Ensure the Secure, Reliable Delivery of Applications to Any User, Over Any Network

How the Citrix Workspace Delivery Platform improves the XenApp and XenDesktop experience for users and administrators

Application and desktop virtualization have dramatically improved end-user productivity and data security. They have also simplified the work of IT administrators and decreased overall computing costs.

Yet a number of developments in business and technology have the potential to undermine these gains. For example:

- New types of applications and mobile devices have led many enterprises to implement multiple remote access solutions. Multiple solutions are expensive to buy and manage, and confuse users with inconsistent login procedures.
- Bandwidth-hungry applications are taxing network capacity. They also create surges in traffic that degrade application quality and increase network costs. These trends will worsen with the increasing use of voice over IP (VoIP), video streaming and video conferencing, virtual applications and desktops, and cloud-based applications.
- The proliferation of networking protocols and products has made it almost impossible to obtain end-to-end visibility of application traffic. Without end-to-end visibility, it is extremely difficult to troubleshoot performance problems or plan for future network capacity.

Proponents of application and desktop virtualization need to overcome these challenges in order to protect and extend the gains they have made in simplifying the end-user experience, increasing the reliability of application performance, strengthening security, and improving management of IT resources.

Citrix offers Workspace Delivery Platform (WDP) solution to address exactly these challenges. WDP brings together the capabilities of application delivery controllers (ADCs), software-driven WAN virtualization, and unified management of application and network resources. The goal of WDP is to enable the secure, reliable, cost-effective delivery of applications to any user, over any network.

This white paper provides a brief overview of the WDP solution and how it addresses three specific challenges:

- Simplifying the end-user experience and enhancing security.
- Improving application performance and quality.
- Providing end-to-end application visibility.

What is the Workspace Delivery Platform?

The Workspace Delivery Platform (WDP) is a comprehensive set of networking platforms from Citrix that secures and optimizes workspace delivery to end users from enterprise datacenters and cloud platforms, while providing compliance, high availability, and simplified access.

WDP lowers the cost of enterprise application delivery, including SaaS-based applications, over all types of networks, for all users, without sacrificing visibility. To ensure a consistent end-user experience, it gives IT the ability to proactively manage application health and performance with end-to-end application and network-level visibility from a single console.

By leveraging Citrix's unique visibility into the ICA protocol, WDP provides the best experience for XenApp and XenDesktop users, whether they are mobile, in a large corporate office, or in a branch.

WDP enables IT organizations to:

- Gain end-to-end visibility of XenApp and XenDesktop traffic to quickly resolve issues
- Secure applications, desktops and data by using NetScaler with Unified Gateway adaptive access control polices to dynamically adjust user access
- Boost performance and improve the experience of mobile and branch users by accelerating XenApp and XenDesktop
- Maximize reliability and resiliency and provide 100% availability of mission-critical apps
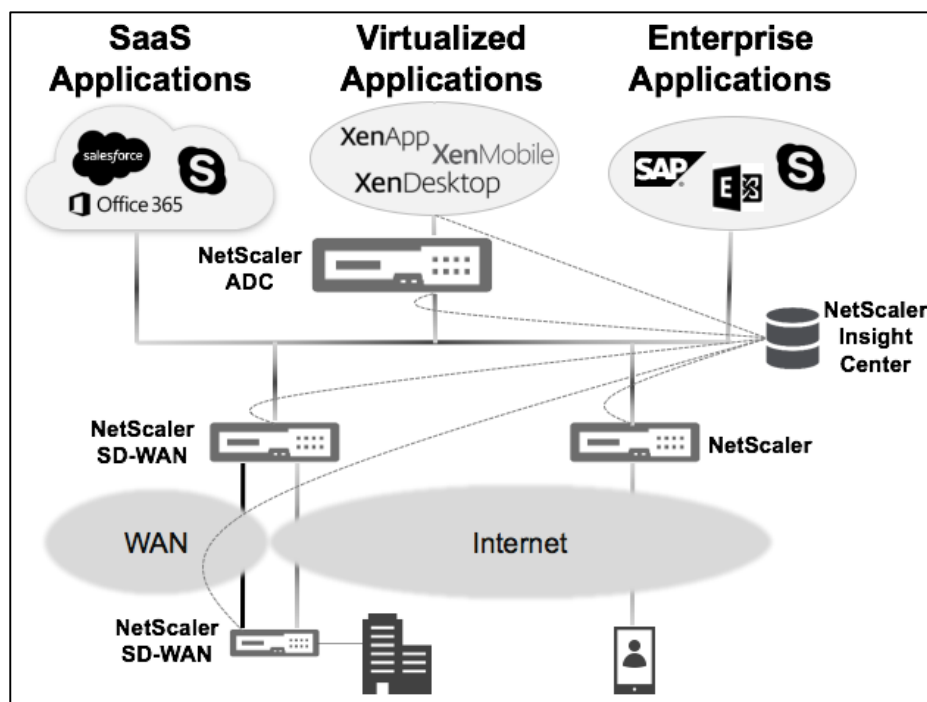

Figure 1: Components of the Workspace Delivery Platform

WDP encompasses several key networking products and services from Citrix. As shown in Figure 1, these include the NetScaler ADC (application delivery controller) appliance, NetScaler with Unified Gateway, the NetScaler SD-WAN (formerly CloudBridge) appliance, and NetScaler Insight Center.

NetScaler ADC

NetScaler ADC is an industry-leading application delivery controller that sits in front of application or web servers in corporate data centers and cloud environments. It improves the resiliency, performance and security of enterprise applications, SaaS applications, and virtualized applications such as XenApp, XenDesktop and XenMobile. Form factors include appliances for the data center, and cloud-ready virtual appliances for data centers and cloud environments such as Amazon Web Services (AWS) and Microsoft Azure.

NetScaler ADC performs server load balancing. This increases application resiliency and performance by distributing traffic evenly across clusters of servers, by monitoring the health of servers, and by providing seamless failover when a server goes down. NetScaler ADC can redirect traffic to servers located in entirely different data centers and in the cloud. It even has the ability to balance queries and updates across SQL databases.

NetScaler ADC improves security by managing advanced authentication techniques during logins, by detecting and blocking SQL injection, cross-site scripting and other network-based attacks, and by implementing rate-limiting measures to protect servers against distributed denial of service (DDoS) attacks.

In addition, NetScaler ADC improves application performance by compressing and caching network traffic and offloading tasks from servers and network devices (discussed in the Improving Application Performance and Quality section, below).

NetScaler with Unified Gateway

NetScaler with Unified Gateway provides secure remote access to any application anywhere, in the datacenter or in a cloud, from devices including laptops, desktops, thin clients, tablets and smart phones. It mediates between users on the Internet and business applications including web and enterprise applications, SaaS applications, mobile applications and virtualized applications. It is available in the form of hardware and cloud-ready virtual appliances.

By providing simple, secure access from all types of remote devices to any application through a single infrastructure, NetScaler with Unified Gateway provides consolidation of remote access infrastructure thereby reducing administrative costs and total cost of ownership, while improving the user experience (discussed in the Simplifying the End User Experience and Enhancing Security section, below).

NetScaler SD-WAN

NetScaler SD-WAN (formerly CloudBridge Virtual WAN) allows enterprises to cost-effectively scale bandwidth and to increase the performance and reliability of wide area networks between corporate offices, branch offices, and cloud environments. It logically binds multiple MPLS, broadband, 4G/LTE and satellite connections into a single virtual link, and dynamically routes traffic for high-priority applications across the available path with the highest performance and best quality. It is available as physical and virtual appliances and as a web-based service for AWS environments.

NetScaler SD-WAN reduces costs by allowing enterprises to increase WAN capacity with low-cost broadband connections instead of expensive MPLS circuits. It also ensures excellent performance for high-priority applications such as XenApp and XenDesktop, even when MPLS or broadband connections fail (discussed in the Improving Application Performance and Quality section, below).

NetScaler Insight Center

NetScaler Insight Center is a powerful tool that provides end-to-end visibility for any type of application. NetScaler Insight Center leverages NetScaler and NetScaler SD-WAN appliances to capture per-flow application-layer data for multiple protocols, including ICA as well as TCP and HTTP. It is both network and application-aware. NetScaler Insight also provides "big data" analytics tools to transform large volumes of raw data into actionable information about individual applications and application users.

NetScaler Insight Center allows administrators to use a single console to:

- Troubleshoot performance and quality issues raised by users.
- Manage performance proactively by identifying and resolving performance issues before they are perceptible to users.
- Perform capacity planning to ensure that resources are in place as networking and appliance demands grow.

Simplifying the End-User Experience and Enhancing Security

One of the key objectives of WDP is to make the end-user experience as simple and uniform as possible for finding and accessing virtual applications and desktops across all devices, in every type of location, across all types of network. Another objective is to enhance security without complicating life for end users.

One URL for Remote Access from Any Device to Any Application

In addition to delivering XenApp and XenDesktop, NetScaler with Unified Gateway also provides remote access to all enterprise, web and SaaS applications. With the One URL feature, end users can access any application they are authorized for, through a single application portal.

Some of the key features of NetScaler with Unified Gateway include:

- **One URL** to provide remote access to all virtual applications and desktops managed by XenApp, XenDesktop and XenMobile, and also to enterprise, web, SaaS and mobile applications.
- **Access from any device**, with the same look and feel and the same access processes, including advanced multi-factor AAA (authentication, authorization and auditing).
- **Customized application portal pages** that display in one place all the resources available to a group of users.
- **Federated single sign-on (SSO)** across Citrix, web and SaaS applications using SAML 2.0
- **Transparent download of client software and configuration settings** upon initial connection.
- **Seamless restoration of active sessions** when connectivity is "patchy" or users change devices.
- **Granular, adaptive access control** through the SmartAccess and SmartControl technologies.

Adaptive Access with SmartAccess and SmartControl

The SmartAccess and SmartControl technologies provide a flexible way to balance user convenience against risk. IT can calibrate login challenges by adjusting the amount of access offered based on attributes such as a person's role or location, the device type, and the sensitivity of the resource being requested. Administrators can make access extremely simple when conditions are appropriate, or more difficult when risks are higher. For example, an employee in a corporate office might be able to authenticate with only a password, while a remote user requesting access from an unknown device might need to use two-factor authentication or answer special challenge questions.

By making access simpler and more consistent across applications, devices and environments, NetScaler with Unified Gateway:

- Increases end-user satisfaction and acceptance.
- Lowers help desk and support costs.
- Improves security by raising the bar for access requests with high-risk characteristics while simplifying authentication for users in low-risk environments.

NetScaler with Unified Gateway also provides a mechanism to create and distribute access control policies, including sophisticated adaptive access control policies, to NetScaler appliances throughout the enterprise. SmartControl facilitates centralized policy management that:

- Greatly increases the productivity of administrators.
- Improves end-user satisfaction by ensuring a consistent set of access rules across all devices and locations.

- Enhances security by strengthening access control at the edge of network, and by reducing the opportunity for human error in distributing and applying access policies.

Improving Application Performance and Quality

Of course, the end-user experience also reflects application performance and quality. That is particularly true for virtual applications and desktops accessed from branch offices and remote locations. The challenge is to maintain or improve application performance and quality in the face of growing bandwidth requirements, increasingly complex network infrastructures, and tight budget constraints.

NetScaler ADC and Performance

The NetScaler ADC is proven to improve application performance through load balancing, TCP compression, content caching, and protocol-level optimization for TCP and ICA. NetScaler also improves application performance by reducing loads on networks and servers by decrypting SSL/TLS traffic before it reaches the server. Features to speed up the delivery of web pages to mobile devices include converting large GIF files into efficient PNG formats and compressing scripts and cascading style sheet (CSS) files.

NetScaler SD-WAN and WAN Virtualization

The NetScaler SD-WAN (formerly CloudBridge) component of WDP brings to the table additional capabilities for strengthening application performance, geared especially to XenApp and XenDesktop. Performance-enhancing features include adaptive TCP flow control, fine-grained quality of service controls, and video compression and caching. Performance is also improved by adaptive compression based on an intimate knowledge of ICA and of network traffic related to mouse movements, keyboard entries and screen updates.

But the newest and most exciting advances related to application performance and quality are WAN virtualization features provided by NetScaler SD-WAN appliances. These bind multiple MPLS, broadband, 4G/LTE and satellite connections into a single virtual link.

Key capabilities of NetScaler SD-WAN include:

- **Latency-aware forwarding**: When an application session is initiated, its network traffic is assigned to the highest-quality and lowest latency (best-performing) path or paths available.
- **Fast failover**: If a network segment experiences a brownout or blackout, traffic for high-priority applications (like XenApp and XenDesktop) is shifted to the best remaining WAN path within milliseconds, so that users don't perceive any interruption.
- **Prioritization and quality of service**: To ensure that the most important applications receive the highest quality of service (QoS), even compared to other high-priority applications, administrators can create custom rules to adjust relative priority based on factors like source and destination IP address, IP protocol, and source and destination ports.
- **Packet duplication**: For critical applications, NetScaler SD-WAN can send duplicate copies of every packet in a session along two independent paths, minimizing latency and eliminating packet loss.
- **Cost-effective scaling and lower network costs**: Enterprises can expand their WAN capacity by adding cost-effective, flexible broadband connections instead of expensive MPLS circuits.

NetScaler SD-WAN appliances also reduce the workload of administrators through "software-defined networking." By continuously tracking the health and performance of WAN links, and by dynamically routing traffic across the best available links in order of priority, they automate tasks that previously required extensive manual configuration and tuning.

And to keep the CFO happy, NetScaler SD-WAN technology can reduce the recurring costs of WAN bandwidth up to 80% by replacing MPLS circuits with more economical Internet access services.

End-to-End Application Visibility

A final key advantage of the WDP solution is its ability to provide end-to-end application and network visibility, which helps IT proactively troubleshoot issues and maximize the availability of resources.

NetScaler Insight Center and Application Visibility

NetScaler is the only product that offers complete end-to-end visibility for XenApp and XenDesktop environments. For XenApp and XenDesktop specific environments, it offers two components:

- HDX Insight, which delivers data analytics for XenApp and XenDesktop traffic flowing through NetScaler or NetScaler SD-WAN appliances.
- WAN Insight, which delivers data analytics for both accelerated and unaccelerated traffic flowing through NetScaler SD-WAN appliances.

With HDX Insight, NetScaler is uniquely able to parse, decrypt, decompress and decompose ICA packets, even at the level of individual virtual channels, to provide in-depth visibility into network traffic that uses the ICA protocol, a standard used by Citrix applications.

That gives enterprises unparalleled visibility into XenApp and XenDesktop traffic. It allows administrators to answer very detailed questions down to the level of specific users and applications, for example:

- What is the average client and server-side latency experienced by a given XenDesktop user?
- Which XenApp users consumed the most bandwidth yesterday?
- Which virtual channels consumed the most bandwidth last week?
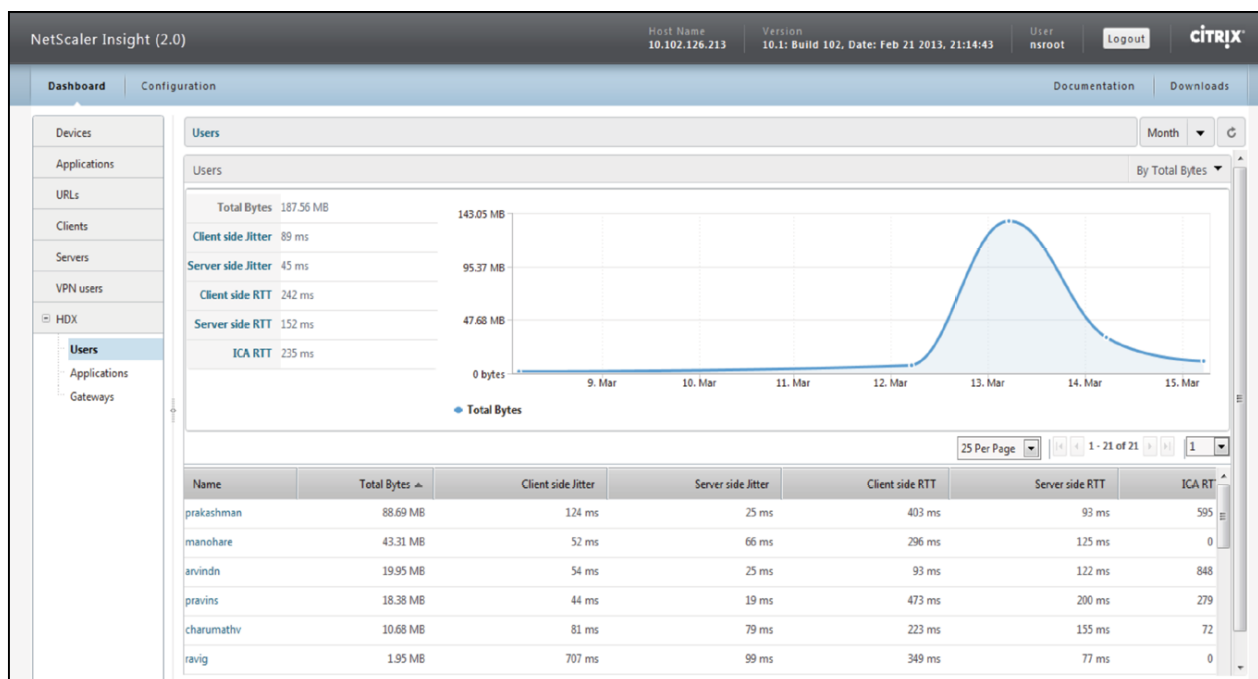- What applications had the most up-time across all XenApp users last month?

Figure 2: NetScaler Insight Center provides end-to-end visibility down to the level of individual applications and users

HDX Insight includes a management suite for monitoring, analyzing and reporting application performance metrics and related data. It gives IT administrators information on user device and network issues in branch offices. For example, it can identify users experiencing issues related to a specific published application, as well as users affected by excessive latency, by too many current users coming in via a particular NetScaler instance, or by a faulty network segment. In short, HDX Insight allows IT administrators to deliver a compelling user experience by analyzing HDX data and performing business intelligence, failure analysis, and capacity planning for the networks.

The WAN Insight component of NetScaler Insight Center gives administrators an easy way to monitor accelerated and unaccelerated WAN traffic flowing through NetScaler SD-WAN datacenter and NetScaler SD-WAN branch appliances. It provides end-to-end visibility with client-specific data, application-specific data, and branch-specific data. WAN Insight gives administrators the ability to deal effectively with issues that degrade performance, because they can identify and monitor all the applications, clients and branches on the network.

Conclusion

You are not alone in confronting the challenges of more devices and applications, exploding bandwidth requirements, and a lack of tools for end-to-end visibility and management. Citrix is dedicated to continually improving application and desktop virtualization for end users, for administrators, and for IT managers. The WDP solution represents a major milestone in Citrix's progress.

This paper has outlined just a few of the ways that WDP can help your organization:

- Simplify the end-user experience by providing always-on access from all types of devices to all authorized applications from a single portal (through One URL), as well as single sign-on, adaptive authentication, other ease-of-use features.
- Improve application performance and quality through proven application and WAN optimization techniques, as well as new WAN virtualization capabilities that provide unique path selection, quality of service and failover features.
- Leverage end-to-end application and network visibility to troubleshoot problems and ensure high performance.

These are only a sampling of the features and advantages of the Workspace Delivery Platform, so please explore the resources listed below.

For more information, please visit:

https://www.citrix.com/products/netscaler-gateway/overview.html

https://www.citrix.com/products/cloudbridge/overview.html

Additional Resources

NetScaler with Unified Gateway

- NetScaler with Unified Gateway Product Overview - https://www.citrix.com/content/dam/citrix/en_us/documents/products-solutions/netscaler-with-unified-gateway.pdf
- Consolidate your Secure Remote Access Delivery Infrastructure with One URL - https://www.citrix.com/content/dam/citrix/en_us/documents/products-solutions/consolidate-your-secure-remote-access-delivery-infrastructure-with-one-url.pdf
- Putting the "Secure" in Secure Remote Access - https://www.citrix.com/content/dam/citrix/en_us/documents/products-solutions/putting-the-secure-in-secure-remote-access.pdf

NetScaler SD-WAN

- Citrix CloudBridge Product Overview - https://www.citrix.com/content/dam/citrix/en_us/documents/products-solutions/cloudbridge-product-overview.pdf
- WAN virtualization with CloudBridge - https://www.citrix.com/content/dam/citrix/en_us/documents/products-solutions/wan-virtualization-with-citrix-cloudbridge.pdf
- Improve the XenApp or XenDesktop experience for branch and mobile workers with CloudBridge - https://www.citrix.com/content/dam/citrix/en_us/documents/products-solutions/improve-the-xendesktop-experience-for-branch-and-mobile-workers-with-cloudbridge.pdf

NetScaler Insight Center

- Solve the Application Visibility Challenge with NetScaler Insight Center - https://www.citrix.com/content/dam/citrix/en_us/documents/products-solutions/solve-the-application-visibility-challenge-with-netscaler-insight-center.pdf

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