Building and maintaining effective cloud computing infrastructures

White paper

Executive summary
A number of technical issues, including WAN performance, security, and central management of virtual and IP services, prevent the widespread adoption of cloud computing infrastructures in the enterprise. This paper explores the nature of these technical challenges and offers solutions for building and maintaining more effective cloud computing infrastructures.

Introduction
Cloud computing holds great promise as the next leap in efficiency for enterprise computing. Primarily enabled by server, storage, and network virtualization, cloud computing allows businesses to dynamically allocate and assign computing resources from across the company's assets to where the resources are most needed. This practice promises to cut hardware and software acquisition costs significantly and can have a tremendous savings in energy expenditures as well. With cloud computing, users access data and applications as they always have – but these data and applications may reside anywhere within the company's cloud. In many cases, the application and data may be spread among many different sites, depending on demands placed on the network.

Problems implementing effective cloud computing
For all its promise as a cost-effective solution for fully exploiting enterprise resources, cloud computing faces a few significant technical challenges before widespread adoption is possible. Three potential problems in particular can complicate implementation of an effective cloud computing infrastructure:

- WAN performance
- Data security
- Central management of virtual resources

Problem: WAN performance with cloud computing
The chief problem in cloud computing is the performance, reliability, and security of connections to the cloud infrastructure. These WAN connections, due to the increasing complexity and bandwidth demands of software applications, will become more and more crowded over time, especially when pressed into the service of cloud-based computing. The trend is toward more traffic and more congestion. In a cloud infrastructure, in many cases, congestion may not be easily predicted. It is estimated that 31-percent of

“Gartner recommends that vendors take advantage during this disruptive period by introducing leading-edge management tools in support of virtualization initiatives and ensure that virtualization-specific management products can integrate within existing management frameworks.”

— Alan Dayley, Research Director, Gartner Group
business communications costs are already consumed by WANs.\footnote{Newman, David. “WAN Acceleration Offers Huge Payoff.” Information Age, October 23, 2007.} Cloud computing may easily increase the cost of communication if WAN optimization is not properly implemented.

Without performance enhancements, the latency and traffic inherent in WAN connections can drag remote connections to the cloud to a crawl in some instances. When remote applications are response-dependent, optimized WAN connections from end-to-end are crucial to prevent applications from timing out, corrupting data, or frustrating workers at remote sites. Applications such as videos, virtualized server applications, and software-as-a-service (SaaS) running in the cloud require more bandwidth than traditional text-based data files and database records across normal WAN connections.

**Problem: WAN security and cloud computing**

WAN optimization schemes should address not only issues of performance, but also the security of data from end-to-end. Companies relying on segments of the public network for some or all of their WAN connectivity to a cloud computing platform should be especially concerned about exposing data to security risks. Regulatory and legal concerns may mandate that these connections are impervious to outside attacks, theft, or intrusion. Regardless, WAN optimization without increased security is not a prudent business or IT infrastructure decision.

**Solution: Circadence MVO™ 1200 WAN Optimization suite**

Circadence® offers the Circadence MVO 1200 WAN Optimization suite that requires far less configuration than existing solutions on the market. Because Circadence MVO does not depend on specific network devices to achieve acceleration and security, it requires virtually no configuration when used in conjunction with cloud computing infrastructures. The Circadence MVO product line is available as a software-only client-server solution, as a hardware-based appliance, and as an embedded add-on to virtualization applications that serve as the backbone for cloud implementation. Regardless of the Circadence MVO solution, the product dynamically adjusts to changing conditions on the WAN to provide peak performance, with no complex settings or parameters to set. The Circadence MVO 1200 WAN Optimization suite also offers solutions for smartphone and PDA users connecting to the cloud. All products work together. Customers can choose the solution that fits their optimization requirements, and no reconfiguration of existing LAN or WAN equipment is ever needed.

Circadence MVO acceleration technology improves WAN performance by at least 50-percent, depending on the application and connection type. In independent testing by a major U.S. cellular carrier, some remote applications experienced an increase in performance ranging from 100- to 1,000-percent over a CDMA cellular network.
Circadence MVO performance is achieved through Circadence’s patented optimization protocol that tunnels through network congestion. Because Circadence MVO solutions do not depend on the native network devices for provisioning, Circadence’s protocol achieves superior speeds regardless of switch equipment brand or type. An independent testing lab compared Circadence’s protocol to TCP protocols in a highly congested Internet environment to 27 disparate geographic locations.

![Circadence Protocol Verses TCP](image)

Circadence’s protocol performed better than TCP to each geographical location. Analysts recorded increased performance using Circadence’s protocol that ranged from 51- to 555-percent. When users from remote offices connect to cloud-based applications, performance is essential to ensuring their productivity.

**Security**

Circadence MVO acceleration algorithms also provide default data security from end-to-end with no configuration needed. Because Circadence MVO solutions maintain protection directly to the client, data at rest on the edge server is not an issue. Circadence MVO security, in fact, has withstood the scrutiny of customers such as the U.S. government and U.S. Department of Defense (DoD).

**Ease of management**
All Circadence MVO products are managed through an intuitive web interface. Regardless of which Circadence MVO product is deployed, the management console provides a unified view of all connected software and hardware agents. Administrators can access the Circadence MVO management console from any location.

Resilient Circadence MVO connection

Circadence MVO solutions provide the additional benefit of a resilient connection. In extremely congested or intermittent carrier conditions, Circadence MVO solutions keep endpoints connected. This resilient connectivity is crucial to the deployment of cloud-based applications and data sharing. Mobile applications in particular require this resiliency to avoid timeouts and data retransmissions. Resilient connections maintain user productivity and minimize the risk of corrupted data in cloud computing environments.

Problem: Virtualization management for cloud computing

Because of the relatively rapid deployment of virtualization technologies, many companies have identified numerous key issues that must be resolved before widespread cloud computing can fully leverage virtualization. These issues generally center on greater integration of services, better visibility into virtualization processes, and matching virtualization services to existing and future workloads and applications. Without such improvements, companies may not realize virtualization’s full benefits.²

Visibility and performance

With many differing virtualization products deployed at once, or across many sites, most companies have little insight into their total virtualization environments. Administrators must hop from management console to management console in an attempt to piece together a unified picture of their virtual resources. In this scenario, inevitable conflicts over resources occur. In some cases, a critical lack of resources becomes apparent only when applications demand them – and it is too late to provision additional physical devices. Applications can experience a sudden drop in performance when resources run low. The ability to view and monitor virtualization services on a global basis throughout the enterprise cloud is essential for not only application integrity, but also to ensure service-level agreements (SLAs) are met. Capacity planning and application stability depend on a clear, unambiguous view into virtualization resources. In short, the only way to fully optimize critical resources and guarantee cloud computing SLAs is through central visibility management.³

Security

Many companies may take the security of their virtual services for granted, but virtual operations are only as secure as the physical platforms on which they run. Consequently, many virtual services may be at risk. In particular, the two areas of greatest concern are

network connections among virtual services and the use of virtual services by unauthorized users. While many of these security concerns can be addressed at the physical layer, the time and administration efforts required can be overwhelming and may not consider all scenarios. Therefore, addressing security concerns on a globally managed basis is best. Again, visibility into virtual environments is a key element in controlling security.

Virtual sprawl and non-compliance

Because deploying and copying virtual environments is easy, unsophisticated users and branch and remote sites may be cloning and saving a proliferation of virtual machines, creating “virtual sprawl.” With no centralized control, these virtual environments can spring up across the enterprise, jeopardizing regulatory guidelines and compliance rules, such as GLBA, HIPAA, PCI-DSS, and many others. Internal data compliance restraints are also regularly violated in such environments. Each instance of a virtual environment needs to be as carefully managed as physical resources, but without the proper tools and safeguards in place, violations are sure to follow. In a Gartner Group report from August 2007, analyst Cameron Haight warns that virtual machine sprawl is a major concern that appears to lack a comprehensive solution.

Aside from the compliance and administrative costs this sprawl represents, unchecked and ad-hoc virtualization can consume all the resources and cost benefits realized by the initial move to virtualization technology as a platform for cloud computing.

Solution: Central management of virtual resources

Since its inception in 1993, Circadence has worked with companies in every conceivable business environment and many government and defense-related institutions. Consequently, the company has closely tracked its customers’ use of virtualization, and in many cases, worked with them to solve many of the challenges in effectively utilizing virtualization products and virtualized assets. In 2006, Circadence delivered virtual WAN optimization products and support for Xen server and Oracle virtualization, as well as the industry’s only virtualized WAN optimization.

In April 2009, Circadence delivered the Circadence MVS™ 1300 Systems Management suite, a comprehensive platform for managing the performance and assets of virtual environments.

Central visibility and control

With the Circadence MVS 1300 Systems Management suite, companies have the ability to view and manage both the physical and virtual assets of their entire enterprise – whether in one location, across remote sites, or across the globe. By giving administrators a tool to finally view their entire environments, managing assets to improve performance, guaranteeing SLAs, and ensuring compliance are more feasible.

and cost-effective. In short, central management of virtual resources makes cloud computing possible for a greater number of enterprise businesses. Using the Circadence MVS 1300 Systems Management suite, administrators can view and manage the physical and virtual assets of servers, network connections, desktops, and handheld devices.

In addition, the Circadence MVS 1300 Systems Management suite is platform-agnostic, supporting VMware, Xen, Oracle, and Microsoft hypervisors. Both Windows workstations and server services are supported, and Circadence MVS offers support for a growing list of handheld computers and smartphone devices.

Strong security

The Circadence MVS platform uses Active Directory for assigning virtual asset permissions. Therefore, Active Directory rights secure virtual assets, regardless of where they reside in the cloud. Rogue virtual machines and non-compliant use of physical and virtual assets are eliminated. Since permission for the creation or cloning of virtual assets can also be assigned, Circadence MVS solutions can help prevent virtual sprawl. For the first time, virtual assets can be tied to uniform user and group policies.

Cloud computing on-demand

With the Circadence MVS 1300 Systems Management suite, enterprises can pool virtual resources for true cloud computing. Resources can be combined from across the enterprise from the central management interface, allowing companies to allocate resources when and where they are required. Because the Circadence MVS 1300 Systems Management suite is tied to Active Directory policies, users have access to only the resources allotted to them, ensuring that virtual and physical assets are secure. For example, as the workday ends at a company site in the U.K., resources can be reallocated to offices in the U.S. or reassigned to special projects at other global facilities. Utilizing Circadence’s superior built-in WAN optimization, these cloud computing environments do not sacrifice performance or suffer from network congestion.

Solution: Monitoring IP services in cloud environments

Because SLAs play an increasing role in the success of cloud computing, the Circadence MVR™ 1400 Route Analytics suite intelligently monitors service paths, detecting IP failures and instabilities not normally spotted by traditional network management tools. This enterprise-wide tool performs continuous mapping and monitoring of IP services to the underlying and changing network infrastructure, allowing rapid fault isolation and remediation before these problems cause wide-scale outages or network degradations. Circadence MVR, through its persistent and continuous path monitoring, is the only way to deliver true service-level assurances for cloud computing.

Circadence solutions for cloud computing

Circadence components can be mixed and matched to provide a complete security and optimization infrastructure for cloud computing without reconfiguring existing networks.
Because all components are modular, the system can adapt as business needs grow.

Circadence offers the following products:

- **Circadence MVO Software suite** – This software package supports Windows and Linux, and is portable to almost any POSIX-compliant operating system.
- **Circadence MVO Appliance** – This hardware solution not only centralizes Circadence MVO connections, but also ensures survivability during denial-of-service attacks. The Circadence MVO Appliance is DoD-certified for classified installations.
- **Virtual Circadence MVO** – This solution provides support for Oracle VM, VMware, Microsoft Virtual Server, Xen, and other virtualization solutions and can serve as a virtual gateway.
- **Circadence MVS 1300 Host** – Installed on each server with a minimal footprint, the server becomes a part of the network of resources.
- **Circadence MVS 1300 Manager** – This web-based interface module allows administrators to deploy and manage an unlimited number of virtual and physical machines from anywhere in the enterprise.
- **Circadence MVR 1400 Route Analytics suite** – This suite enables rapid, cost-effective isolation of service degradation not detected by traditional management tools. The Circadence MVR 1400 Route Analytics suite is essential for ensuring all cloud computing customers receive optimum performance and IP connectivity, especially where IP video and voice services are deployed.

Conclusion

The Circadence MVO 1200 WAN Optimization, Circadence MVS 1300 Systems Management, and Circadence MVR 1400 Route Analytics suites solve persistent problems in implementing effective cloud computing infrastructures. The Circadence MVO 1200 suite of products ensures resilient, high-performance WAN connections, while offering DoD-grade data security over public and private connections. The Circadence MVO platform is available as software for Oracle, Windows, POSIX-based systems, and many handheld and mobile devices, as well as stand-alone edge appliances. Circadence MVO solutions are easily integrated into existing network infrastructures.

The Circadence MVS platform provides universal management of virtual and physical machines within cloud computing environments, regardless of the native virtualization software. Circadence MVS solutions allow dynamic monitoring and control of the entire virtualization cloud and provide additional security through Active Directory permissions.

Finally, Circadence MVR solutions intelligently monitor, detect, and help correct routing instabilities and faulty configurations that affect quality of service within the entire cloud environment.

These suites of products, when coupled with high-performance, high-density switches and routers, create a highly reliable, secure, and dynamically configurable cloud computing infrastructure. Only when the issues of resilient performance, security, and central management are solved can cloud computing truly become a widespread and cost-effective platform for enterprise computing.

About Circadence
Since 1993, Circadence has leveraged the power of advanced technologies to pioneer smarter, faster, and more cost-effective solutions for improving IT performance. What started with an innovative platform for making massively multiplayer online games run faster has quickly grown into the most capable suite of optimization solutions available. Based in Boulder, Colorado, Circadence continues to expand today's possibilities with tomorrow's technologies – addressing new, growing concerns with dynamic, high-performance solutions. Only Circadence offers the most capable IT innovation solutions available – proven to outperform some of the world's most demanding challenges. For more information on Circadence, visit www.circadence.com.