

## A Dynamic Delivery Center for the Enterprise

# Overview

There is more to a data center than data; it's about the applications as applications are the gateway to the data. Applications make the data useful, just like the browser helped to make the Internet easy to use and comprehend. Organizations' data centers have expanded as new applications have been deployed, as new computing systems have been introduced and as new markets have opened up. The old data center was built based on a silo-ing model, where each team was responsible for their slice of the data center. This methodology resulted in huge amounts of duplicated and wasted resources. By taking a step back, it is possible to provide a better environment from which to deliver applications and desktops to users. It's also now possible to virtualize many facets of the data center resulting in a more consolidated, cost efficient, dynamic Infrastructure. This better approach is termed the Dynamic Delivery Center.

## Dynamic Delivery Center Overview

The dynamic delivery center is focused on the delivery of applications to the users, regardless of location, device or network. Users should not be aware of the infrastructure or be required to change their workflows in order to gain access to their applications. From the users' perspective, they start their end-point devices and are delivered their applications via a receiver. Users are completely unaware of where the applications or desktop operating systems are located. If performance at a data center is degraded or compromised, the users should not be required to change their workflow. A dynamic delivery center should detect the degradation or fault and dynamically reroute the request as necessary. This is but a small example of the power behind a dynamic delivery center, which is governed by the following guiding principles:

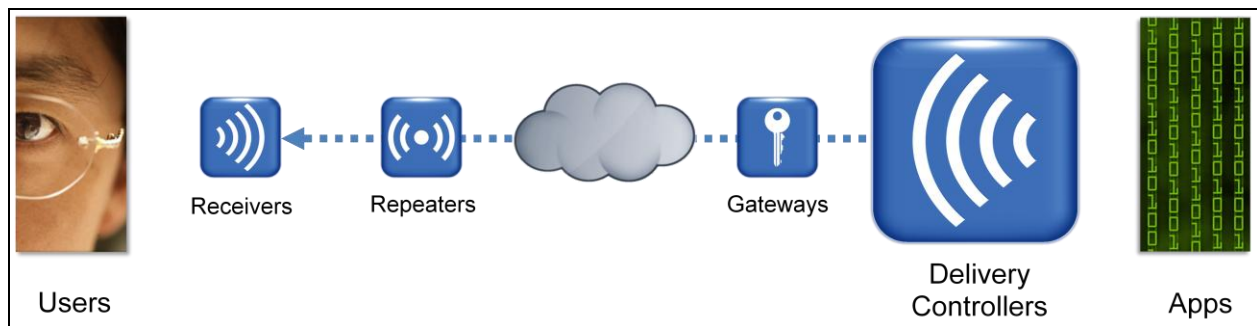
- **Workload<sup>1</sup> Mobility:** A data center contains many different workloads to support the business. In the older data center model, those workloads were bound to a set of hardware devices, limiting their ability to change as the needs of the business changes. In the dynamic delivery center model, workloads must become untethered from the underlying hardware.
- **Automatically Managed:** The delivery center must be managed and orchestrated through appropriate policies based on scheduled and event-driven triggers. As the utilization and availability of services changes, the environment must automatically move workloads, restart services, alert administrators, etc., without requiring manual intervention.
- **High Availability:** All aspects of the delivery center must be made highly available. Applications that are not cluster-aware must be made highly-available to provide the best experience to the users and overcome any unforeseen service disruptions.

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<sup>1</sup> A workload is an application or a set of applications running on a server. In a physical environment, a single server typically hosts a single workload. When the server is virtualized, the single physical server is now capable of hosting multiple workloads within different virtual servers.

- **Energy and Space Efficient:** The costs of running and maintaining the typical data center has continued to increase due to wasted resources and improper planning. Efficiencies must be built into the environment by moving workloads to more appropriate systems and by temporarily powering down unused resources.
- **Secure:** The delivery center must be secure as threats are arriving constantly from numerous sources, internal and external. Communication and infrastructure security is a requirement to providing the best and most secure application delivery experience to users.
- **Optimized Network Communication:** Users are not all located in headquarters locations. In fact, the number of locations where users carry out business is increasing and can include branch offices, home offices, hotels, conference centers, airports and even coffee shops. The dynamic delivery center must take these unique offices into consideration and incorporate solutions to provide headquarters-like speed.
- **Simplified User Experience:** Users should not be required to change their habits as the infrastructure changes; instead they should be able to continue operating in their normal workflows regardless of infrastructure faults or changes. This simplified view must be capable of delivering any application to users in a single, cohesive structure and take into account application requirements like multimedia.

Figure 1 depicts, at a high-level, what is required to provide a dynamic delivery center model while taking into account the different types of applications, locations, and security requirements.



**Figure 1: Dynamic Delivery Center Overview**

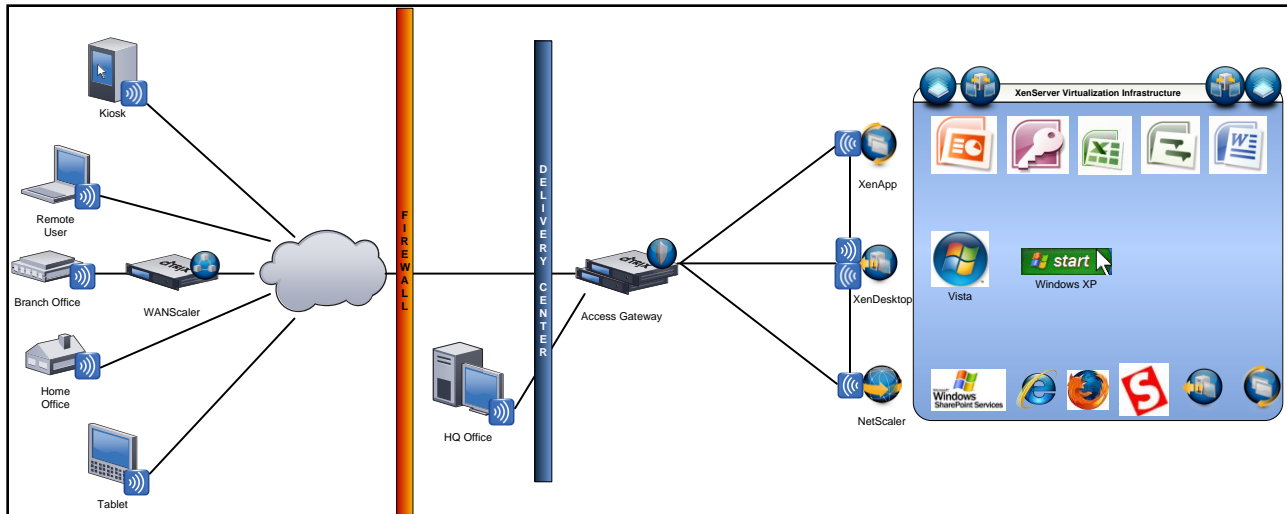
Users are separated from the applications across any number of network connections and distances. Properly delivering applications must be capable of integrating numerous components into a cohesive solution:

- **Delivery Controllers:** Specialized and optimized delivery controllers are responsible for providing the appropriate applications to the users while optimizing hardware utilization, thereby making better use of hardware and energy. The delivery controllers are responsible for application virtualization, server virtualization and desktop virtualization.
- **Gateways:** Before the delivery controllers send the applications and data to the users, the communication must be protected to prevent eavesdropping or tampering. Also, based on the current user scenario (location, device, firewalls or antivirus), different levels of desktop and/or application access will be granted or denied.
- **Repeaters:** As the distance between the user and the applications grows, the speed of delivery starts to degrade due to bandwidth and latency challenges. By optimizing and compressing the traffic through delivery repeaters, the application delivery experience is viable for all types of connections and locations.
- **Receivers:** Once the applications or desktops reach the user, they must be displayed in an intelligent manner, without requiring numerous interfaces for the user to remember, such as which application or desktop goes with which interface. This simplified view into their application set is provided by the receiver.
- **Orchestration:** The entire delivery experience must be monitored, managed and maintained in an automated fashion to continuously provide the best application delivery experience to the users. This is accomplished with end-to-end monitoring and delivery center automation.

In order to gain a better appreciation and understanding for the power of the dynamic delivery center model, the architecture must be examined at a deeper level.

# Dynamic Delivery Center Architecture

At the high-level model of a dynamic delivery center, we have five components, not including the users or applications. When designed properly, this simple model can be used to meet the guiding principles of the dynamic delivery center, as shown in Figure 2.



**Figure 2: Dynamic Delivery Center Architecture**

## Workload Mobility

The underlying fabric of the dynamic data center is the XenServer virtualization infrastructure. This virtualization fabric allows for the separation of hardware and workloads. Integrated into XenServer is the capability to move active workloads to other hardware, without disruption, which is known as XenMotion. As the needs of the business change, the workloads can be shifted to different hardware automatically. For example, as capacity increases, Workflow Studio, Citrix's Orchestration technology, could identify the need for more capacity and contact Citrix Provisioning Server to deliver a new workload to the XenServer virtualization infrastructure. In a matter of seconds, a new workload is online and accepting incoming requests. As the required capacity decreases, Workflow Studio can determine the excess and notify the appropriate workloads to shutdown to conserve resources.

## Automatically Managed

A major challenge with any data center is trying to maintain systems. Each time a new server is added, a new application is deployed or a new system is built, it must be maintained. As the environment continues to grow, the time required to update and maintain the environment grows exponentially. The Dynamic Delivery Center strives to simplify management and maintenance with the following integrated Citrix solutions:

- **Citrix Provisioning Server:** Integrating Provisioning Server with XenDesktop and XenApp allows organizations to update all operating systems with a single click. A modification to the base operating system can cause all physical and virtual servers using the operating system image to receive the updates upon the next reboot. Before a reboot, a XenDesktop user could be running Windows XP, but after the reboot the user could have been upgraded to Vista. This greatly simplifies the time required to update operating systems. And on every subsequent reboot, the user receives a brand new desktop operating environment.
- **Citrix XenApp:** Applications go through constant changes with new updates or security patches. Using XenApp as the basis for application delivery allows all applications to be managed and maintained from a central location, which greatly reduces storage requirements as the applications are separated from the virtual

desktop. Once a change is made to an application profile, all users will be able to receive the update automatically.

- Citrix Workflow Studio: Each system requires scheduled maintenance, but before the outage can begin, the services must be disabled ahead of time. Workflow Studio is able to manage the environment automatically based on defined events or schedules.

## High Availability

Unfortunately, application, server and site failures are inevitable, and the risks associated with these failures must be mitigated. Even if the systems are not cluster-aware, they must be made highly available. The Dynamic Delivery Center provides high-availability in the following ways:

- Application: If an application fails, the user can simply restart the application, where any application configuration issues or server hosting issues will be bypassed automatically.
- Desktop: If the user's desktop fails, he/she will automatically be delivered a new virtual desktop on-the-fly, with all of the application and personalization settings intact.
- Workload: If a server fails, the workload can be dynamically routed to another available server to host the workload, whether physical or virtual.
- Server: If a server fails, the server will be bypassed, a new server could be started, and all subsequent requests will go to the remaining available servers.
- Site: If an entire site fails, the environment can automatically reroute all requests to the next best site based on usage, proximity or speed.

## Energy and Space Efficient

Power and space savings are important to organizations trying to save resources. Without proper planning, setting up a dynamic environment requires large amounts of hardware, resulting in wasted resources. However, as a guiding principle for the dynamic delivery center, efficiency is critical and accomplished with the following:

- Virtualization: One of the easiest ways to save space and power is to fully consume all available resources. The XenServer virtualization infrastructure allows workloads to be shifted to other hardware without incurring downtime. As more capacity is required, new systems can be brought online and moved, while the opposite can be done when total capacity should be decreased due to temporary drops in resource requirements..
- Offloading: The operating system performs many repetitive tasks that, while important, reduce the overall capacity of the server. Being able to offload those repetitive tasks to specialized hardware will increase the capacity of the server, while providing faster response times to the user. Integrating NetScaler in front of web servers allows for better TCP management and offloading of numerous processor-intensive functions like SSL decryption.
- Caching: Servers are responsible for responding to user requests in a timely manner. Oftentimes, multiple users request the same or similar data from a web application. Even though the returned data will be highly repetitive, the server is unable to save resources and must rerun the entire request; this can even get to a point where more hardware resources are required to fulfill all requests. By integrating NetScaler in front of web applications, repetitive data can be cached and used to fulfill requests in a more timely and efficient manner, which can oftentimes result in a smaller hardware footprint for the application.

## Secure

Incoming and outgoing data must be protected from tampering and eavesdropping. Users will access the environment by means of any number of corporate and non-corporate devices, including shared systems like airport kiosks. Security cannot be overlooked in the Dynamic Delivery Center model, and it is integrated with the following aspects:

- **SSL-VPN:** All data entering and leaving the Dynamic Delivery Center is encrypted with SSL-based encryption. This prevents individuals from capturing network packets and identifying user IDs, passwords or other sensitive data.
- **Role-based Access:** Full access and no access are rudimentary, but these two options are not sufficient. Oftentimes, users should be granted partial access to their resources. Access Gateway determines the type of device the user is on, what material the user is trying to access, and determines the appropriate level of granularity to be provided. For example, a user might get a hosted application where drive mapping, printing and copy/paste functionality has been disabled. The same user, when on a different device, could then get the application delivered to the corporate workstation and be able to edit, save, print and copy the data.
- **Web Application Firewall:** The applications and data must be protected from valid and fraudulent requests. As a user could access the web application from un-trusted devices, certain types of data should not be transmitted, including those that could put people at risk for identity theft. The Application Firewall will protect certain types of data from being transmitted across the wire and will protect web applications from unusual activity. For example, some credit card companies will contact the card owner if the card is subject to unusual activity. Once this has been confirmed, the transaction will be processed. The Application Firewall can function in a similar manner by flagging unusual application activity.

## Simplified User Experience

With so many applications, agents, plugins and systems to access, it may be difficult for users to keep them all straight. Unfortunately, the user's workflow often changes when a failure strikes. It is paramount that the user has a simple user experience, regardless of any changes or difficulties within the infrastructure. In the Dynamic Delivery Center model, the user simply has a receiver showing the applications and/or desktop environment(s) available, regardless of location. The receiver automatically maintains the proper set of plugins required based on the user's location and device. This guarantees the best application delivery experience.

## Optimized Network Communication

Users are not all located in headquarters locations with high-speed LANs. Many are located in branch offices, home offices or other locations like airports and hotels where bandwidth is sporadic and latency is high. To ensure effective delivery of applications to all users, the network must be optimized. Because users are operating in many different sized work locations from a few hundred users all the way down to a single user, it is imperative that the solution takes into account the unique, specific requirements. Integrating Citrix WANScaler technology into the Dynamic Delivery Center gives every type of user, from the single home office worker to the branch office all the way up to the large regional office, a headquarters-like computing experience based on the device's optimization and compression capabilities.

# Summary

Moving from a traditional data center model to a Dynamic Delivery Center is not an easy endeavor as it takes proper planning and design. The benefits of the Dynamic Delivery Center can dramatically change the way users work with the infrastructure and how applications are delivered. The Dynamic Delivery Center can improve the flexibility, availability and usability of the environment while making it easier to manage. Although the transition may take several months or longer, it can be addressed in stages, allowing an organization to quickly see the benefits in a short amount of time. The first phase is to improve utilization and reduce the power and space requirements by means of virtualization. Building the core XenServer virtualization infrastructure will allow an organization to migrate the appropriate physical workloads into a virtual environment at a reasonable pace. As the virtualization infrastructure is built, application virtualization, desktop virtualization, network optimization can be integrated to provide more automated management, greater levels of availability and redundancy, and a more simplified user experience. By incorporating user mobility requirements, high user experience, simplified management, high availability, energy efficiencies, security, and network optimization, it is possible to transition from the static data center to the Dynamic Delivery Center.

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