# Comparative Feature Analysis

Citrix XenApp and XenDesktop 7.15 built on Microsoft Windows Server 2012 R2, and Windows Server 2016 RDS/VDI

The Microsoft server and desktop operating systems provide a solid foundation for an enterprise-level RDS and VDI deployment, whether that deployment is based within the organization's data center running Hyper-V or in the Azure cloud. This foundation, when extended with Citrix XenApp and XenDesktop 7.15, can enable the following benefits for a broader array use cases:

- **Simple, scalable management and support capabilities**: A single solution, supporting RDS, VDI and physical workloads with built-in life cycle revision management for dev, test, UAT, production and archive image, capable of updating and rolling back images in the time it takes a user to reboot.

- **Delightful and productive user experiences**: A dynamic protocol providing users with the best route to their workspace, built with the integration of local, on premise and cloud-based apps and desktops, utilizing logon optimizations capable of reducing logon times by up to 90%. The user experience also provides print capabilities to any end point device (Windows, Mac, Linux, iOS, Android, Chromebooks, and HTML5) from any resource (apps and desktops) over any connection (locally attached printers and network attached printers) with a single, universal print driver and print server

- **Device, app and cloud flexibility**: An open solution that supports any hypervisor, any cloud and any device while running on a set of integrated infrastructure technologies that not only optimizes storage performance but does so in a way that directly impacts the user experience. According an ESG analysis, the storage optimization technologies can potentially decrease storage costs by 80% through the use of RAM caching, sequencing and optimizing storage data before it gets written to disk, all without the need for additional hardware, licenses or training costs.

- **Contextual and embedded security**: Solution hardening options allows for usage within any type of secured environment through the use of a non-Windows, hardened appliance within the DMZ minimizing the attack footprint, end-to-end SSL/TLS encryption as well as adaptive user access based on SmartAccess technologies that provides granular access to resources and functionality through the evaluation of multiple, dynamic factors (devices, end point capabilities, locations, local device security and more).
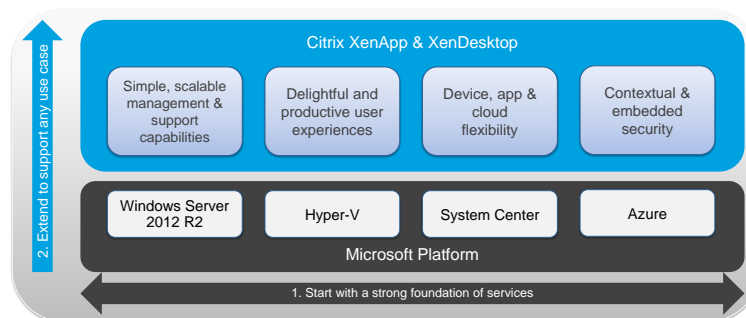
The sections that follow provides an in-depth analysis of the different features and how Citrix XenApp and XenDesktop extends the functionality of the strong Microsoft foundation.

Simple, scalable management & support capabilities

Any technology implemented to solve a business challenge must be managed and maintained. Citrix XenApp and XenDesktop incorporates multiple approaches, through two, role-based tools to help manage the images, users, and infrastructure. These tools provide real-time monitoring, fast image updates and rollbacks for any physical and virtualized resources, which allows an administrator to quickly deploy security patches as well as rollback in the event of a failed update is impacting users. A proper management and support solution should include:

- Life cycle management
- Performance monitoring
- Deployment and maintenance

Life cycle management

Managing the life cycle of the underlying solution is important for ongoing support. With the Windows Server 2012R2 version of RDS and VDI, Microsoft introduced a base set of capabilities that has continue in Windows Server 2016. As the environment grows to include additional user groups and use cases, Citrix XenApp and XenDesktop 7.15 are able to meet those needs by extending the underlying Microsoft solution with additional capabilities.

Microsoft

Feature	Description
VDI master image deployment	By using a single, master image, be able to create and deploy many child VDI-based desktops.

Citrix Value Add

Feature	Description	XenApp 7.15 XenDesktop 7.15
Application layering	As a means for reducing master RDS/VDI images, provides application layering functionality integrated into the virtualized resources and administrative management console.	X
Application layering compatibility analysis	Able to identify and report on application compatibility issues with the app layering technology.	X
Application layering OS compatibility analysis	Provides analysis and reporting on applications, contained within an application layering, being compatible with the allocated operating system.	X
Application layering dependency analysis	Through analysis and reporting on a linked application layer and operating system, able to validate application dependencies are in place.	X
Application layering prioritization analysis	Due to the potential of last write wins issues with application layering technologies, able to analyze and recommend proper layer prioritization.	X
Application layering interoperability analysis	Provides analysis and reporting on the behavior of multiple application layers merged into a single RDS or VDI image, helping to determine if the applications will play nicely together.	X
Patch impact analysis	Able to quickly determine the impact a system patch will have on operating system images and application layers.	X
App-V compatibility analysis	Able to identify and report on whether an application can be sequenced as a Microsoft App-V package.	X

App-V integrated delivery	Able to assign and delivery Microsoft App-V packages to RDS and VDI hosts without relying on the App-V management server and the App-V publishing server.	X
App-V sequence analysis	In the event of a Microsoft App-V sequence failing, able to provide analysis and reporting on why it failed and how to overcome.	X
RDS master image deployment	By using a single, master image, be able to create and deploy many child RDS-based servers.	X
Hybrid image deployment model	With the use of a single imaging platform, be able to deploy VDI and RDS based workloads.	X
Fast image rollback	Able to quickly rollback to a previous image build in the event of an issue with a recent update.	X
Fast image update	Able to quickly update all target servers/desktops with a new image, regardless of size of deployment.	X
Built in image optimization	As part of the master image creation process, have automated tools that optimizes the image before deployment.	X
Image lifecycle revision management	Simplify the ongoing maintenance of the master image through the use of an image life cycle process where an image can go through multiple phases: development, test, user acceptance testing, production and archive.	X
Single Image Server Provisioning	Simplifies and streamlines server management by ensuring server consistency within silos by provisioning servers simultaneously from a single standard workload image. Increases IT responsiveness and agility by enabling capacity on-demand through the ability to repurpose any server to do any job.	X
Application compatibility analysis	Be able to assess application compatibility across multiple operating systems, platforms and delivery models in an effort to take the guesswork out for the design.	X
Application compatibility remediation	Based on the application, be able to remediate potential issues that might impact compatibility with operating systems, platforms and delivery models.	X
Web browser compatibility analysis	Be able to assess application compatibility across different browsers and browser versions, including Microsoft Internet Explorer, Microsoft Edge and Google Chrome.	X
Application compatibility effort	Provides a report detailing the time required to manually update applications for platform compatibility.	X

Performance monitoring

Understanding how the hardware and software is performing is critical to understanding if the users are having a positive or negative user experience. With the Windows Server 2012R2 implementation of RDS and VDI, Microsoft provided an introductory look at the overall health of the implementation. To obtain greater levels of detail into the system performance, Citrix XenApp and XenDesktop 7.15 provides additional capabilities across desktop and server monitoring, logon performance monitoring and integrated license alerting, in addition to the following capabilities.

Microsoft

Feature	Description
Basic Server Health Monitoring	Monitor the health of server components and report any failures when they happen.

Citrix Value Add

Feature	Description	XenApp 7.15 XenDesktop 7.15
System Center Operations Manager pack for RDS	Able to provide performance monitoring reports for a RDS workload (XenApp) within System Center Operations Manager.	X
System Center Operations Manager pack for VDI	Able to provide performance monitoring reports for a VDI workload (XenDesktop) within System Center Operations Manager.	X
System Center Operations Manager pack for image delivery	Able to provide performance monitoring reports for an image delivery workload (Provisioning Services) within System Center Operations Manager.	X
System Center Operations Manager pack for SSL VPN	Able to provide performance monitoring reports for a SSL VPN workload (NetScaler) within System Center Operations Manager.	X
System Center Operations pack for hypervisor	Able to provide performance monitoring reports for a hypervisor (XenServer) within System Center Operations Manager.	X
Advanced Server Health Monitoring	Automatically monitor the health of multiple hosts and components and report any failures when they happen. If an issue is detected, initiate automatic server recovery actions, such as restarting the server, or preventing it from accepting user sessions until the problem is resolved.	X
Built-in Logon performance analysis	Track user logon performance and break it into multiple phases, making it easier for the admin to better optimize logon times and speed up the entire process.	X
Built-in User connection monitoring	Track the user connection process to proactively identify potential issues, like client connection failures, configuration errors, machine failures, unavailable capacity and unavailable licenses before entire user groups experience failures.	X
Desktop VM monitoring	Monitoring the deployed desktop virtual machines for issues, like failed to start, failed to boot or failed to register to proactively correct before large portions of the user population is impacted.	X
Server VM monitoring	Monitoring the deployed server virtual machines for issues, like failed to start, failed to boot, failed to register or maximum load to	X

	proactively correct before large portions of the user population is impacted.	
Integrated License Alerting	Tracking license usage, integrated into the admin console, allows an administrator to see trends that might impact user connection in the event not enough licenses exist or that licenses are about to expire.	X
Application usage monitoring	Track the usage of a set of applications to identify trends, issues, and utilization. The trending information helps administrators identify if the loads are increasing and requires additional resources in order to take on the new users.	X
Network usage	Analyzes the network connectivity between the user's end point and the hosted desktop or session to identify potential issues, bandwidth usage, latency issues, etc.	X
Multi-site monitoring	From a single tool, be able to monitoring deployments spread out across multiple, self-contained data centers.	X
Support filtering	Allows the support team to quickly find a particular user, desktop or application session regardless of the size of the overall deployment.	X
Issue correlation	Provides the capability to easily link changes to the infrastructure with issues that are impacting the environment including user connection failures, desktop failures, application failures, etc.	X
Latency alerting	Integrated and configurable threshold to raise an alert within the administrator and support consoles when the network latency is too high for a session.	X
High CPU alerting	Integrated and configurable threshold to raise an alert within the administrator and support consoles when the CPU utilization within a virtual desktop is too high for a session.	X

Deployment and maintenance

The base Microsoft RDS and VDI solution provides administrators with the tools required to alert users of impending system status changes as well as allowing an organization to better manage the solution with System Center. In order to simplify the administrator experience, Citrix XenApp and XenDesktop 7.15, in addition to a few additional capabilities, also integrates with System Center Virtual Machine Manager, Configuration Manager and Operations Manager.

Microsoft

Feature	Description
Per user licensing	Licensing is available based on the number of named users within the organization.
Per device licensing	Licensing is available based on the number of devices within the organization.
System and logon messages	Messaging can be used to keep remote desktop clients more informed. System messages can be used to inform users of upcoming server downtimes. Logon messages can be used to display legal information that the remote user must acknowledge before starting a session.
Integration with System Center	Provides integration with System Center 2012R2 in order to simplify management of the solution by using already deployed tools.

Citrix Value Add

Feature	Description	XenApp 7.15 XenDesktop 7.15
Policy based Application Publishing for groups of servers	Provide a centralized mechanism for publishing applications to groups of servers simply by adding or removing servers from a group.	X
Reboot management	Policy defined schedule, built within the administrator console, allowing for a daily or weekly schedule for rebooting servers, allowing an administrator to define specific groups of servers and warning messages to users.	X
Session recording for RDS	Improves troubleshooting capabilities by having administrators create user session recording policies to capture every user action in the event of capturing the entire sequence of events that generates an issue.	X
Session recording for VDI	Improves troubleshooting capabilities by having administrators create user session recording policies to capture every user action in the event of capturing the entire sequence of events that generates an issue.	X
Streamlined RDS Image Update	Ability to push patches and service packs to a set of RDS-based hosts simultaneously with sub 1-minute downtime.	X
Multi-site support	Able to have a deployment span multiple, WAN-connected locations, that are managed and maintained as a single deployment.	X
Centralized Power Function Management	Ability to manage restart or shutdown RDS host servers and VDI VMs from the management console.	X
Licensing grace period	In the event of the license server being inaccessible, the users should still be able to access the environment via a temporary license.	X
Full license HA	In a highly-available design, 100% of the licenses should be available if a license server fails.	X
Concurrent licensing	Licensing is available based on the number of concurrent users within the organization.	X
Centralized Publishing	Allows administrators to easily deliver server resources – such as applications, content, and server desktops – from hundreds to tens of thousands of users from a single wizard-driven console.	X
Automated Client Installation	A web-based process walks the user through the process of automatically detecting the needed client software and then automatically installs the appropriate client software for the platform used.	X
Role-based management tools	Support and management tools designed to align with the common tasks associated with different support roles.	X

Delightful and productive user experiences

Citrix XenApp and XenDesktop are built around the needs of people, eliminating complexity at every turn where everything just works, intuitively and consistently so they can concentrate on business and not on technology. Citrix enables people to move seamlessly across a diverse mix of devices and locations throughout the day.

XenApp and XenDesktop is able to achieve a rich experience based on the many advancements included within the protocol and user session. XenApp and XenDesktop also includes functionality to improve the usability and experience of common activities within a session like profile management and printing. A delightful and product user experience is based on the following:

- Session
- Protocol
- Printing
- Profiles

Session

Having a proper set of functionality within the session is core to providing the user with a productive experience. The Microsoft Windows Server implementation of VDI and RDS provides a strong set of features that provides a positive session experience. A Citrix XenApp and XenDesktop 7.15 implementation builds on these features to provide an even better experience by providing an almost instant logon experience, a seamless experience with the integration of local applications and providing users with advanced application enrolling capabilities.

Microsoft

Feature	Description
Auto-resize user desktop	As a user changes end point devices with different resolutions or the user resizes the virtual desktop window, the interface and application automatically resize for the new resolution.
Session Roaming	Provides seamless roaming of the user's session across devices.
Email-based configuration	Allows the user to connect to the app and desktop store without being required to remember a unique URL. The configuration of the end point is done via the user's email address.
Language bar redirection	Enables use of the language bar on the client computer to control the settings within their remote programs.
Pass-through authentication	For Windows clients connected to the company directory, the credentials used for local device logon are passed automatically to sessions running on Remote Desktop Services. This simplifies and speeds up the user's connection process.
Seamless end point integration	Allows applications to appear in the start menu or on the local desktop providing a familiar application access experience for users.
Folder management	Allows applications to be grouped within folders for easier organization for multiple user groups.
Client-to-server redirection	Redirects requests for a specific document or file type to a Remote Desktop session. For example, clicking on a Visio document on the client device will launch the document in a Visio application on the server, instead of a local application. This is a useful feature in environments where a particular application may not be installed locally.
Multilingual User Interface	Dynamically changes the locale of the web application portal depending on the user or administrator's preferences.
Per-user Application Filtering	A list of applications can be filtered that are available to a specific group or user account when logged on to a web portal.

Disconnect or Close All Applications	A single button provides a means for the user to suspend or exit all running applications without having to perform this action in each individual application. This functionality works regardless of how many server sessions the user has established. This is especially useful for situations where the user wants to switch devices such as when leaving the office to go home.
Support for video conferencing in hosted sessions	Provides the ability to use video conferencing applications within server hosted sessions.
Seamless applications	Enables applications running on the server to look and feel as if they are running locally
Connection resiliency	Automatically reconnects user sessions when the network connection is temporarily lost.
USB printer support	Enables users to remotely print to USB printers connected to their client device
USB storage device support	Enables remote access to most USB storage devices connected to their client device
Virtual IP Address Support	Applications that require a unique IP address for each application instance may not work properly in a Remote Desktop Services environment. Virtual IP address support allows an administrator to define a range of IP addresses so that each user session can have a unique IP address. This is especially useful for customer service applications that integrate into VoIP telephony systems. It is also useful when using third-party tools to monitor internet traffic from RD Session Host users.

Citrix Value Add

Feature	Description	XenApp 7.15 XenDesktop 7.15
Local App Access (reverse seamless)	Allows a user to access end point installed applications within their virtual session, thereby allowing users to access personal and work apps within a single desktop.	X
Session pre-launch	A session is automatically created when a user logs onto their endpoint. When the user launches an application or desktop, 80% of the session instantiation was already completed, providing a much faster logon time and user experience.	X
Session linger	When a user closes their last hosted application, the session remains active for a period of time in the event the user launches a new application. As the session is still active, the user does not have to go through the logon process again.	X
Drawing and Signature USB Tablet Redirection	Provides USB enhancements for signature and drawing tablets, providing artists with instant visual feedback from drawing pad interactions.	X
Auto enrolled apps	The app or desktop will have an automatic subscription for a user without the user being required to manually subscribe. The user can still unsubscribe.	X
Featured apps	Provides an administrator to highlight an app or desktop. This feature is often used when there are hundreds of apps published for a single user and is used for the most widely used apps.	X
Preferred apps	Allows an administrator to set conditions that a local application on the end point should be used if the same app exists as a hosted application.	X

Primary/Secondary apps	For deployments consisting of multiple sites, allows an administrator to determine which application and site combination is the primary. If the primary application is not available, the store will automatically direct the user to the secondary app.	X
Multi-app store support	Based on the organization and security requirements, there might be a need to create multiple application and desktop stores.	X
App store branding	Allows an organization to add a corporate brand with the application store without requiring extensive coding expertise.	X
Multi-launch prevention	Many times, due to the few seconds it takes between the selection of a resource until the launch window is seen, users tend to click multiple times, which could launch a single application 5+ times. Multi-launch prevention prevents this accidental and resource intensive behavior.	X
Client-to-server Folder redirection	Instead of redirecting an entire drive, the user can define a set of folders that are redirected. Client-to-server folder redirection provides more granular client folder redirection.	X
Client time zone redirection	The user's session time zone is synchronized with the end point.	X
Support for video conferencing in hosted sessions	Provides the ability to use video conferencing applications within server hosted sessions.	X
Session reliability	When a network connection issue occurs, the application window remains visible on the end point and the session continues to accept keystrokes and mouse movement from the user while session re-connection is attempted in the background. For transient network issues, such as where users roam between wireless "hot spots", the user may not even know connectivity was lost.	X
User initiated desktop reset	Provides self-service capabilities allowing a user to reset their virtual desktop to a pristine state.	X
Wake on LAN	Allows a user to remotely connect to a traditional PC (Remote PC Access) even if the PC is powered down.	X
Regional settings redirection	The regional settings of the end point are automatically applied to the user's session.	X
Client device location awareness	Based on the location of the end point device, the session connection parameters will dynamically change to accommodate new security requirements, optimizations or access URLs. This allows the user to roam without having to remember to unique URLs or reconfigure their session.	X
Server-to-client URL redirection	When clicking on URLs (such as HTTP or HTTPS links) within an application running on a server, the link is opened with the local client browser instead of launching the browser on the host. This feature enhances support for mixed desktop/Remote Desktop Services environments, and ensures that the local browser and Internet connection is used for web browsing. This can reduce the data center bandwidth requirements, free processing resources on the server, and improve performance for users. In addition, for environments that track internet usage by IP address, this features preserves the ability to do so using third-party monitoring products.	X

User self-service for application subscription	Users are provided self-service control of which applications are integrated within their desktop environment through a simple application subscription store front. Without this, users might see a list of over 100 applications, many not relevant to their job.	X
Persistent Bookmarks	Provide users the ability to create persistent browser bookmarks directly to their favorite applications. When using pass-through authentication, the user can access their application without the need for additional authentication.	X
Automatic Reconnection	Configurable option allowing users to automatically reconnect to all disconnected sessions at logon without user interaction.	X
USB Webcam support	Provide seamless support for USB webcams, regardless of when the webcam is plugged in (before or after session logon).	X
Scanner support (TWAIN)	Enables applications running on the server to access TWAIN scanners connected to the client device.	X

Protocol

The protocol is responsible for delivering the screen images to the endpoint and to take the user feedback from the endpoint and relaying it back to the server in a fast and optimal way. The Microsoft VDI and RDS capabilities provide a solid foundation upon which Citrix XenApp and XenDesktop 7.15 are able to provide optimized protocol routing and Aero remoting while protecting the overall session through bandwidth limits for non-critical channels.

Microsoft

Feature	Description
High resolution graphics	If a bitmap looks as if it is photographic or highly detailed, an extra level of lossy JPEG compression is added to reduce the bandwidth required to transmit the image to the client.
Visually lossless	Remoting protocol dynamically adjusts visual quality based on the network link conditions, degrading image quality to save bandwidth without the user being aware.
Aero support on Windows endpoint	Provides support for Windows Aero on endpoints running Windows 7 or later.
Audio playback	Supports audio playback on the client device for audio streams from the server session.
Bi-directional audio (LAN)	Supports audio recording and playback on a client desktop. Bidirectional audio is a common requirement in medical and legal firms, and provides a foundation to support VoIP soft phones in the future.
Enhanced audio codec	Provides CD quality audio
Server rendered Flash	The request for a media file is intercepted on the server and rendered. The rendered video is sent to the client via the remoting protocol, thereby allowing any endpoint to see Flash content.
Server rendered Silverlight	The request for a media file is intercepted on the server and rendered. The rendered video is sent to the client via the remoting protocol, thereby allowing any endpoint to see Silverlight content.
Server rendered multimedia	The request for a media file is intercepted on the server and rendered. The rendered video is sent to the client via the remoting protocol, thereby allowing any endpoint to see multimedia content.
Client rendered multimedia	The request for a media file is intercepted on the server, which streams the media to the client where it can be rendered using local resources, thereby increasing server density.
DirectX Support	DirectX and Direct3D apps configured for 32-bit or 16-bit color depth can leverage a graphics card (any card that is WDDM compatible) on the server thus improving single server scalability by

offloading application rendering to the graphics cards as opposed to using CPU software rasterization.

Multi-monitor support	Allows applications running on Remote Desktop Services to be displayed across multiple local monitors connected to the client workstation forming a single virtual display. Multi-monitor support includes dynamic display configuration and boundary awareness.
Support for multi-media collaboration	Provides support for Microsoft Lync within server-based sessions.

Citrix Value Add

Feature	Description	XenApp 7.15 XenDesktop 7.15
4K Resolution Support	Able to deliver a high-definition experience to a virtual desktop with at least 8 monitors each with 4K (4,000 pixel) support.	X
Intent-based UX protocol	Next generation remoting protocol that goes beyond simple compression and works to understand the user's intent, helping to eliminate redundant retransmissions responsible for things like runaway scrolling, often an issue on mobile network connections.	X (FrameHawk)
Adaptive Display	Multiple encoding schemes are utilized within a single session for different portions of the screen. With Adaptive Display, we end up with the following:	X
Enlightened Data Transport	A transport layer protocol that combines much of the resiliency of TCP with the performance gains of UDP over High-bandwidth, high-latency WAN links.	X
Adaptive Transport	The ability to automatically switch the transport layer of a user's session between multiple transport options in order to compensate for dynamic network conditions.	X
Optimized routing	External users will be routed to the optimal gateway based on the applications or desktops they access	X
Auto-optimizing High latency network support	Optimizes performance of remote applications presented over high-latency network links (i.e. satellite). The user benefits from a more usable experience.	X
Skype for Business Optimization	Provides voice and video optimization capabilities for Skype for Business Server when accessed via Skype for Business clients running on Windows and Mac operating systems.	X
Microsoft Lync/Skype for Business optimization	Provides voice and video optimization capabilities for Lync Server 2010, Lync Server 2013 and Skype for Business (Office 365) when access via Lync Client 2010 and Lync Client 2013 and Skype for Business Client running on Windows, Mac and Linux operating systems.	X
Aero support on non-Windows endpoint	Provides support for Windows Aero on endpoints that are not Windows 7 or later endpoints and are typically unable to run Aero.	X
Aero redirection to endpoint	Windows Aero rendering occurs on the end point, providing a better user experience while decreasing server load.	X
Client rendered Flash	The request for a media file is intercepted on the server, which streams the media to the client where it can be rendered using local resources, thereby increasing server density.	X

Server Flash fetching	The request for the flash media is obtained by the server and then sent to the client for rendering. This allows devices that do not have direct access to the content to still be able to access it.	X
Client Flash fetching	The request for the flash media is obtained by the client, helping to reduce the load on the server.	X
Dynamic Flash Support	Automatically adjusts Flash rendering and fetching based on the endpoint and network link to provide the user with the optimal user experience.	X
Flash bandwidth limit	Allows an administrator to set the maximum bandwidth limit for Flash to reduce the likelihood that a print job could disrupt the user experience.	X
Client rendered Silverlight	The request for a media file is intercepted on the server, which streams the media to the client where it can be rendered using local resources, thereby increasing server density.	X
WAN Optimized protocol	In circumstances where network bandwidth is 8Mbps or less and network latency is 50ms or higher, the user experience continues to be acceptable.	X
Bi-directional audio (WAN)	Supports audio recording and playback on a client desktop across the WAN by utilizing latency reduction and compression optimizations.	X
Audio bandwidth limit	Allows an administrator to set the maximum bandwidth limit for audio to reduce the likelihood that a print job could disrupt the user experience.	X
Graphics Display Optimizations	Dramatically improves the performance and usability of graphics-intensive applications. Enables IT to centrally manage graphics-intensive applications such as PACS (used in Healthcare) and GIS mapping applications, while providing the speed and anywhere-access flexibility that users need.	x
Video bandwidth limit	Allows an administrator to set the maximum bandwidth limit for video to reduce the likelihood that a print job could disrupt the user experience.	X
OpenGL Support	Provides hardware assisted GPU rendering of OpenGL for the VM	X
Web browser performance optimizations	Provides a combination of features that can automatically disable GIF animations, intercept images and pass them on before being uncompressed, dynamically re-compress JPEG images, deliver images in the background, and cache images on the client.	X
Priority packet tagging	Enables the prioritization of virtual channel traffic by third-party Quality-of-Service (QoS) network infrastructure providers.	X
Client drives bandwidth limit	Allows an administrator to set the maximum bandwidth limit for client drives to reduce the likelihood that a print job could disrupt the user experience.	X
USB bandwidth limit	Allows an administrator to set the maximum bandwidth limit for a USB device to reduce the likelihood that a print job could disrupt the user experience.	X
Network QoS	Assesses network usage and classifies apps and services to better control bandwidth consumption, mitigate network congestion and delays.	X

Printing

Printing is still a core function with any RDS or VDI implementation. Microsoft includes a basic printing platform capability for VDI and RDS with user self-provisioning and a universal printer. These features are extended with a Citrix XenApp and XenDesktop 7.15 implementation by optimizing printing bandwidth and extending universal printing to local printers, network printers, Macintosh and Linux printers.

Microsoft

Feature	Description
Client-based universal printing	Provide printing to local, client-attached printers without requiring a printer driver to be installed on the server.
Default printer provisioning	Restricts the available client-side printers to only the default printer.
Universal Printer for Windows endpoints	For users with many printers on a Windows endpoint, a single universal printer can be defined that improves logon speed. That printer is used to create a print job, sent to the end point where the user selects the appropriate printer mapped on the endpoint.
Client printer auto-creation	Automatically create a mapping of client-attached printers into the user's session when connected to a server-side virtualized application.
Client printer session isolation	Ensure that client-attached printers are isolated to the user's session and not available to other users on the same server.
Inheritance of printer properties	Provides the ability to inherit the existing printer settings instead of relying on default settings. This provides the user with a seamless experience when printing to their local printer.
User self-provisioning	Allows the user to define additional printers available to the session and have them be available in the session without requiring the user to logoff and logon to use the printer.
Automatic driver installation	Automatically installs in-box printer drivers when they are needed
Printer driver mapping	Allows an administrator to define a mapping of server printer drivers to use for given client printers

Citrix Value Add

Feature	Description	XenApp 7.15 XenDesktop 7.15
Universal printer for non-Windows endpoints	For users who require printing on non-Windows endpoints, a single Universal Print Server can be used to define network printers using a single, optimized driver. This helps to improve logon speed and stability.	X
Network-based universal printing	Provide printing to network, mapped printers without requiring a printer driver to be installed on the server.	X
PCL/Postscript universal printing	Provide client-side printing support on non-Windows clients (Macintosh, Linux, etc)	X
Client printer provisioning	Provides administrators with the ability to control client-side printer auto-creation based on policy.	X
Network printer provisioning	Enables users within a specified IP address range to automatically access the network printing devices that exist within the same range.	X
Print job optimization	Reduces the network utilization for a print job by compressing images and removing duplicate images.	X

Retention of printer properties	Users can configure settings for client-attached printers and have those settings stored on the client device or in their user profile.	X
Printer job routing	Allows administrators to choose between the traditional network printing path or the ICA printing path when using client printer auto-creation for provisioning of printers. In cases where the client can connect to a network print server for their local printer this can offer significant reduction in bandwidth and overall time required to print. Policies provide administrators the control necessary to ensure this is only applied in situations where it makes sense.	X
Print job load balancing	Provides increased scalability and performance for network based print queues.	X
Universal Print server High-Availability	Provides greater performance and resiliency for network based print queues.	X
Printer bandwidth limit	Allows an administrator to set the maximum bandwidth limit for a print job to reduce the likelihood that a print job could disrupt the user experience.	X
Print driver compatibility control	Allows administrators to manage a list of print drivers that can be used on the server for client-side printers. By supporting both inclusion and exclusion lists administrators have the ability to only allow known "safe" drivers or to block known "unsafe" drivers.	X
Control security rights for client printers	Provide users with access to the printer device settings for their client-attached printers. The default ACL on redirected printers in Remote Desktop Services does not allow the user to adjust device settings because it would also allow the user access to additional settings like driver, port, etc. With custom security filtering the user can be provided access to manage the printer properties without exposing the full rights.	X
Google Cloud Print support from Chrome	Ability to utilize Google Cloud Print services directly from the application when using Google Chrome.	X
Print Driver Certification Tool	Provides utilities to stress-test print drivers against the VDI/RDS system in order to prevent system disruptions due to poor print drivers.	X

Profiles

A solid profile solution is an important aspect of any VDI and RDS-based solution. The Microsoft base VDI and RDS implementation continues to make improvements includes advanced user profile management capabilities. Citrix XenApp 7.15 and XenDesktop 7.15 provides additional capabilities to improve the logon performance via profile streaming, and help with operating system migrations through profile migration capabilities.

Microsoft

Feature	Description
Basic roaming user support	Allows a user to roam between devices and networks while maintaining the state of their server-based applications. User will be automatically connected to their applications with the display automatically re-configured when the user re-connects.
Roaming user profile cache management	In Remote Desktop Services environments with many users, the profile cache can grow very large and may potentially overrun the available disk space on the server. This feature limits the size of the overall profile cache. If the size of the profile cache exceeds the configured size, the least recently used profiles are deleted until the overall cache goes below the quota.

Advanced profile management	Includes built-in profile management to make it easy for IT to provide a personalized, consistent experience for user's every time they log on, regardless of endpoint devices or locations. Resolves "Last Write wins" issues across multiple simultaneous server sessions found in more complex environments.	
Profile policy Tag filtering	Able to apply the profile definition based on an associated tag name for resources.	
Profile policy User/group filtering	Able to apply the profile definition based on the user's Active Directory username or group	

Citrix Value Add

Feature	Description	XenApp 7.15 XenDesktop 7.15
Profile streaming	Allows portions of the user profile to be delivered to the virtual resources as needed instead of sending the entire profile at logon. This speeds up the logon, providing a better user experience.	X
Integrated Agent install	Support for advanced profile capabilities from the profile tool does not require additional agent installations.	X
Profile policy endpoint filtering	Able to apply the profile definition based on the user's endpoint (location, capabilities, antivirus, OS)	X
Profile policy IP Address filtering	Able to apply the profile definition based on the client's IP Address	X
Profile policy client name filtering	Able to apply the profile definition based on the user's client name	X
Profile policy delivery group filtering	Able to apply the profile definition based on the published resource group name	X
Profile policy OU filtering	Able to apply the profile definition based on the user's Active Directory organizational unit	X
Active profile write back	Allows for files to be synchronized to the profile store throughout the user session. Provides data loss protection in the event of a failure in the host as the files have already been actively synchronized.	X
Profile conflict mitigation	Allows an administrator to decide what to do in situations where two different profiles exist for a single user (in the profile store and on the local server).	X
Profile migration	Provides the capability to automatically migrate the user's local Windows profile to the user store.	X
Out-of-Box app support	Supports saving user configuration settings with all applications using the out-of-box configuration and does not require per-application configurations	X

Device, app and cloud flexibility

Flexibility is a core component of the Citrix XenApp and XenDesktop solution. The flexibility is based on the underlying infrastructure, the types of resources that can be delivered, as well as the flexibility in the overall scale of the solution by using numerous optimization technologies that are fully integrated into the solution. A flexible solution includes

- Hypervisor and cloud
- Resource OS support (VDI/HSD)
- Endpoint device support
- Enterprise performance
- App and desktop resources

Hypervisor and cloud

Organizations have the option to deploy the VDI and RDS solution on-prem with a local hypervisor or to the cloud. Microsoft provides an on-prem solution with Hyper-V and a cloud option with Azure. Citrix XenApp 7.15 and XenDesktop 7.15 can utilize these two options as well as many additional alternatives.

Microsoft

Platform	Description
Microsoft Hyper-V 2012	Windows Server 2012 and Windows Server 2012R2
Microsoft Hyper-V 2016	Windows Server 2016
Microsoft Azure	

Citrix Value Add

Platform	Description	XenApp 7.15 XenDesktop 7.15
Citrix XenServer	XenServer 5.x, XenServer 6.x, XenServer 7.x	X
Microsoft Hyper-V	Windows Server 2008 and Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2, Windows Server 2016	X
VMware vSphere	ESX 4.x, vSphere 5.x, vSphere 6.x	X
Amazon AWS	Able to provide RDS and VDI capabilities to the Amazon AWS Cloud	X
Microsoft Azure	Able to provide RDS and VDI capabilities based on Microsoft Azure	X
Bare metal	VDI and RDS resources can be deployed and managed, via the integrated image management system, to bare metal servers and desktop PCs.	X
Nutanix Acropolis	Able to provide RDS and VDI capabilities based on Nutanix Acropolis	X
Hybrid deployment	A single installation can manage resources available onsite in the data center as well as hosted on a cloud provider.	X

Multi-Cloud deployment	A single control plane installation can manage resources located in multiple datacenter and multiple cloud infrastructures (i.e. AWS EC2, Microsoft Azure, and On-Prem VMware ESX) simultaneously.	X

Resource OS support (VDI/HSD)

Most organizations will often hold off on utilizing the latest operating systems, due to user training and application compatibility. While Microsoft continues to support the latest Windows desktop and server OS with greater levels of functionality, Citrix XenApp 7.15 and XenDesktop 7.15 expands on the supported operating system list to help organizations provide alternative desktop operating systems including Linux.

Microsoft

Platform	Description
Windows Server 2016	
Windows 2012R2	
Windows 2012	
Windows 2008R2	
Windows 7	
Windows 8	
Windows 10	

Citrix Value Add

Platform	Description	XenApp 7.15 XenDesktop 7.15
SUSE Linux		X
Red Hat Linux		X
Ubuntu		X

Endpoint device support

Providing the any-ness in end point support is one of the common criteria for a RDS and VDI implementation. Microsoft provides support for several endpoints and OSes with their base solution. Citrix extends this to be all-encompassing to support any user on any device.

Microsoft

Platform	Description
Windows Vista	
Windows 7	
Windows 8 RT	
Windows 8.x	
Windows 10	
Macintosh	
iOS	

Android	
Windows Phone	
Small form-factor device support	Panning (scrolling) and scaling (magnification) technology provides an improved user experience when viewing full-screen Windows applications on small form-factor devices since many applications are not designed to support the screen resolution available on mobile devices.

Citrix Value Add

Platform	Description	XenApp 7.15 XenDesktop 7.15
iOS Mouse Support	Provides Bluetooth enabled mouse support for iOS devices like Apple iPads and iPhones.	X
Desktop lock	Provides the capabilities to transform a traditional PC into a locked down terminal that hides the underlying operating system interface and automatically connects to a virtual application or desktop.	X
HTML5		X
Chromebooks	Native support, not via HTML5	X
Linux		X
Unix		X
Blackberry		X
Seamless end point agent experience	Regardless of the end point device used, the experience should be look the same, which includes the interface, application lists and application favorites.	X

Enterprise performance

Optimally utilizing servers and resources will help to keep costs low. Microsoft provides based load balancing and disk optimization technologies with the base RDS and VDI platform. Citrix extends these capabilities to provide greater levels of performance for disk and server performance.

Microsoft

Feature	Description
IOPS read optimization	Reduces the number of reads from disk that must occur, typically useful for boot storms.
Basic Load Balancing	Provides load balancing across a group of servers based on session count.

Citrix Value Add

Feature	Description	XenApp 7.15 XenDesktop 7.15
Enterprise Class Scalability	Supports large server farms that can span wide area networks while maintaining performance and reliability. Proven large deployment support with over 1000 servers.	X
IOPS write optimization	Reduces the number of writes to disk, which typically occurs during the user's steady state. Reducing write IOPS can help reduce overall storage costs of the solution.	X

Multi-host local storage volume	Able to utilize local host storage across multiple physical hosts, managed as a single storage entity.	X
Open platform	Able to use any cloud or hypervisor in order to achieve the greatest levels of functionality and capability based on unique characteristics of the infrastructure components.	X
Comprehensive Load Management	Establishes user sessions across a group of load-managed servers based on configurable parameters like session count, application usage, CPU utilization, memory consumption, concurrent logons, IP ranges, time intervals, and more.	X
Offline database support	When the database cluster is unavailable, users are still able to function in their current session and start new sessions.	X
Optimized storage space usage	All types of resources are able to be thin provisioned, helping to reduce the overall storage space requirements for the solution.	X
Integrated infrastructure load balancing	All components within the solution can be made highly available without the addition of 3rd party components.	X
Virtual Machine power policy	Granular policies allowing for desktops to power on/off based on time of day and day of week with built in buffers, eliminating the need of users to wait for a desktop to boot.	X
Multi-site load balancing	Ability for a solution to grow beyond a single site and have users automatically load balanced to the optimal data center.	X

App and desktop resources

Many organizations think about RDS and VDI with a focus of applications and pooled virtual desktops. Microsoft provides these capabilities with the RDS and VDI platform base. However, organizations have user groups with more demanding requirements that cannot be sufficiently fulfilled with the base models. Citrix XenApp 7.15 and XenDesktop 7.15 expands the possible resources to include many options able to support any use case within a single, integrated solution. Some of these alternatives are able to provide a VDI-like session without the cost of doing VDI by implementing Remote PC Access.

Microsoft

Feature	Description
Windows session-based desktops	A shared desktop is hosted on a server OS, and delivered to the user as a virtual desktop session over a remote presentation protocol.
Session-based apps	Individual applications are hosted within a session on the server OS and delivered to the user as a published application over a remote presentation protocol.
VM hosted applications	Individual applications are hosted on a virtual desktop OS, such as Windows 7, Windows 8.1 or Windows 10, and delivered to the user as a published application over a remote presentation protocol.
Pooled VDI	Hosted on a virtual desktop OS, such as Windows 7, Windows 8.1 or Windows 10, and delivered to the user over a remote presentation protocol. The desktop pool is managed by a single master image that updates all members of the pool. User persistence is disabled.
Dedicated VDI	Hosted on a virtual desktop OS, such as Windows 7, Windows 8.1 or Windows 10, and delivered to the user over a remote presentation protocol. The desktop pool is managed individually. User persistence is enabled as the VM belongs to a specific user.
GPU sharing	Provides a physical GPU to the virtual machines, where the GPU is managed and emulated by the hypervisor.

Citrix Value Add

Feature	Description	XenApp 7.15 XenDesktop 7.15
Remote PC Access	Access to a user's desktop from a remote location.	X
Local app access	While in a virtual desktop session, the user's applications, located on the end point, appear to run within the virtual session even though they are executing from the end point. Local app access provides a seamless user experience.	X
Physical VDI	Local desktop OS, such as Windows 7, Windows 8.1 or Windows 10, that is delivered across the network to a physical endpoint, without a hypervisor.	X
Server VDI	Hosted on a server OS, and delivered to the user over a remote presentation protocol. The desktop pool is managed by a single master image that updates all members of the pool. User persistence is disabled.	X
Personal VDI	Hosted on a virtual desktop OS, such as Windows 7, Windows 8.1 or Windows 10, and delivered to the user over a remote presentation protocol. The desktop pool is managed by a single master image that updates all members of the pool. User persistence is enabled in the form of a personal container associated with the user or desktop.	X
Local VM	Windows-based desktops are delivered as a local VM to a physical endpoint (Mac or Windows)	X
Linux session-based desktops	A desktop simultaneously shared to many concurrent users, hosted on a virtual Linux OS and delivered to the user as a virtual desktop over a remote presentation protocol.	X
Linux personal desktops	Hosted on a virtual desktop Linux OS and delivered to the user over a remote presentation protocol where user changes persist	X
Linux seamless apps	Individual applications are hosted on the Linux OS and delivered to the user as a published application over a remote presentation protocol.	X
Mixed desktop/app deployment	A server OS can simultaneously deliver desktops and apps.	X
Virtual GPU	For the many power users, who need GPU acceleration for viewing graphical content (rather than generating it), GPU virtualization provides excellent density (thus reducing TCO considerably), while achieving outstanding graphical performance for a range of different users. With virtual GPU, each user receives a real "slice" of hardware. Supported vendors: NVIDIA Intel AMD	 X X X
Dedicated GPU	When you need the full power of a GPU for CAD, graphic design or video processing, emulated adapters are far from sufficient. With GPU pass-through users requiring high performance graphics can be assigned a dedicated GPU contained within the hypervisor host making GPU pass-through the highest performing option on the market.	X
User installed applications	Supports the requirement of users installing their own applications while still maintaining a single master image for virtual desktop lifecycle management.	X

Contextual and embedded security

Centralized application management is the most secure architecture for delivering applications. Data remains in the datacenter while only screen updates, mouse clicks and keystrokes transit the network. The Microsoft Windows Server RDS and VDI platform provides a core set of security features that includes delegated admin, SmartCard support and integrated SSL. As security is a core element for any implementation, Citrix XenApp and XenDesktop significantly extends the security capabilities through an optional Citrix NetScaler hardened DMZ appliance, to provide additional security-related capabilities.

Microsoft

Feature	Description
Smart Card support for Windows	Smart Card Integration for Windows devices
Delegated Administration	Allows different administrators to manage different aspects of the solution including: images, delivery groups, catalogs, infrastructure, and monitoring tools.
Centralized Access Policies	Administrators can configure settings for user sessions as policies that can be applied to sessions based on username, group, server name, server management container, client IP address or subnet, zone, or client name (or partial name). Priorities can be applied to these policies depending on specific user session situations.
Self-Service Password Reset	Allows users to securely and safely reset their domain password or unlock their Windows account from their PC or web browser, thus reducing help desk costs for password resets.
Secure Sockets Layer Access to Server Applications	Provides SSL/TLS encryption and multifactor authentication to provide authorized application access to appropriate users.
Support for Network Access Quarantine Control	Examines and validates the configuration of a remote access computer through an administrator-provided script.
Device Redirection Enforcement	Device redirection enforcement helps prevent malicious code on remote clients from overriding security polices set by an administrator.
Active Directory Federation Services Support	Supports authentication using credentials from a federated Active Directory forest, thereby increasing the security of applications used by business partners.
Pluggable Authentication and Authorization	Pluggable authentication and authorization allows you to use non-Windows-based methods for authentication and authorization. IT admins can use this to develop their own custom plug-ins to better fit their network admission requirements.
Double-hop DMZ Traversal	Provide access to corporate resources from anywhere over SSL. Double-Hop allows the use of SSL end-to-end from the client, through the DMZ, and into the internal corporate network.
User or group based policy enforcement	User and security policies are applied based on the user or group name.
OU based policy enforcement	User and security policies are applied based on the Active Directory organizational unit name.

Citrix Value Add

Feature	Description	XenApp 7.15 XenDesktop 7.15
iOS Jailbreak Detection	Able to detect jail broken iOS devices and either provide a warning message to the user or completely deny access to the environment.	X
Hardened DMZ Appliance	The Citrix NetScaler secure gateway appliance in the DMZ is a non-domain joined, non-3rd party, hardened appliance, reducing the threat of an attack.	X
Active/Active load balancing	The external gateway used for remote users should be capable of being implemented in an active/active fashion so that a failure does not disrupt the user session and a user's active session is automatically transported to the other gateway device if the initial gateway fails.	X
FIPS and Common Criteria	The entire remote accessible solution is FIPS and Common Criteria certified.	X
Clipboard Security	Users are permitted, denied or partially denied usage of copying text and images from the server to the client or from the client to the server via the clipboard (copy/paste)	X
Multi-provider Federated Identity support	Provides integration with non-corporate Identity providers across a variety of solutions, enabling simplified secure user provisioning/de-provisioning for administrators and a simplified login experience for users.	X
Smart Card support for Linux	Smart Card Integration for Linux devices	X
Smart Card support for iOS and Android	Smart Card Integration for iOS & Android devices	X
Smart Card pass through	Smart Card authentication is pass through to the virtual environment from the end point, reducing the number of logon challenges.	X
Virtual Smart Card Support	Provides support for Microsoft virtual smart cards in a RDS/VDI environment.	X
Smart Card Session Termination	Provides dynamic session termination in the event that the SmartCard is removed from the system, eliminating the potential for an unsecured terminal after the user leaves.	X
Self-Service Password Change	With built-in functionality, provides users notification when their password is about to expire and allows users to change their domain password directly from their browser. This feature is important for remote access scenarios and other situations where user devices do not authenticate to the directory.	X
Adaptive User Access	Dynamically determine the access policy through evaluation of multiple factors such as the user role, location, client device information, and client integrity allowing administrators to provide varying degrees of access instead of simply denying access.	X
Anonymous Access	Provides the ability to grant access to applications without requiring explicit authentication from the user. This can be implemented simply by IT administration and enables support for additional authentication schemes like third party LDAP directories.	X

Secure sockets layer access to all applications and protocols	Provides a secure, always-on, single point-of-access to all applications, network resources, and protocols.	X
End point lockdown	Provides a way to lock down and convert a traditional PC to a thin client-like end point where an alternative shell is used to simplify access to available virtual resources.	X
Solution hardening guidelines	Prescriptive guidance is available to help secure the overall solution.	X
Administrative Logging	Keeps a running log of changes made to system configurations - for audit trail and root cause analysis purposes.	X
Tag based policy enforcement	User and security policies are applied based on an administrator defined tag.	X
Resource type base policy enforcement	User and security policies are applied based on the type of virtual resource being accessed (app, desktop, etc).	X
Resource group based policy enforcement	User and security policies are applied based on the resource group or collection.	X
End point name based policy enforcement	User and security policies are applied based on the name of the end point.	X
End point IP address based policy enforcement	User and security policies are applied based on the IP address of the end point.	X
Advanced filtering options	Resources can be filtered to end users based on location, group membership, end point scans, etc.	X

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