



Is your load balancer cloud ready?

How NetScaler helps enterprises achieve
cloud computing benefits



Executive summary

Cloud computing is one of the emerging developments in IT service delivery. A recent survey by Gartner revealed that cloud computing rates as the second highest technology priority in 2010, behind only virtualization.¹ This is because cloud computing has the potential to reduce cost of ownership, improve responsiveness and agility, and ultimately transform IT by allowing leadership to focus on managing results rather than managing the underlying infrastructure.

However, cloud computing is also ill defined and comes with challenges, as expected with any new technology model. This has led to variation in the rate and extent to which organizations are pursuing cloud computing initiatives. While some enterprises are moving aggressively, most are taking more conservative routes. A major key to success is having an IT infrastructure that is cloud ready, that delivers a robust set of cloud-oriented capabilities and can support all cloud computing use cases.

This paper identifies the trends, technical characteristics and value propositions of cloud computing. It demonstrates how Citrix® NetScaler® enables enterprises and service providers to capitalize on cloud computing benefits. Specific strengths and capabilities of NetScaler include the ability to:

- Support any combination of public, private, and hybrid cloud computing configurations
- Support multi-tenant environments
- Consolidate, virtualize, migrate, dynamically scale, and otherwise manage and secure essential application delivery services
- Ensure enterprise SLAs through high availability and disaster recovery features

¹ Press release, "Gartner EXP Worldwide Survey of Nearly 1,600 CIOs Shows IT Budgets in 2010 to be at 2005 Levels," January 19, 2010

Cloud computing

Cloud computing defined

Cloud computing is technology that hosts computing services in centralized datacenters and provides access to them via the Internet. Cloud computing is very much a utility, like electricity: sold on demand, instantly scalable to any volume, and charged by use, with the service provider managing every aspect of the service except the device used to access it.

External clouds are computing services hosted by providers in very large datacenters that are offered to the general public. An internal cloud is a proprietary cloud for a limited number of people that provides internal computing services on demand via the Internet, but which may require servers, networks, and other infrastructure to host and provide the services.

Cloud computing has these functional and technical characteristics:

- Agility
- Applicability
- Responsiveness
- Manageability

Agility refers to the ability to adapt to change. This is achieved through:

- **Virtualized resources**, where the hard-coded links between hardware and software are eliminated, allowing the elements to be used in a highly efficient manner
- **Dynamic scalability**, where the amount of service can be adjusted upward or downward on demand

Applicability means being able to serve the widest possible use cases.

This is delivered by:

- **Multi-tenancy**, where one physical infrastructure can effectively be used to support multiple constituents
- **Wide accessibility**, providing services to all devices and connections
- **Broad technology support**, particularly for web services and Web 2.0

Responsiveness is concerned with the business and user experience.

It is achieved through:

- **Resilience**, where services are always on
- **Performance**, or having uniformly low response times

Manageability means the ability to have visibility and control over services and usage. This is enabled by:

- **Programmatic management interfaces** to facilitate integration and automation
- **Rich web management capabilities** that span all life cycle management functions
- **Self-service provisioning**



Why cloud computing matters

Public cloud computing offers businesses highly scalable, highly responsive web computing services without having to build the underlying infrastructure. Organizations realize lower startup costs, quicker time to value, the ability to pay only for what they use, and agility and investment protection since they can change directions without being tied to hardware and software investment costs.

The economies of scale achieved by sharing investments across multiple tenants, and how that sharing is accomplished brings additional benefits. The ability to scale up and down quickly through virtualization technology helps maximize infrastructure utilization, thereby lowering unit costs, as well as those passed on to the customer. Advanced features and capabilities are also more affordable. Cloud computing puts stronger security, superior performance, and high availability within reach for more organizations, not just the largest or best-funded ones.

Private or internal cloud computing delivers the same benefits as those listed above for public clouds, although it requires investment to build the underlying infrastructure.

Challenges shaping the course of cloud computing

Although cloud computing holds a tremendous amount of promise, it does present challenges, including:

- The security of sensitive data that is migrated to the cloud
- Regulatory compliance for cloud-based elements of an organization's IT operations
- The lack of mature tools for managing such elements, as well as hybrid configurations
- Efficient migration of applications from enterprise datacenters to the cloud
- A lack of interoperability and consistency between different cloud providers and services which could create a lock-in scenario, or complicate integration
- Reliability of cloud services, as well as vendor viability, especially given the relative immaturity of the market segment and many of its participants

These issues impact when and how organizations take advantage of cloud computing. The majority are pragmatically taking an evolutionary approach characterized by progressive, internal implementation of cloud computing principles augmented with tactical use of public cloud options to address a well defined subset of their computing requirements. When it comes to cloud computing, each organization is on its own path and timeline.

How NetScaler supports cloud computing

Citrix NetScaler application delivery controllers let enterprises embrace cloud computing at their own pace. NetScaler is a cloud-ready solution that delivers the necessary cloud requirements, whether organizations seek to unlock incremental gains, pursue a more rapid evolution to a fully dynamic datacenter and delivery of IT as a service in a private cloud, or use public cloud offerings.

Agility

NetScaler provides any size cloud the agility it needs through:

- **Layer 4 load balancing** – Increased resilience and scalability is achieved by enabling clustering of back-end application servers.
- **Layer 7 content switching** – The ability to distribute traffic based on application-layer data and attributes improves back-end utilization and scalability by allowing specialization of systems by function.
- **Global server load balancing (GSLB) spillover** – Application traffic can be redirected from an overloaded site or cloud to an alternate site based on configurable parameters, thereby facilitating cloud-bridging arrangements.
- **High object counts** – Unmatched entity scaling of the number of servers, virtual IP addresses, and individual services that can be assigned ensures that a single NetScaler instance can simultaneously support the delivery requirements of thousands of applications.
- **High SSL performance and offload** – NetScaler appliances can process over 200,000 SSL connections per second, and can be configured to effectively boost the capacity of back-end servers by relieving them of CPU-intensive cryptographic operations.
- **Pay-as-You-Grow** – This innovative pricing program eliminates the need for upgrades to expand capacity and functionality. Customers can buy only what they need today, and can easily scale up their network as demand grows with a simple software license upgrade. In particular, high-end NetScaler MPX platforms allow customers to seamlessly scale from 20 Gbps to 50 Gbps using the Pay-as-You-Grow option.
- **Dynamic provisioning** – Citrix® NetScaler® VPX, a full-featured virtual appliance version of NetScaler, facilitates dynamic provisioning of NetScaler instances to turn on new services or relocate existing ones—for instance to the cloud—and for delivering additional NetScaler capacity on demand.



Applicability

The Flex-tenancy model of NetScaler supports multi-tenant configurations common to both public and private cloud computing models by using both hardware and virtual NetScaler appliances to create a highly flexible and scalable web application delivery fabric. Being able to segment associated delivery services into a shared network services flex tier and an application-specific tenant tier—enabled by hardware and virtual appliances respectively—yields several advantages over traditional deployment techniques. These include: better isolation, security, and manageability; enhanced delivery and responsiveness; greater business-model flexibility; and reduced cost of infrastructure and operations².

Other complementary multi-tenant capabilities of NetScaler include:

- **Network-aware policies** – VLANs are the most common way to segment cloud computing networks into virtual private clouds to serve individual tenants. Network-aware policies provide segmentation and security to back-end resources (e.g., those associated with a given tenant) by restricting access based on attributes such as a user's VLAN, source IP, or MAC address.
- **Policy-based routing** – Similar in nature to the previous feature but operating in the opposite direction, policy-based routing ensures that server responses from NetScaler are routed to a specific virtual private cloud or VLAN.
- **Role-based administration** – Administration of policies, configurations, and applications can be locked down to individual tenants or administrators, providing security and separation while operating NetScaler as a shared resource.

NetScaler addresses accessibility and breadth of technology support through the following:

- **Citrix Access Gateway** – An embedded, full-featured SSL VPN helps ensure that users operating anywhere with virtually any type of device can gain secure access to all cloud computing services.
- **RADIUS load balancing** – This ensures that user authentication and accounting requests can be intelligently routed based upon RADIUS attributes in a way that maintains persistence to back-end servers for optimal service delivery. For example, NetScaler can use the user logon as a session ID and redirect all connections and records associated with that user session to the same servers.
- **IPv6 support** – As the global address shortage becomes increasingly critical, more organizations will be incorporating or transitioning to IPv6. NetScaler provides industry-leading IPv6 performance and support for mixed IPv4 – IPv6 environments.

² Citrix Systems white paper, "Architecting Scalable Multi-tenant Infrastructure with NetScaler VPX Virtual Appliances" http://www.citrix.com/%2Fsite%2Fresources%2Fdynamic%2Fsalesdocs%2FFlex_Tenancy_Multi_Tenancy.pdf

- **Web 2.0 routing** – High-performance and intelligent XML Xpath and JSON content switching optimizes the delivery of Web 2.0 applications. Advanced expressions can now operate on XML bodies as well as headers.
- **Web services security** – Web services are an integral part of the application and cloud computing landscape. Protection for web applications in general—and those based on web services in particular—is provided by an embedded application firewall with an extensive set of XML-centric and application-level security features.

Responsiveness

Many of the NetScaler capabilities applicable to resiliency have already been introduced, such as layer 4 load balancing, layer 7 content switching, and global server load balancing. These NetScaler features increase infrastructure resiliency by facilitating high-availability operations. Session persistence is also applicable in this regard, as are surge protection and priority queuing, NetScaler capabilities that ensure services remain responsive during periods of flash activity, such as those caused by high-profile events or denial-of-service attacks.

Enhanced application performance is delivered by NetScaler features including:

- **AppCache** – Caching is available for both static and dynamic content and, with the extensive capacity provided, up to 24 GB on current platforms, caching can be used to offload a greater number and variety of applications and content, such as video and multimedia from back-end servers.
- **AppCompress** – AppCompress reduces the amount of data that traverses the network, alleviating congestion, and accelerating transactions by several factors.
- **TCP optimization** – Techniques such as multiplexing, buffering, and window scaling significantly reduce application chattiness and the load placed on back-end servers, thereby shrinking application response times.



Manageability

The management functionality relevant to cloud computing begins with Citrix Command Center, which provides a secure web-based interface for administering hundreds of NetScaler instances whether they reside in one or more datacenters, across multiple clouds, or at numerous remote branch offices. Robust configuration and real-time performance monitoring capabilities support timely troubleshooting and routine adjustments, while consolidated logging and granular reporting can be used to facilitate the allocation of associated costs across multiple tenants—bringing enterprise SLAs to the cloud.

Application lifecycle management is another strength of NetScaler. Command Center and AppExpert templates, in conjunction with the availability of NetScaler VPX, provide a cost-effective and highly efficient way to take the network into account when conducting application development, testing, and staging processes. A full set of application delivery services can be made available to more accurately simulate production conditions, and NetScaler configurations can easily be imported, tracked, synchronized, and exported in support of this effort. These capabilities carry additional significance by facilitating the management and migration of applications as organizations transition from a traditional datacenter environment to a cloud computing model.

Other relevant manageability features include:

- **AppExpert Visualizer** – This tool simplifies monitoring and administration of the complex configurations that web applications and cloud computing require by providing a graphical view of the health status of the entities, service pools, and individual services that compose a NetScaler configuration and how these items relate to an organization’s applications and associated components. In addition, Network Visualizer provides a graphical and fully interactive view of how NetScaler is connected to the network, while GSLB Visualizer provides a domain level view of which systems are up/down and other statistics.
- **Fleet management** – Multiple NetScaler instances can be managed as a single, logical group, easing administration for high-capacity cloud services.
- **Web services monitoring** – Web services that form an integral component of cloud computing offerings can be monitored for performance, utilization, faults, and security violations.
- **XML/SOAP APIs** – Programmatic interfaces enable automation of NetScaler operations, as well as self-service provisioning, via integration with higher-order management and orchestration systems.

Conclusion

Cloud computing holds tremendous potential for transforming IT service delivery to significantly reduce cost of ownership and improve overall responsiveness and agility. However, related challenges, especially those pertaining to security, privacy, regulatory compliance, and interoperability are causing considerable variation in the extent to which different organizations are moving forward with cloud initiatives. IT departments should implement infrastructure solutions that are cloud ready. One such offering, the Citrix NetScaler line of application acceleration, load balancing, and web security appliances, helps establish a foundation that delivers many immediate gains and enables enterprises to accrue the benefits of cloud computing whenever and to whatever extent they decide to embrace it.



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About Citrix

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