Why Cloud Computing Needs a Cloud-Intelligent Network

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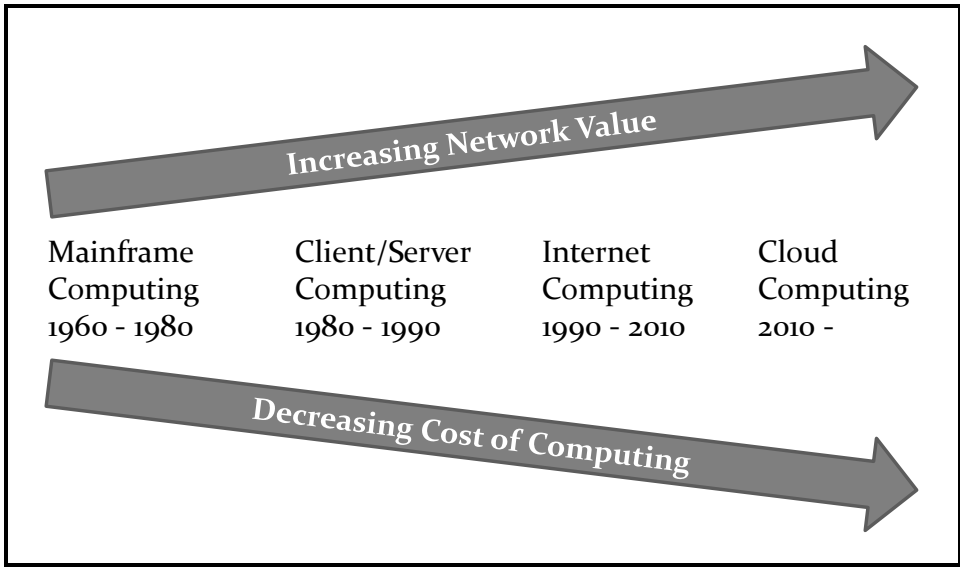
Introduction: Cloud Computing has Arrived

Cloud computing has been on the horizon of most CIOs for the better part of half a decade. Cloud computing represents the next evolutionary step for computing. Decades ago, the mainframe era kicked off computing. This phase lasted about 20 years, eventually giving way to the client/server era. Organizations began to locate more employees in branch offices, giving rise to Internet computing. Now the industry finds itself in the midst of another transformation — the shift to cloud computing (see Exhibit 1). While each phase of computing created new ways to operate and manage IT, there were three commonalities to each:

Exhibit 1: The Cloud Computing Era Begins



Source: ZK Research, 2012

1. **The cost of computing was dramatically reduced**: The cost of computing has continued to fall. This has allowed organizations to deploy more compute capabilities in more places, cost-effectively. This is one of the main reasons cloud is becoming a reality instead of just a vision that organizations may never reach.
2. **The strategic value of the network continues to rise**: Computing has become more reliant on connectivity. Never has this been more true than with cloud computing. In fact, cloud computing is the most network-centric computing model to date, and an organization's ultimate success or failure with the cloud can be determined by its network strategy.
3. **The interdependency of the network and computing is tighter with each successive wave**: Over time, the relationship between compute and networking has grown increasingly stronger. With cloud computing, the network is the best way to manage, secure and orchestrate cloud-based resources.

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Cloud computing is the fastest growing segment of business applications and will be the norm for most companies. Some organizations have aggressively moved to the cloud to get a jump on the competition.

> *"Leveraging the cloud was one of the company's fundamental strategies for our 2015 IT vision. We want to move now to where everyone will be in a few years."*
>
> ***– Chief strategy officer***
> ***A national travel agency***

Because the role of the network has changed, current network strategies are no longer sufficient to enable a shift to the cloud. The main limitations of current network approaches are:

- **Inefficient use of network bandwidth**: Historically, enterprise networks have been designed with a hub-and-spoke architecture. Each branch is connected only to the data center for connectivity. This means all traffic is backhauled over the corporate WAN, through the data center and then to its destination, whether it's the Internet or another branch. This "trombone" effect is highly inefficient as all traffic goes through a single choke point.
- **Inability to apply security policies**: SaaS applications are not controlled by the enterprise, and the ability to apply data and network security is limited. With shared public clouds, enterprises must rely on inconsistent security capabilities offered by the cloud provider.
- **Poor network visibility**: Legacy network management tools provide limited visibility at the network layer. Typically, the network manager has no ability to view application-level traffic or optimize it through the network.
- **Lack of control**: Improving user experience and application performance requires more than just adding bandwidth. Better control over network choke points, with the ability to apply network optimization techniques, provides greater control for network managers.
- **Inconsistent user experience**: Workers want to access applications wherever they are and when they need them. Unfortunately, user experience varies widely depending on whether the user is in a branch office, telecommuting, working from home or at other locations. This inconsistency can be extremely frustrating and can hurt morale in some situations.
- **Lack of survivability for SaaS applications**: The continuous availability of business applications is paramount to the success of the organization. The network needs to be architected to survive link failure or degradation in performance.

The network has shifted from a tactical, best-effort resource to a key enabler, raising corporate productivity to unprecedented levels. To achieve this, the network must fundamentally change. This is the only scalable way companies can fully leverage public, private and hybrid cloud services.

To get maximum benefit from cloud computing, organizations need an intelligent network capable of providing security, visibility and optimization for a high-quality consistent user experience. Additionally, the network is the most scalable place to put the control points to manage and orchestrate cloud-based resources.

Customers that do not embrace the network as a foundation for cloud delivery put their organizations at risk, as users will experience inconsistent application performance, security exposure and poor business continuity. Leveraged correctly, the network plays a key role helping any organization shift business applications to the cloud.

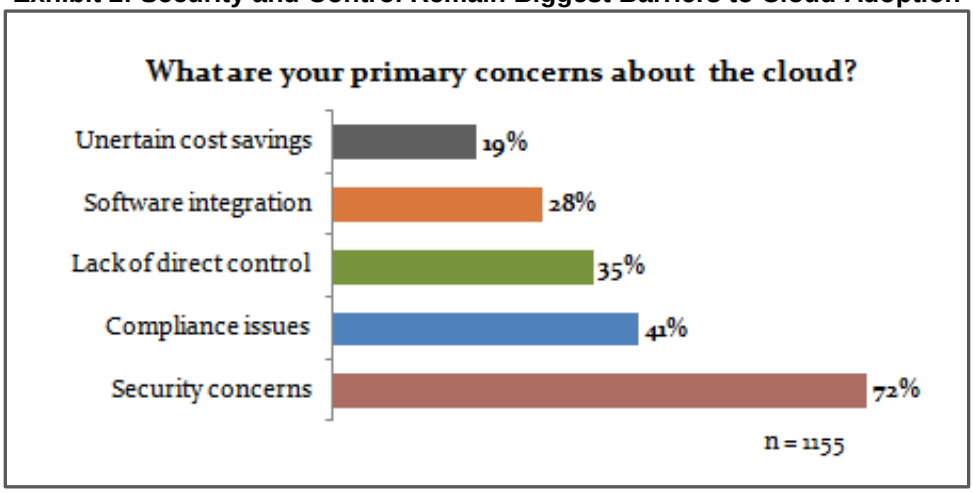
> *"Our executives were wasting hours on a weekly basis coming into the branches to check email and update internal systems. We migrated all of our applications to the cloud and now they have access to all of the applications where ever they are. This has not only saved significant time, but executives are more responsive, raising productivity for almost everyone."*
>
> ***– CIO***
> ***New England-based regional bank***

Section II: The Role of the Network

Cloud computing is the most network-centric computing model to date. Because of this, the network plays a key role in the delivery and performance of cloud-based services. The network has long been considered plumbing — a tactical area, but not strategic. However, the cloud raised the network to a strategic asset. It has assumed this role for the following reasons:

- **The network is the best place to secure and manage the cloud**: The two biggest barriers to broader use of cloud computing remains security and control (see Exhibit 2). Many IT managers are unclear as to how to secure and manage resources that they no longer own, and are not on-premises. Pushing control and security points to the network allows IT managers to meet these challenges. The network is the only IT asset that touches every other IT resource.

Exhibit 2: Security and Control Remain Biggest Barriers to Cloud Adoption



Source: ZK Research, 2012

- **The network is the most cost-effective delivery platform for cloud services**: When the main client computing device was a PC, it was sufficient to use servers as the primary delivery platform. This worked well while hardware, operating systems and applications were all tied together. In today's cloud-centric environment, a user can be in any location using a multitude of devices. The only way to cost-effectively deliver applications is to push the application into the cloud and use the network as the delivery mechanism.
- **The network is pervasive**: Just a few years ago, it would have been difficult if not impossible to use the network as the foundation for cloud computing, as there were too many coverage gaps. Today the combination of corporate networks, home networks, 4G coverage, public hot spots and Wi-Fi means users can connect almost 100 percent of the time.
- **The nature of applications has changed**: Applications used to be deployed in tight silos where each application had dedicated storage, compute and network resources. Virtualization makes it possible for application, compute and network resources to reside almost anywhere. Many cloud computing services are delivered by mashing up components from multiple locations. The network ties these resources together to deliver a high-quality cloud experience.

The era of cloud computing raises the network from a tactical commodity used for best-effort traffic to a strategic asset for competitive differentiation. To capitalize on this, it must evolve into a cloud-intelligent network.

> *"Shifting the IT control points to the network is the only way we can move to the cloud without putting the business at risk."*
>
> ***– CIO***
> ***A midsize financial services firm***

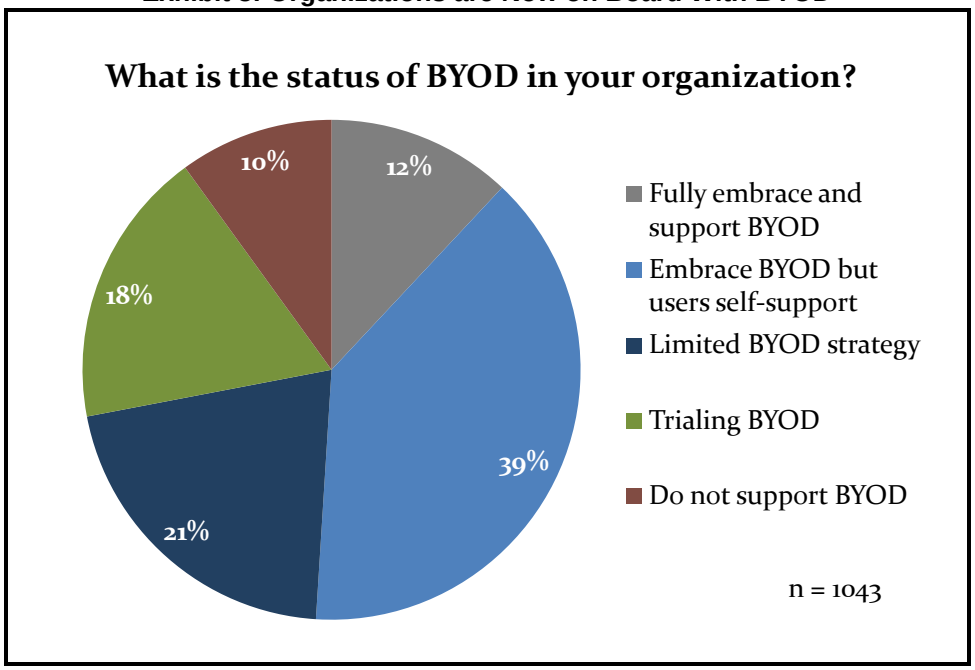
Section III: A Cloud-Intelligent Network

A cloud-intelligent network (CIN) can be thought of as the evolution of the network to adapt to a cloud-based world.

The network must deliver a secure, manageable and optimized cloud experience. The primary drivers of network change and CIN are:

- **Consumerization of the enterprise**: The influx of consumer devices has exploded over the past two years, with technically savvy users and business leaders driving demand. This has forced most organizations to adopt a bring-your-own-device (BYOD) strategy (see Exhibit 3). Traditional end-point management strategies with client software or application agents do not scale. The network must take on this role.

Exhibit 3: Organizations are Now on Board With BYOD



Source: ZK Research, 2012

- **The cloud is viral within**: Cloud services are already rampant, but are being procured directly by users. Sales managers buy directly from SaaS providers such as Salesforce.com, application developers purchase compute resources from Amazon and applications like WebEx allow almost anyone to share content inside and outside the organization. ZK Research estimates, on average, companies have four cloud services — outside traditional IT control.
- **The rise of corporate video**: Corporate video systems are about two decades along, but overall use has been low. Recently, use exploded due to new higher-quality systems that are easier to use, plus a bevy of video-enabled consumer devices. Video is, by far, the most bandwidth-intensive application on corporate networks. If the network is not ready, deployment will be a struggle.
- **Webification of corporate applications**: The rise of wireless networks and evolution of consumer devices has given almost every corporate worker Web access anywhere, any time. This has driven IT departments to deliver more applications via the Web, as it scales better and is easier to implement in a multioperating system, multidevice world.

As trends continue, the need for a CIN becomes critical. Organizations need to move quickly to adopt CIN, to avoid falling behind competitively.

> *"We have seen video use grow by orders of magnitude on our campus. It accounts for almost half of network traffic."*
>
> ***– VP of network operations***
> ***A North-East U.S. university***

CIN connects corporate-grade cloud based services to workers but also:

- **Secures the cloud**: The CIN protects both the user and the data being transported. The security is built into the network instead of overlay technology, and is tunable based on policy. Some information, such as health records, may require the highest security levels while Internet traffic may require only basic security.
- **Provides visibility into the cloud**: The CIN can record which users connect to the cloud, what resources they access, where they are located and what task they are trying to perform. This information is difficult if not impossible to gather from traditional management tools. Since the CIN is pervasive, it can provide the visibility to allow IT to manage cloud-computing services.
- **Optimizes user experience**: User experience is a significant part of competitive advantage. Build a service with a high-quality user experience and the service will be successful.
- **Enables cloud-to-cloud connections**: This connects cloud providers and optimizes the sourcing of data. As clouds federate this will become increasingly important. The cloud needs to become a primary citizen of the corporate network to enable secure connectivity between users and the cloud, as well as between cloud services. Today the cloud is tethered to the enterprise data center, which does will pose long-term scalability problems.
- **Network management and automation**: Clouds must be agile, manageable and secure. Applications and tools used to secure and manage legacy IT are no longer sufficient for cloud computing. CIN can deliver manageable, automated and secure services.

The CIN can be thought of as an underlying network platform that integrates computing with networking to deliver a world of connected clouds. There are several components that comprise the CIN, such as:

- **Network platforms**: This includes access routing, edge routing, and core routing, delivered via physical or virtual appliance where it makes sense. These are the primary infrastructure building blocks of the CIN.
- **Branch WAN services**: These are technologies that can optimize application performance and user experience. For branch technology, branch routers provide a highly secure, reliable platform that scales to small business and branch offices. WAN optimization can accelerate and optimize bandwidth for improved user experience. WAN services are delivered via aggregation routers for multiple network and security services from the WAN edge, as well as network positioning systems to provide application layer recommendations to optimize traffic. This can fulfill the vision of the lean branch, with emphasis on survivability services.
- **Security solutions**: Security is, by far, the no. 1 barrier to broader cloud use, and the network is the most scalable place to secure the cloud from. Security solutions include the secure mobile VPN client, Web and email security, early-warning security intelligence, identity services and edge security services. Applying VPN to the cloud can give the highest levels of link encryption. A must for all organizations.

> *"We moved to Web-based email and reduced operating expenses by 73 percent. Over the next 24 months we will move as many applications as we can to Web delivery and expect similar cost savings."*
>
> ***– Director of IT***
> ***Midsize media company***

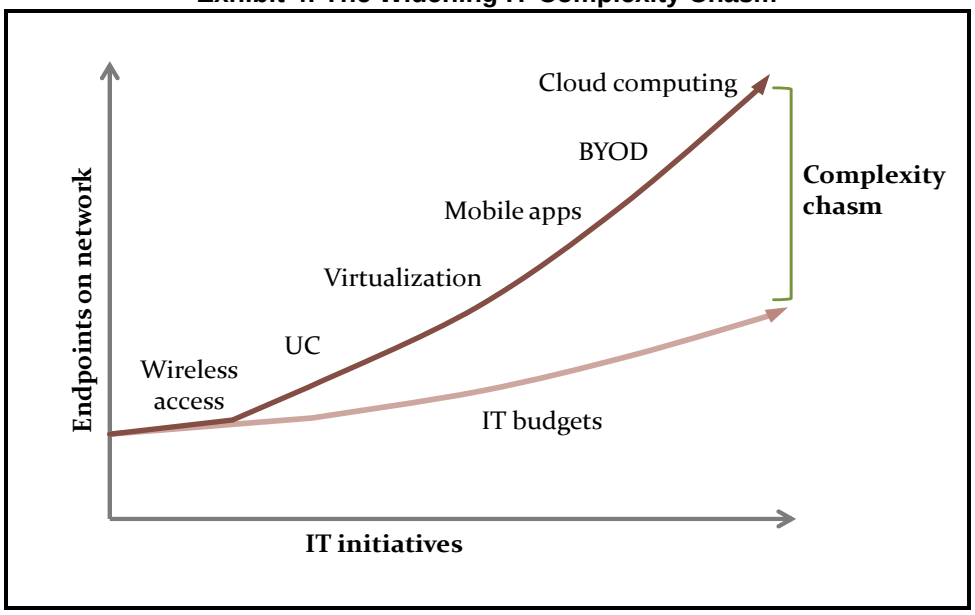
- **Data-center services**: The heart of any cloud service is the data center. The data center needs a robust, scalable network to provide high-quality cloud services. Data-center services are made up of data-center aggregation routers, high-density gigabit and 10 gigabit connectivity, network fabric technologies and virtual private LAN services.
- **Cloud management**: Much of the success of any cloud deployment will be based on the ability to manage the environment, making cloud management tools critical. The category of cloud management is very broad, and includes converged user-access management, unified communications management, network analysis, application-level visibility and cloud automation.

Section IV: The Benefits of a Cloud-Intelligent Network

Organizations that adopt a cloud-intelligent network will realize many benefits, such as:

- **IT-driven business agility**: Competitive advantage for organizations is defined by the ability to adapt quickly to the changing business climate. A CIN enables a dynamic, efficient cloud with high levels of IT agility.
- **Low TCO**: A CIN can definitely lower infrastructure costs but it can also address significant operational improvement. ZK Research estimates that operational tasks account for roughly 65 percent of the total cost of running a data center. A CIN will automate many tasks done manually today, reducing the chance of error and improving service quality.
- **Time to market advantages**: ZK Research finds 90 percent of IT projects are either cancelled or delivered late. This is because of the increasing complexity of the IT environment. A CIN can pave the way to faster deployment of cloud services, allowing organizations to realize quick benefits.
- **Assured experience**: The vision of delivering any application to any worker on any device can only be successful if the user has an assured experience. Service disruption creates frustration and has significant impact on worker productivity.
- **Simplified management**: While advancements such as mobility, virtualization and VoIP made IT more efficient, it also widened the IT complexity chasm (see Exhibit 4). A CIN can simplify operational tasks, removing the burden on IT. Simplified management enables IT to spend more energy on strategic initiatives.

Exhibit 4: The Widening IT Complexity Chasm



Source: ZK Research, 2012

Section V: Conclusion and Recommendations

Cloud computing is the most network-centric compute paradigm to date. A successful transition to cloud will depend on a rock-solid network foundation that enables organizations to transition to the cloud at their own pace.

Deployment of a CIN such as Cisco's Cloud Connect will enable organizations to stay competitive and deploy cloud services faster, with less risk and a higher degree of success. This will allow organizations to start enjoying the benefits faster, while ultimately reducing the total cost of running IT. However, the business environment is very competitive today and companies need to get started with a CIN immediately — or risk falling behind. To help get started, ZK Research recommends the following:

- **Invest in your network now**: Any organization even thinking about cloud should invest in the network today to ensure the foundation is there to transition to the cloud when the company is ready. It's critical that companies choose infrastructure than can enable the proper level of network intelligence to enable a quality cloud experience, rather than using network infrastructure that is simply "good enough." When it comes to cloud, a good enough network is no longer good enough.
- **Leverage the network for cloud success**: Legacy thinking considers the network merely plumbing. Cloud computing success is highly dependent on the network. Business and IT leaders must position the network as a strategic asset that will determine the ultimate success or failure of cloud services. A network-first strategy will create the most secure and lowest-risk deployment model for a future cloud strategy.
- **Take an architectural approach to building a CIN**: A network is more than a collection of routers and switches. An architectural approach will ensure the network can not only connect users to the cloud but ensures a high quality, optimized user experience with a lower TCO than a nonarchitectural approach.
- **Focus on user experience**: Understanding how the CIN is performing has IT value but no direct business value. A focus on user experience provides IT with the ability to more directly measure the business value of the CIN and create measurable ROI.

> *"Cloud computing is the biggest technological shift in corporate IT since the birth of computing. It allows us to finally achieve the vision of delivering any application to any worker no matter what device they use and wherever they are. It is critical to our workplace-of-tomorrow strategy. The bank has taken a network-first strategy, as it is the only IT resource that ties all of our global assets together."*
>
> ***– VP of IT***
> ***European-headquartered global bank***