services such as Microsoft® SharePoint®, Microsoft® Exchange Server, and Microsoft® Lync™ Server from an on-premise deployment model to a public cloud model. Windows Azure facilitates either moving existing customer applications to or building new applications in the public cloud. While managing and configuring these various services remains in the IT professional's hands, the majority of the infrastructure tasks are eliminated. Tasks that remain include monitoring, configuration, and integration with existing on-premise services such as Active Directory, while activities such as purchasing hardware, installing operating systems and managing patches are no longer needed since they are handled by the cloud provider.

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### **Skills Impacts in Cloud Computing**

The move to cloud solutions opens up new opportunities for IT professionals. Key technical skill sets become more critical to career success, including custom application development and deep technical knowledge of the various collaboration products such as Exchange Server. These skill sets can be used to complement and enable customization of the provider cloud offerings. IT should look for opportunities to reduce tactical day-to-day support and spend more time developing and delivering services and applications that demonstrate value to the business.

"I think new marketing efforts will change and help IT administrators in their understanding of what the cloud portends," said Kay Sellenrode, Senior Technical Consultant for Platani. "IT professionals and developers face quite some challenges. But they represent good challenges. IT professionals need to see the new version of cloud as a product they would deal with in-house. They know the basics already. What's important is not what they're doing, but where they're doing it.

“The need for design skills will remain. The principal difference is that the infrastructure may be hosted outside the company. Additionally this will include more care of service agreements and less maintaining the service running Windows Server.

“They can give themselves new names; a network administrator can become a cloud administrator,” he explained. “Once they learn more about the cloud and they see there’s a big change that will help them in the future, it will become clear to them that they will have a job that is more challenging than just being an administrator.”

In general, IT professionals should prepare for the multitude of cloud environments in which they might work. New paths are presenting themselves and options abound. Administrators may choose to shift to consulting, which entails enhancing their soft skills and beginning to focus on serving business needs. They may end up serving as a liaison between business divisions and IT within an enterprise. Contrastingly, they may also choose to deepen their technical skill sets and specialize in building and configuring the stack itself.

### **Considerations for Developers**

Developers will have to focus on innovation, integration, and rapid delivery on business requirements. They also will find more design opportunities beyond what they currently manage.

Developers will need to work effectively with a much broader group of IT professionals for solutions they are developing. IT will also need to work more closely with business units to find out what they can do to help improve the productivity in departments such as marketing, human resources, and finance. Since enterprises can adopt more varied solutions in the cloud, it becomes vital to ensure that the selected solutions address any required service agreements between the business and IT.

### **Security Implications**

Cloud solutions have new security implications for consideration. Organizations in different industries have divergent requirements regarding privacy and data retention. This means that the solution selected by an organization or an enterprise must be carefully evaluated to ensure that the selected services allow the organization to remain in compliance. International companies may need to comply with regulations that vary by country or economic region. These must also be taken into consideration by the IT professional when selecting a cloud-based service.

Managing security and compliance involves translating enterprise compliance requirements into a technology implementation. This requires practical skills and an understanding of implementing compliance within the deployed solutions. IT professionals will benefit from sharpening their security skills, including knowledge around data protection, privacy standards, and secure message integrity. Secure messaging may include topics such as encryption, digital signing, and malware protection. Additional skill sets of value include identity management, authentication methods, and auditing.

## Understanding IT as a Service

To understand IT as a service it is best to start with an understanding of the cloud models implemented today. Cloud services can be delivered in one of multiple formats. Often, an IT department will start with a private cloud environment and perhaps focus on deploying virtual servers. This is commonly referred to as infrastructure as a service and represents one of the flavors of IT as a service that is available within the world of cloud computing. Since this is only a single example of the possible cloud models, IT professionals must become familiar with a variety of cloud standards so that they can select appropriately based on the needs of the enterprise. It is common to divide cloud computing into three categories:

- **Infrastructure as a service (IaaS)**, which provides flexible ways to create, use and manage virtual machines (VMs).
- **Platform as a service (PaaS)**, focused on providing the higher-level capabilities — more than just VMs — required to support applications.
- **Software as a service (SaaS)**, the applications that provide business value for users.

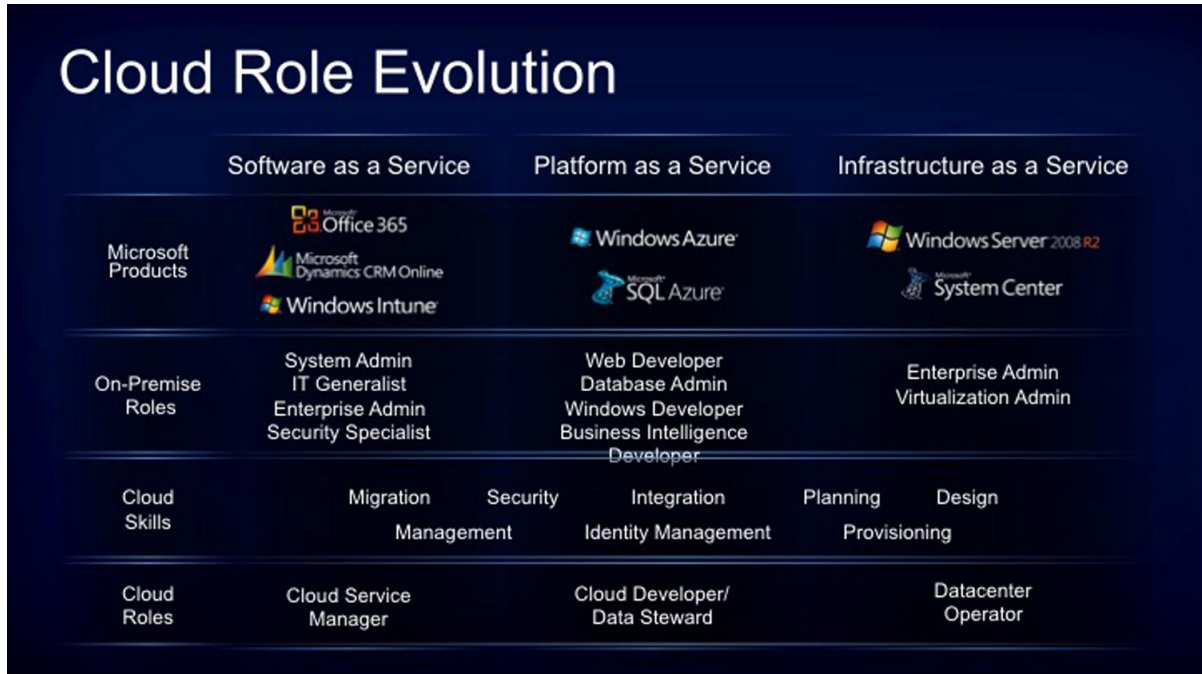
## Deployment Models

For each cloud computing category there are additional decisions regarding the type of cloud chosen. The type of cloud that is selected determines the placement and usage model of the physical infrastructure that is being removed from the customer's datacenter world. Essentially, the cloud computing deployment model describes where the software runs and includes the following options:

- A **private cloud** is a set of standardized computing resources that is dedicated to an organization, usually on-premises in the organization's datacenter. It works with the current capital investment and delivers the new functions as a service.
- A **hosted private cloud** has a dedicated infrastructure hosted by a third party, inaccessible to other organizations.
- A **public cloud** consists of computing resources hosted externally but shared with other organizations and dynamically provisioned and billed on a utility basis — the customer will pay for what is used as they use it.

*The next few years will see a mix of private and public cloud solutions. That makes the challenge even better because they have to deal with connecting the two. Identity management will be key in the next few years.*

Keeping these categories in mind, the next sections of the white paper discuss the service models and explore the roles and skills IT professionals and developers need to invest in for each of them.



### Infrastructure as a Service

IaaS is the capability to provision processing, storage, networks, and other fundamental computing resources where the consumer is able to deploy and run software. This may include both operating systems and applications. Companies can choose to optimize their infrastructure by adopting an IaaS.

IT professionals who manage and maintain IaaS infrastructure have a cultural mind shift to adopt. Once viewed simply as a localized resource, infrastructure in the cloud now carries the characteristics of a commodity and functions as a service. In this new guise, it becomes dynamic, always available, and has self-service capabilities. That translates into the need for an additional skill set beyond what traditional IT administrators already possess.

It is a common misconception that the mind shift is simply to virtualization. Although a first step, virtualized infrastructure fails to reach the level of service necessary. It pools resources into a single structure to serve multiple customers. An elastic, or dynamic, quality becomes important. A measured service, which includes the change monitoring and operational IT reporting, must be created.

The first step in moving to an IaaS model usually starts with a private cloud with virtualization. In this environment, as applications and services achieve critical mass the cloud provider will be called upon to provide IT services to support the systems and potentially the applications.

### **Products**

IT professionals can use their current infrastructure skills and product knowledge to build on for private cloud implementations, and then leverage that to be ahead of the game for public cloud implementations as well. For example, they may use Windows Server® 2008 R2, Microsoft® Hyper-V™ Server 2008 R2, and Microsoft® System Center within a private cloud. From a management perspective, they will need to provide self-service systems while still managing the environment as a single service in an on-demand fashion.



Additionally, net new systems provisioning and systems decommissioning must be made possible and available as a part of the service. By taking the products into an IaaS mode, it broadly elevates infrastructure to a service level. Service becomes the differentiator.

### **New Technologies and Areas to Consider**

New technologies or areas to consider include virtualization and datacenter management. Virtualization will involve the management of virtual machines and the self-service environment.

The important job areas include:

1. Provisioning and management
2. Monitoring and protecting
3. Service management
4. Virtualization
5. Automation
6. Security and compliance
7. Performance optimization

One of the pitfalls of providing self-service is misunderstanding what it involves. For example, some models may have finite resources, even when pooled together. Proper scheduling of resources is critical and scheduling techniques such as reservations and bookings become required. Another factor to consider is dynamic provisioning: who sets the controls depends on the organization.

Another component within IaaS is datacenter management. In areas of management, such as orchestration, workflow, and user interface, there will be administration and configuration tasks.

That involves service management and process automation. All must be configured, and some must be customized because every organization's workflow is different.

The emerging roles for infrastructure specialists are in such areas as datacenter operations. Infrastructure specialists currently focused on virtualization need to enhance skills to manage the datacenter, engage in network management, user account management, server management and application management.

### **Critical Skills by IT Job Role**

The following are job roles and skills the IT professional can invest in:

- **Business liaison:** Move skills up the stack in the decision process. Hone expertise to the business from within IT. Move into design and architecture roles. Determine whether to focus in-house or off-premise, define options whether the organization decides to stay on-premise or moves to the cloud.
- **Datacenter manager:** Reposition datacenter skills toward the hosted datacenter. Enhance automation skills. Work in standardized environments and with standardized applications as an option. Become good at management applications, scripting, and performance optimization. Acquire best practices skills, such as information services technology management.
- **Security specialist:** Help businesses move core business processes and data securely to private, public, or hybrid cloud solutions. Security specialists need to stay abreast of new security models and technologies, such as data protection skills, privacy standards, securing message integrity (encryption, digital signing and malware protection), federated identity management, authentication methods, and auditing.
- **Software architect:** Serve as a link between the organization's technical and business staff. Architects are asked to design and build complex distributed systems that exist both outside and inside an enterprise and the cloud. They need to acquire the new skills required to build infrastructure, platform, and software clouds. They need to understand how to design and construct multi-tenant and virtualized systems that can manage thousands of simultaneous users and isolate higher levels of the stack from physical component failures.

Another consideration would be "change management." IT professionals need skills to manage the common practices. Organizations need to have security- and compliance-certified employees.

### **Platform as a Service**

PaaS delivers a computing platform and/or solution stack as a service, often consuming cloud infrastructure and sustaining cloud applications. It provides a consistent hardware and software infrastructure aimed entirely at running applications, such as within Microsoft Windows Azure.

Developers are less constrained by resources, such as memory and processing power. They are able to use existing skills with Microsoft® Visual Studio® and Microsoft® .NET to build compelling applications and services that are hosted within the cloud. They can build customized applications and tools that improve developer productivity on behalf of the entire engineering organization.

But they also must begin to use their business brain. They must think architecturally. How will they design their application? What services will they purchase on Windows Azure? Now developers must think about how they maintain applications and address questions that will arise as part of the impact of their decisions. Do they put an application on the server using SQL Azure™, Windows Azure storage services, etc.? What they decide will have cost implications.



### **Products**

Dealing with various cloud products that exist in the PaaS space means developers must think more about what application services may or may not be offered. In the past, everything was self-contained, built-in — and typically all on-premises. Now, developers must focus on new concepts, such as the access control between remaining on-premise components and the offered cloud service and how they will communicate with each other.

Architecture becomes more of a factor. It provides opportunity, creating technological building blocks in the cloud for using code and dealing with organizations. An individual can bring to the organization knowledge and understand of how to use the many components involved as an integral part of the application.

SQL Azure provides a database level service, which allows for work in reporting which may need to deal with synchronization of data. The Windows Azure AppFabric fits in between applications and can handle any messaging between applications and helps to facilitate how multiple applications work together.

### **New Technologies and Areas to Consider**

Technology developers should consider expanding their skill sets to include identity and access control, Windows Communication Foundation, and HTML5. With identity and access control, Windows Identity Foundation offers a foundation for handling security and enables developers to work easily with Azure access controls. Windows Communication Foundation opens communication by having code already out there that developers should be aware of. HTML5 provides richer websites without the need for third-party plug-ins.

## **The Cloud Developer**

The cloud developer will need to understand how applications are designed, developed, and deployed for a PaaS. The skills developers need to invest in to prepare for the cloud include the following:

- Identity management
- Windows Communication Foundation (WCF) and Rich Internet Application (RIA) services
- Connects
- Middleware
- Architecting Cloud Solutions

### **Windows Communication Foundation Rich Internet Application**

While identity management addresses security issues, WCF RIA services will allow the creation of compelling websites and front ends. Microsoft® Silverlight® enables media and more compelling video in applications. RIA services bring them back to end users. This is important because with RIA services and Windows Azure Content Delivery Network, it allows immersive experiences on websites. Whether hosted in the cloud or streamed from the cloud, Windows Azure provides a huge datacenter and offers very rich experiences that will allow more to happen in the cloud, including lightweight applications with a huge, rich content experience.

### **Connect**

By connecting and exposing the Windows Azure AppFabric distributed application, Windows Azure Connect service allows developers to work with the hosted virtual machines in Windows Azure. They can access the application from the cloud as if it were on their desktop. Middleware handles access controls, integration and caching services, and creates a bridge between an on-premise and off-premise solution.

### **Architecting**

Architecting addresses computer service applications and cost considerations. The investment now is in composite applications — and that has cost implications. Developers will need to understand their data storage options and data partitioning. They don't need one single store for all their data; it can be put in a particular location. The question becomes where to keep the data. It behooves developers to think about how to design applications with regard to where data is.

### **Database Administrator Opportunities**

Database administrators (DBAs) who are able to design and manage databases anywhere also emerge as an important role. DBAs in a cloud environment need to invest in skills like architecting a cloud strategy (e.g., story type, cost) and identifying potential data to move to cloud storage

(Windows Azure, SQL Azure). To take advantage of the scaling nature of the cloud, DBAs need to be aware of the new storage services. Windows Azure storage services provide scalable blob, queue, and table storage services, and SQL Azure provides a cloud-based relational database service built on Microsoft® SQL Server® technologies.

### **Software as a Service: Productivity Skills Needed for Productivity Solutions**

SaaS is “software deployed as a hosted service and accessed over the Internet.” The user accesses applications running on a cloud infrastructure via a web browser or other client software and IT professionals are not required to manage the underlying cloud infrastructure to administrate their applications.

#### **Products**

Office 365 still requires administration and IT professionals to receive new technology training. Office 365 brings together Microsoft® Office, Microsoft® SharePoint® Online, Microsoft® Exchange Online and Microsoft® Lync™ Online in an always-up-to-date cloud service.

“When considering cloud and the use of Office 365, the first and most important considerations involve the size of a company and its physical location,” said Siegfried Jagott, a Principal Consultant at Siemens.



There are new opportunities to acquire skills that address the synchronization necessary to maintain the cloud service. IT staff must manage the transition between new and existing systems and monitor performance. Microsoft® SharePoint® 2007 to SharePoint 2010 still requires similar types of migration. A lot of background work must be done. Such a venture needs an underlying foundation before the migration begins. IT professionals must prepare themselves for handling the migration.

#### **The Microsoft Office 365 Skills Impact**

Office 365 uses a central identity that administrators must manage. IT professionals need to define the best solution for creating a single identity for users, an identity to share across all cloud solutions.

“The next few years will see a mix of private and public cloud solutions,” Sellenrode said. “That makes the challenge even better because they have to deal with connecting the two. Identity management will be key in the next few years.”

What IT professionals need to know about is Internet connectivity, including the Domain Name System (DNS) registration and everything that comes with it, such as Mail Exchange (MX), Service (SRV), and DNS Replication, especially if they are the administrator of Office 365. They have to know how message flow works and about federation services for single sign-on.

For Exchange Online, they need to understand Exchange Control Panel, which combines the capability of on-premise Exchange Management Console (EMC) with adding features to make managing Office 365 Exchange deployments easier. In addition, they will want to educate themselves about Microsoft® Forefront® Online Services and anti-spam management.

### **New Office 365 Administrator for Small and Midsize Businesses**

The role of Office 365 administrator is a potential new specialization for the IT generalist. Such a generalist tends to have a deep background in one area, usually Exchange, as well as SharePoint and Lync. This role could primarily be responsible for planning, deploying, and administering the hosted solution of Office 365, with limited migration and hybrid scenarios in a small- to midsize business IT environment.

### **Technology Skills to Invest In**

An Office 365 Administrator will need the following technology skills:

- Foundational understanding of the Office 365 service offerings and related technologies
- Planning and implementation skills for Office 365 hosted solution
- Skills for migrating from an existing environment to newly hosted solution and hybrid solution
- Skills for implementing and managing the provisioning of new users
- Skills for day-to-day service management tasks
- Foundational networking skills
- Foundational security skills

*IT professionals need migration and integration skills to determine coexistence and maintenance strategies and solutions between on-premise systems and the cloud.*

### **New Office 365 Enterprise Service Administrator**

This is a potential evolving role for enterprise IT professionals. This role is primarily responsible for planning, migrating, deploying, and administering Office 365 in an enterprise. It entails significant migration and hybrid scenarios for an enterprise solution as compared with a small- to midsize business IT environment.

To further elaborate, certain organizations may choose to coexist, having part of a mailbox solution deployed in their own infrastructure and part of the mailbox solution deployed in a hosted environment. The skills to support such complex hybrid scenarios will be essential for this evolving role.

Typically, the IT professional leading the Office 365 deployment would have a deep background in one of the supporting technologies of Office 365 (SharePoint Server, Lync Server and Exchange Server).

### **Technology Skills to Invest In**

An Office 365 Enterprise Service Administrator will need the following technology skills:

- Planning and design skills
- Infrastructure skills to determine basic infrastructure requirements such as Directory Synchronization, mail routing and namespace planning, Active Directory Federation Services, DNS, bandwidth, etc.
- Security skills to determine internal security and privacy policies and address any concerns or legal requirements
- Migration and integration skills — you will still manage your users and their mailboxes. Industry-specific data retention compliance, as well as implementing custom workflows, remains a responsibility.
- Hybrid deployment skills to determine coexistence and maintenance strategy between on-premise systems and the cloud
- Core skills in configuration of all Office 365 technologies with deep specialization in one or more of the following: SharePoint Server, Lync Server and Exchange Server.

### **Summary**

IT professionals should look forward to the cloud experience with both competence and confidence. Much of the experience and talent that IT professionals and developers possess today are transferable to the emerging cloud world. With the capability to build and adapt their existing skills, savvy professionals should view new cloud opportunities as a chance to expand upon and grow their portfolio of skills.

Companies that instill the knowledge and understanding their IT professionals and developers require in making the transition to cloud based skills will enable transition to the cloud both more successfully and more profitably.

As is historically true, the world of IT is changing. Those who discover and master the skills needed to bridge the gap between the now and the not yet will secure their future, and the future of their companies.

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