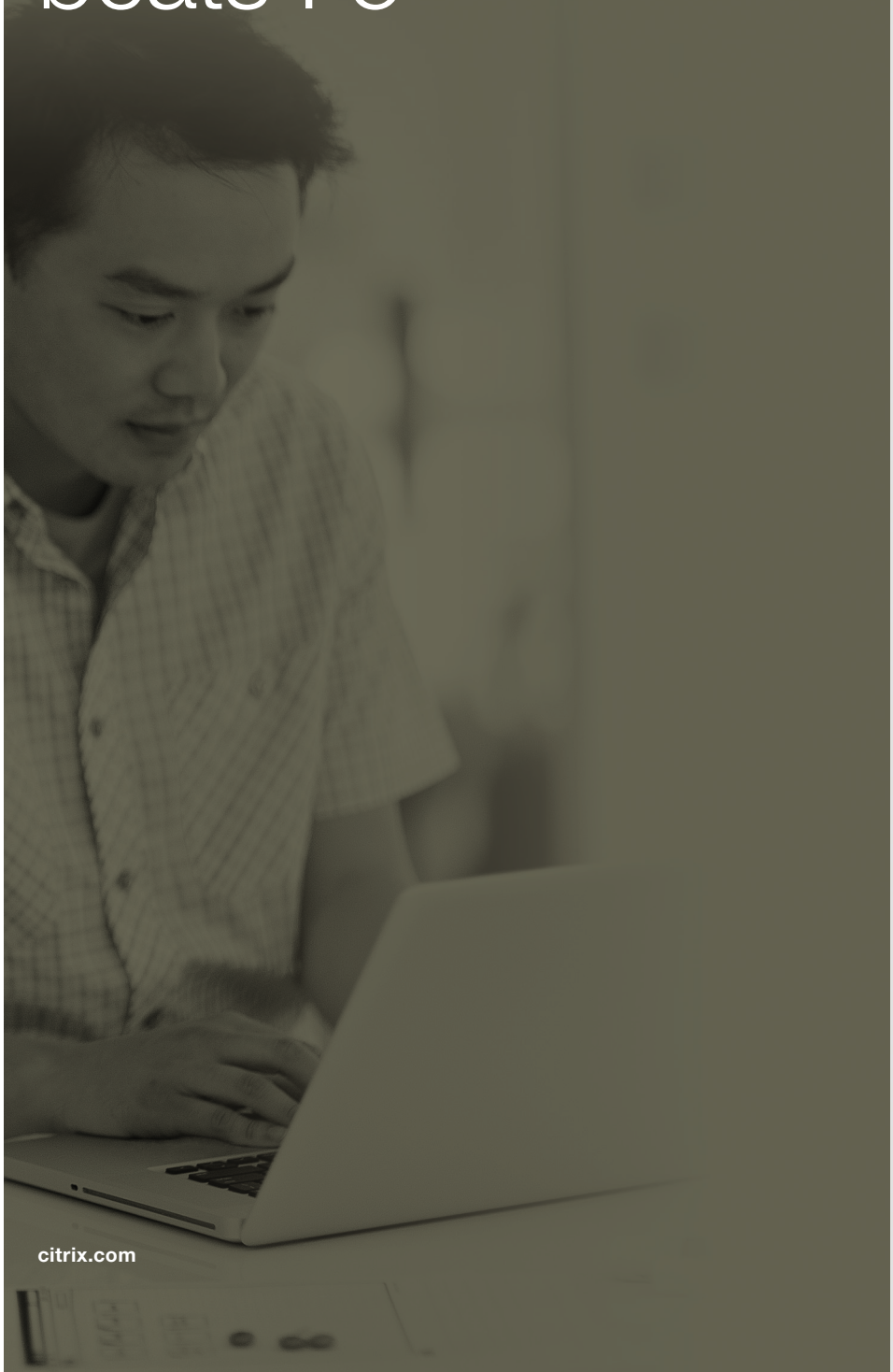
9 reasons why Citrix NetScaler beats F5



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Executive summary

Application delivery controllers (ADC) are one of the most critical elements of cloud infrastructures and enterprise data center architectures. ADCs strongly impact performance, scale and security of the entire application environment, so it is extremely important for IT leaders to choose the right one.

F5 Networks® has established a well-deserved reputation, not to mention a strong market presence, for providing high-quality, capable ADC solutions that meet classic enterprise requirements. A focus on addressing yesterday's application delivery challenges, however, has compromised F5's ability to meet emerging requirements for cloud infrastructures and cloud-ready enterprise networks.

Relied upon to power the world's largest enterprise data centers and cloud networks, Citrix NetScaler is universally recognized as an outstanding ADC. It is a highly integrated service delivery platform that accelerates application performance, provides 100% application availability, improves the efficiency of application and database servers and protects applications from attack. Available as a hardened network appliance, software-based virtual appliance or virtualized, multi-tenant solution, Citrix NetScaler has become the *ADC of choice* for leading cloud providers and enterprises across the globe.

Here are just 9 important areas where Citrix NetScaler beats F5 in making enterprise networks cloud ready.

Citrix TriScale Technology

Citrix TriScale Technology uniquely incorporates multiple complimentary methods for dynamically scaling application delivery infrastructure in response to changing conditions. Depending on an organization's specific needs at any given point in time, managers have the option to Scale Up, Scale Out, and/or Scale In.

Citrix TriScale

1. Pay-As-You-Grow elasticity to increase ADC capacity on demand
2. ADC consolidation solutions with higher density
3. Clustering technology for expanding appliance capacity up to 32x
4. Software-based virtual ADCs with 100% feature parity to hardware-based appliances
5. Innovative cloud bridging functionality for hybrid cloud environments
6. Open, standards based application visibility with AppFlow
7. SQL-intelligent load balancing of database servers to scale out the data tier
8. Simple, highly intuitive policy engine that doesn't require complex programming
9. 2x faster 2048-bit SSL performance

1. Scale Up with Citrix TriScale: Pay-As-You-Grow

IT managers are incorporating cloud capabilities into next-generation data center architectures. Central to this objective is adding elasticity to handle increasingly unpredictable application traffic loads, while meeting strict performance service level agreements (SLA). Traditional network over-provisioning is no longer sufficient. It's too expensive and too slow. Networks must have the inherent flexibility to quickly support unanticipated application demand. Otherwise, sudden surges will noticeably degrade application performance due to increased latency and dropped packets.

Recognizing this emerging need, Citrix created NetScaler Pay-As-You-Grow —a simple licensing model that provides on-demand elasticity, avoids costly hardware purchases and upgrades, and ensures that IT managers can quickly respond to changing traffic conditions. And, because it leverages a software-based architecture, NetScaler Pay-As-You-Grow enables data center managers to purchase an ADC solution optimally sized to meet current needs, while preserving the ability to scale up to support future capacity requirements— all without purchasing additional hardware.

In contrast, F5 BIG-IP network appliances that offer only fixed levels of performance and capacity cannot deliver the on-demand elasticity required by next-generation data centers. When traffic demands outstrip the capacity of the BIG-IP appliance, F5 customers are forced to completely discard their initial investment and undertake a forklift upgrade of the ADC infrastructure.

While F5 claims Pay-As-You-Grow flexibility with its VIPRION chassis-based systems, these devices fare no better. The hardware-centric approach inherent in the VIPRION architecture forces IT organizations to purchase new blades each time they need to scale performance. This results in substantial procurement and installation delays, unused capacity and unplanned network investments. Making matters worse, F5 VIPRION systems require expensive licenses to unlock full performance and to enable advanced features. These licenses are sold per chassis, significantly increasing initial acquisition costs and substantially diminishing potential financial benefits.

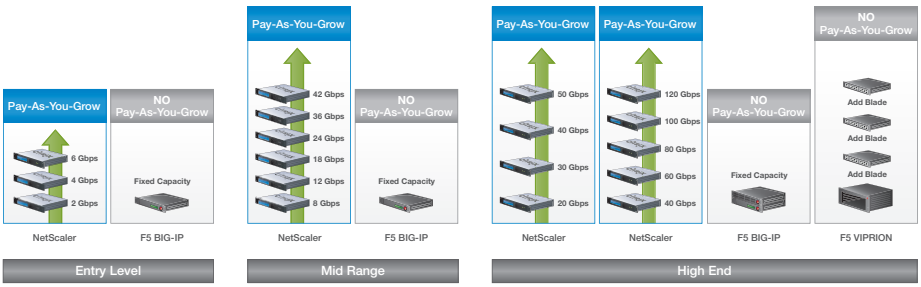

Figure 1: Citrix NetScaler delivers true Pay-As-You-Grow elasticity with no additional hardware

Lastly, F5's pure hardware-based approaches preclude the ability to temporarily increase capacity to accommodate short-lived traffic bursts. While Citrix supports temporary capacity increases with NetScaler Burst Pack licenses, F5 BIG-IP® and VIPRION devices force organizations to permanently add capacity, even when traffic loads may quickly subside and return to normal levels. The obvious mismatch between hardware-centric solutions and real-world enterprise requirements underscores the inability to build genuine elasticity with chassis-based systems.

2. Scale In with Citrix TriScale: better consolidation solution

While server and storage virtualization have become mainstream within modern data center designs, emerging virtual application delivery controllers (ADC) promise to extend the benefits of virtualization into the core of the networking infrastructure, enabling large-scale consolidation of separately deployed ADC appliances. Citrix NetScaler SDX service delivery platform offers a superior ADC consolidation platform as compared to F5 VIPRION® chassis-based systems that employ the company's virtual Cluster Multi-processing (vCMP) technology. These advantages span key deployment criteria, including:

- **ADC consolidation density** – Successful consolidation of ADCs requires a platform that not only absorbs the existing number of ADC devices in the network, but also has the headroom to handle future needs. Even with a fully populated VIPRION chassis, F5 vCMP customers are unable to consolidate more than 16 guests—compared with the 40 supported by NetScaler SDX, a critical 2.5x advantage for NetScaler customers.
- **ADC functionality** – NetScaler SDX provides 100% ADC feature parity to the popular Citrix NetScaler MPX network appliances, enabling NetScaler SDX to consolidate all ADC deployments. In contrast, F5's new vCMP technology, while providing basic consolidation capabilities, does not support the complete set of ADC functionality delivered on F5's BIG-IP hardware appliances. For example, a vCMP guest cannot support core capabilities, such as caching of dynamically generated web content. This limitation may prevent customers from consolidating existing ADC devices. At the very least, they may have to reduce their ADC policy to fit the resulting constraints of vCMP.
- **ADC isolation** – NetScaler SDX dedicates critical system resources, including memory, CPU and SSL processing, to individual NetScaler ADC instances, ensuring that resource demands made by one tenant do not negatively impact other tenants running on the same physical system. F5's vCMP technology, on the other hand, succeeds in isolating CPU and memory resources between guests, but does not allow SSL or compression processing to be assigned on a per guest basis. Consequently, a single vCMP guest can potentially 'starve out' adjacent tenants of SSL or compression resources—resulting in higher application latency or dropped sessions.
- **Pay-As-You-Grow** – All NetScaler SDX solutions support the popular Pay-As-You-Grow licensing model from Citrix, enabling customers to scale performance and capacity with a simple software key, and eliminating expensive hardware purchases and upgrades. F5 vCMP complicates ADC consolidation decisions by unnecessarily making system ADC density and performance interdependent. To add more vCMP guests, for example, F5 requires customers to purchase additional hardware blades—the same way they would buy more blades to increase aggregate performance.

	NetScaler SDX	F5 VIPRION with vCMP
ADC density (max instances per platform)	40	16
Basic system isolation (CPU and memory)	✓	✓
Isolation of core ADC processing (SSL acceleration and compression)	✓	Not supported
ADC functionality supported	All	Missing key capabilities (e.g. dynamic caching and SSL VPN)
Pay-As-You-Grow elasticity	✓	No (requires additional hardware purchase)

Table 1: Comparative summary of ADC consolidation solutions

3. Scale Out with Citrix TriScale: advanced clustering technology

Next-generation data center architectures must be able to seamlessly expand capacity to support new business requirements, such as the delivery of new, revenue-generating applications or services. This expansion must fully leverage existing ADC investments, and not require expensive forklift appliance upgrades. Citrix TriScale clustering enables IT managers to Scale Out their application delivery infrastructure by clustering as few as two NetScaler appliances, up to as many as 32 physical or virtual NetScaler appliances. Overall capacity can be increased incrementally—one appliance at a time—from a few Mbps to more than 3 Tbps—all without discarding existing infrastructure investments.

A true clustering solution must also be capable of replacing traditional HA redundancy pairs, while offering simple solutions for capacity expansion. Citrix NetScaler provides a functional, flexible, and cost effective approach to clustering—superior to F5 VIPRION chassis-based systems and BIG-IP appliances systems.

Capacity expansion via clustering

VIPRION systems offer clustering capabilities to scale out capacity by using multiple VIPRION blades together. Unfortunately, F5's hardware-based clustering technology imposes some serious restrictions. First, F5's VIPRION clustering is limited to just four blades, constraining overall scalability to 4x. When application traffic exceeds the capacity of a fully populated VIPRION chassis, F5 customers are forced to further segment their network to accommodate another chassis or BIG-IP appliance.

Additionally, F5's clustering technology does not permit blades from different VIPRION chassis systems to function within the same cluster, preventing network architects from tapping idle resources that may be available in other VIPRION systems, and impairing overall data center flexibility. Also, since F5

clustering is offered only within a single VIPRION chassis, and most customers demand at least two chassis systems to avoid a single point of failure, F5 customers have the added burden of reserving double the rack space and incurring additional upfront costs to safely realize clustering benefits.

In comparison, NetScaler clustering allows up to 32 appliances (physical or virtual) to be clustered together. These appliances can be added as required, without initial upfront investment, and designed to fully meet strict high availability requirements.

Scale Out beyond a single device

F5 aggressively touts their device service clustering (DSC) technology as providing "… true scale out of BIG-IP devices." The product reality, however, does not live up to the marketing claims. DSC does not fulfill the fundamental promise of ADC clustering—that is, to leverage multiple ADC appliances *simultaneously* in order to scale out capacity for a single application. True scale out demands that a single virtual IP (VIP) address be 'striped' across multiple appliances so that one application can benefit from the aggregate processing capabilities of multiple ADC devices. Support for a single VIP is also critical to preserve the end user transparency that has made ADC solutions so valuable in modern enterprise and Internet data centers.

F5's DSC technology does not allow a single IP address to be active on multiple BIG-IP appliances simultaneously. A single iApp configuration policy can be manually moved between BIG-IP appliances, but only one BIG-IP appliance at a time can actively host any one virtual IP.

NetScaler clustering, in contrast, has been engineered to enable customers to group multiple appliances together, and have these appliances work in concert to support one or more applications. Specifically, a single VIP can be seamlessly striped across multiple NetScaler appliances, while the entire NetScaler appliance cluster is managed via a single, unified policy.

4. Full featured virtual ADC

The unmistakable trend toward virtualization of networking infrastructure also provides the flexibility to support innovative data center architectures, including:

- **Flex tenancy** – This architecture uses both physical and virtual ADCs together in a two-tier arrangement. High capacity appliances can be deployed at the network edge to implement ADC functionality that spans applications, such as SSL processing and global load balancing, while software-based virtual appliances can be deployed within the data center core, per-application.
- **Application lifecycle** – Physical and virtual ADCs can also be used at different points in the application lifecycle. For example, application developers can take advantage of the lower cost and flexibility of software-based ADCs during application development. Then physical appliances can be used to implement the ADC policy once the application is in production.
- **ADC-as-a-Service** – Cloud providers and enterprise data center architects are supporting multiple tenants using shared IT resources for increased flexibility and elasticity. Rather than building out dedicated infrastructure 'stacks' with hardware-based ADC appliances for each tenant, a virtual appliance can be

rapidly provisioned as an infrastructure service on a per-tenant basis. ADC-as-a-Service becomes financially viable with subscription-based service provider pricing that avoids the costly upfront expense of perpetual, or permanent, ADC software licenses.

Supporting these new architectures requires a software-based virtual ADC with the following characteristics:

1. 100% feature parity with hardware-based ADCs
2. 3 Gbps+ performance to sustain demanding application workloads
3. Available with service provider license agreements (SPLA) for flexible subscription-based pricing

Understanding the leading virtual ADCs

F5 released their ADC virtual appliance, BIG-IP Virtual Edition, in 2010—a full year after the introduction of NetScaler VPX. While its initial inability to support multiple hypervisors has recently been remedied, BIG-IP Virtual Edition still imposes functionality constraints preventing it from supporting cloud-based data center designs.

Additionally, BIG-IP Virtual Edition can only support only one BIG-IP feature module at a time. For instance, customers cannot run F5's Global Traffic Module (G) and Application Security Module (ASM) at the same time—adding yet another dimension of constraints when attempting to use Virtual Edition.

Citrix NetScaler VPX was released in 2009, and has always maintained 100% feature parity with physical NetScaler MPX appliance solutions. With full ADC feature capability enabling customers to transparently switch between physical and virtual form factors, NetScaler supports important use cases that are inaccessible to F5 customers. For example, NetScaler appliances and NetScaler VPX instances can be deployed together to support flex tenancy. They can also be deployed at different stages throughout the application lifecycle, enabling ADC policies developed during development on NetScaler VPX to be seamlessly promoted to NetScaler MPX appliances for testing, staging and production.

NetScaler VPX has become the *de facto* standard for virtual ADC appliances used by both public and private clouds. Besides full support for advanced use cases, NetScaler VPX also delivers three Gbps performance, and can be seamlessly managed by popular virtualization management frameworks, including Citrix XenCenter, Microsoft® System Center and VMware® Vcenter™.

5. CloudBridge for hybrid clouds

As the industry moves rapidly from the 'PC era' to the 'cloud era,' IT organizations are increasingly taking advantage of the agility, elasticity and economics of cloud computing. Some are relying heavily on public cloud services, while others are leveraging virtualization and innovative orchestration technologies to build private clouds within the boundaries of the traditional enterprise data center. Regardless of which approach is chosen, enterprise IT organizations need to design their

data centers to meet the flexibility requirements of the cloud era. ADCs are a fundamental building block of the modern data center and must enable—rather than hinder—this important transition.

NetScaler solutions are designed for advanced cloud environments, enabling IT organizations to leverage an existing data center footprint to easily extend and expand the capabilities of their enterprise data center. In contrast, F5 BIG-IP and VIPRION devices remain focused on the challenges of the past, and fall short in providing requisite functionality to fully embrace cloud computing.

For example, while F5's WAN Optimization Module (WOM) includes the company's iSession feature that establishes secure tunnels between two locations, it suffers from at least one notable limitation. It falls short in providing the network-layer transparency necessary for seamlessly extending enterprise networks into cloud infrastructures. CloudBridge is a leading example of a cloud enabling technology that F5 has failed to incorporate into their ADC product line.

Extending the enterprise data center into the cloud with NetScaler CloudBridge

Enterprise organizations are using hybrid clouds to keep data and sensitive application components within the confines of the private cloud and take advantage of the public cloud to scale services and applications on-demand. In building an optimized hybrid cloud, enterprises encounter the fundamental problem of how to extend their data center network to a public cloud infrastructure, seamlessly and without compromising security or performance.

Citrix addresses this challenge with NetScaler CloudBridge, making cloud-hosted applications appear as though they are running on one contiguous enterprise network. CloudBridge makes the enterprise ready for hybrid clouds by providing:

- **Seamless Network** – Network bridging makes the external cloud infrastructure a natural extension of the enterprise's network, overcoming IP addressing and routing challenges.
- **Secured Tunnel** – IPSec security ensures that data remains secure as it traverses network links between the enterprise and the cloud. This enables application workloads to run in an external cloud environment, while confidential data remains in the enterprise data center.
- **Optimized Access** – TCP optimization, compression and data de-duplication minimize WAN-induced performance degradation between enterprise data centers and the Cloud.
- **User Transparency** – Global server load balancing gives end-users a single, consistent path to their applications no matter which enterprise or Cloud data center happens to be hosting the application.

Regardless of which type of Cloud environment is constructed or used, ADCs must be ready to handle the new requirements of the cloud era. ADCs that lack these essential capabilities do not enable IT organizations to be truly Cloud ready

6. Open standards-based application visibility

Application managers need deep visibility into the performance and behavior of their business-critical applications in order to ensure optimal delivery. Unlocking the application-layer data to deliver this degree of visibility, and enabling this within both enterprise data centers and cloud environments, requires:

- Eliminating intrusive network taps, which have historically been required to access critical application flows. Alternatively, the ADC itself can be employed as a universal tap—one that is uniquely situated in the data path so that it can inspect end-to-end traffic at very high speed.
- The ability to export collected application data in an open, standardized format so that it can be easily consumed by third-party performance monitoring and analytics solutions. Further, this performance data can then be correlated with information from other devices in the application infrastructure to gain more insight into how the entire infrastructure is performing.

Unfortunately, F5's iApp Analytics fails to meet either of these straightforward requirements. iApp Analytics is a completely proprietary performance monitoring and reporting feature that does not permit customers to export data in standardized formats or schema. Additionally, it prevents customers from using existing performance monitoring and business analysis solutions to get at the root of performance issues. F5 customers are forced to deploy yet another single-vendor, proprietary solution.

Citrix has taken a completely different approach with AppFlow, an open industry standard. With AppFlow, organizations can use their ADC footprint as a full application tap, and leverage existing performance monitoring tools such as SolarWinds and analytics tools such as Splunk. By providing a standards-based approach, along with broad industry partner support, AppFlow eliminates networking expertise as the admission price to gain improved business intelligence, and provides enhanced application visibility in both enterprise and cloud infrastructures.

The entire NetScaler product family natively supports AppFlow, enabling unprecedented application visibility within next-generation service delivery infrastructures with no additional investment. By providing out-of-the-box application visibility, NetScaler helps to:

- Quickly identify application response times that exceed SLAs
- Determine whether changes in the infrastructure have slowed application performance
- Immediately identify aborted customer transactions
- Automatically identify sources of performance degradation in the infrastructure

7. SQL fluent database load balancing

Advanced ADCs are extending their load balancing prowess beyond the application and web tiers, adding protocol-aware support for the data tier. Load balancing of database servers enables database administrators to 'scale out' their database infrastructure by using SQL-intelligent load balancing and content switching capabilities so that database servers can be easily added to an existing pool and smartly direct database queries to the right server. This provides a simple and cost effective alternative to expensive and complex database clustering solutions. They can also 'scale up' the data tier by offloading SQL connection management tasks from database servers through multiplexing and advanced connection pooling.

Meaningful database load balancing requires deep knowledge of database protocols. It is not as simple as deploying a TCP-based ADC to load balance SQL database servers. F5, for example, cannot intelligently manage or load balance database traffic since its BIG-IP devices lack the requisite ability to understand SQL-based traffic flows and make routing decisions based on SQL-specific commands and syntax. Unlike

NetScaler, F5 solutions cannot:

- Terminate native SQL connections between clients and servers
- Multiplex SQL connections to back-end database servers for greater scale up capabilities
- Content switch SQL streams based upon action, including "select," "drop," "insert," "update" and other SQL statements for intelligent scale out architectures
- Monitor the health of database servers with SQL-specific heath checks

The absence of essential SQL-based intelligence has not stopped F5, however, from marketing a database load balancing solution that uses rudimentary TCP-level load balancing algorithms and health checks. Even a cursory review of this approach reveals fundamental flaws. Without SQL fluency, customers cannot adequately scale out or scale up the database infrastructure.

Citrix NetScaler addresses the challenge directly with a native SQL data load balancing technology called DataStream. With this new innovation, Citrix NetScaler is the first ADC that extends the benefits of scalability, availability and security for the web tier to the data tier. NetScaler offers native data format, protocol and transaction support for scaling database infrastructures. Microsoft SQL (MS-SQL) and Oracle MySQL protocols are natively parsed and interpreted in NetScaler's high-speed processing engine, making the entire advanced policy framework available to act on data connections and transactions.

By applying proven application-layer acceleration technologies to SQL, NetScaler is able to improve scalability and performance at the data tier with intelligent SQL load balancing and content switching, SQL connection multiplexing, and SQL health monitoring.

8. Intuitive policy engine with no programming requirement

ADC administrators need to focus their efforts on application delivery, not programming. They require simple yet powerful tools that allow them to quickly deploy and update ADC policies, ensuring optimized application delivery that meets the needs of the business. Complexity and programming often lead to errors, and just one mistake can lead to security vulnerabilities, performance issues and downtime. Instead, ADC management tools should be intuitive, easy to use and not require programming skills.

F5 compels BIG-IP and VIPRION customers to develop script-based iRules for even commonly used content switching and load balancing policies. This introduces a steep learning curve for administrators who are not familiar with iRules or adept at writing TCL code. While F5 touts the flexibility of a programmatic approach to defining policies on an ADC, the reality is customers must adapt their policy definition and management processes to fit the F5 iRules model.

The mandated use of iRules forces administrators to write custom TCL-based scripts that can quickly become complex and unwieldy to manage. Minimal iRules competency requires in-depth understanding of not only programming constructs such as variables and arrays, but also of F5-specific APIs and syntax. Administrators end up spending much of their time sorting out programming infrastructure, deducting from the time spent focusing on the applications and meeting business needs. Further, F5's new iApp Templates do not remediate the complexity issue. This new tool simply adds a veneer to the iRules engine, but still requires customers to delve into TCL scripts nearly every time they want to make a policy change.

NetScaler takes a far simpler approach with declarative policy expression. The NetScaler AppExpert Visual Policy Builder abstracts NetScaler's underlying policy framework infrastructure—including the object model, APIs and language syntax—away from administrators. This way administrators are freed to focus on quickly optimizing straightforward application delivery policies (e.g., "I want to compress this", "I need to cache this") to get the best out of the organization's applications.

9. 2x faster 2048-bit SSL performance

With unabated increases in ecommerce traffic and continued growth in the transmission of personal information over the Internet, SSL is no longer a 'nice to have' capability, it is an absolute necessity. The requirement to protect information is further heightened by the universal availability of easy-to-use hacking tools, such as Firesheep. This has prompted application owners to adopt an SSL Everywhere posture, such that they encrypt not only the sensitive components of the application (e.g. login page), but the entire application 'surface area.'

In addition to simply using SSL to secure application traffic, the strength of encryption is also critical. Any application using SSL should migrate from the *de facto* standard of 1024-bit SSL key strength to 2048-bit (or larger) key sizes. Doubling key strength from 1024-bit to 2048-bit offers an exponential increase in protection, but requires 5x more processing power to handle the same number of SSL transactions per second.

Citrix NetScaler MPX and SDX appliances incorporate the most advanced SSL acceleration and offload technologies to handle the increased processing imposed by the use of 2048-bit keys. Due to important architectural and design differences, NetScaler dramatically outperforms equivalent F5 solutions across the most critical performance metrics, namely SSL transactions per sec.

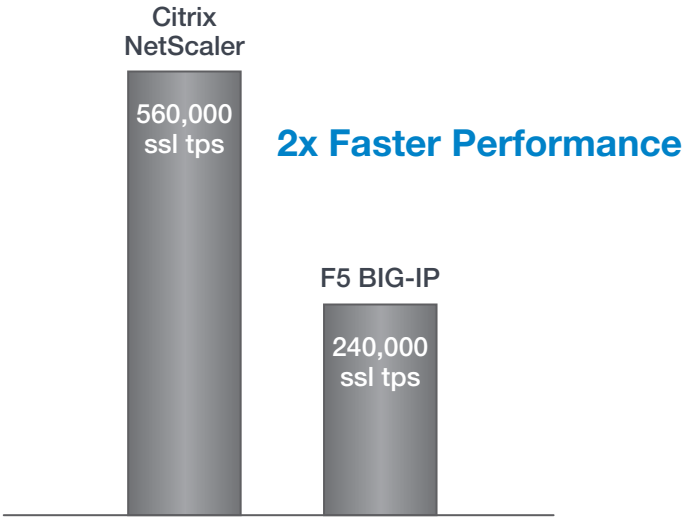

Figure 2: NetScaler offers faster 2048-bit SSL Performance than F5

While many ADC vendors integrate similar or equivalent SSL acceleration technology, Citrix NetScaler software is performance optimized for 2048-bit key lengths. These optimizations include:

- **Intelligent load balancing of SSL** – SSL sessions are load balanced across the set of integrated SSL acceleration chips to provide the best processing performance and lowest latency
- **Multiple queues** – Multiple SSL operations can be queued per chip to optimize utilization of a chip's processing capabilities
- **SSL resource isolation** – In a multi-tenant ADC deployment, each tenant is assigned dedicated SSL resources, preventing one ADC instance from consuming a disproportionate processing capacity and, thus, degrading the performance of other tenants

Conclusion

ADCs strongly impact performance, scale and security of the entire application environment, so it is extremely important to choose the right one. F5 has gained a strong market presence with capable ADC solutions that meet classic enterprise requirements. At the same time, however, F5 has failed to keep pace with the emerging set of requirements to enable cloud infrastructures and cloud-ready enterprise networks.

Here are just nine important areas where Citrix NetScaler beats F5 BIG-IP and VIPRION devices in making enterprise networks cloud ready.

A new, innovative scaling technology powering all NetScaler application and service delivery capabilities, **Citrix TriScale Technology**:

Citrix TriScale

1. Pay-As-You-Grow elasticity to increase ADC capacity on demand
2. ADC consolidation solutions with higher density and a more functional architecture
3. Clustering technology for expanding appliance capacity up to 32x
4. Software-based virtual ADCs with 100% feature parity to hardware-based appliances
5. Innovative cloud bridging functionality for hybrid cloud environments
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