



Simplifying data management through agile and secure cloud storage

By Gene Chesser, Eric Dey, and Fred Johnson

Cloud storage places high demands on data management. Combining the Dell™ DX Object Storage Platform with the F5® BIG-IP® application delivery controller creates a highly flexible, secure object-storage system.



F5 and Dell communities

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Storing and managing growing amounts of unstructured digital content requires administrators to apply intelligent data management to help reduce costs and to achieve enhanced efficiency. The Dell DX Object Storage Platform provides content-addressable storage designed to intelligently access, store, protect, and distribute fixed digital content in varied environments. For activities that range from Web publishing to archiving, the DX Object Storage Platform offers data and storage management features through a self-managing, self-healing, and peer-scaling architecture.

The DX Object Storage Platform consists of integrated storage software that runs on standard x86-based Dell servers, creating advanced storage clusters interconnected by Ethernet and TCP/IP. These clusters use a cloud-based architecture and simplified access through standard protocols including HTTP (native Representational State Transfer [REST]), Common Internet File System (CIFS), and Network File System (NFS). As storage needs evolve, administrators can transparently upgrade—they can add, replace, or retire nodes—without manual migrations. By incorporating metadata into stored objects, administrators can apply preservation, search, replication, retention, and deletion policies, among others, thereby reducing demand on management resources and facilitating enhanced discovery.

Scaling the interface

Best practices for HTTP access to the Dell DX Object Storage Platform recommend that application clients communicate with the real IP addresses of the individual storage nodes within a cluster. This direct method of access works very well for applications that share a private virtual local area network (VLAN) with the DX Object Storage Platform cluster nodes, but it can limit the ability of IT managers to securely and effectively provide high-performance object-storage access to a large, highly distributed and diverse client base.

To scale DX Object Storage Platform access beyond the local network, clusters must be presented in a way that allows organizations to safely and easily publish access to a shared cluster across various organizations and locations, while supporting application traffic that traverses a mix of trusted and untrusted networks. To meet these requirements, a successful deployment often depends on a tightly integrated application delivery network (ADN) to enhance security, management, and monitoring; help simplify and scale access; and help improve availability.

Virtualizing the network access

The F5 BIG-IP application delivery controller and in-line proxy presents a Dell DX Object Storage Platform cluster as one or several virtual IP (VIP) addresses. Virtualizing a cluster at the VIP address helps simplify the network interface for

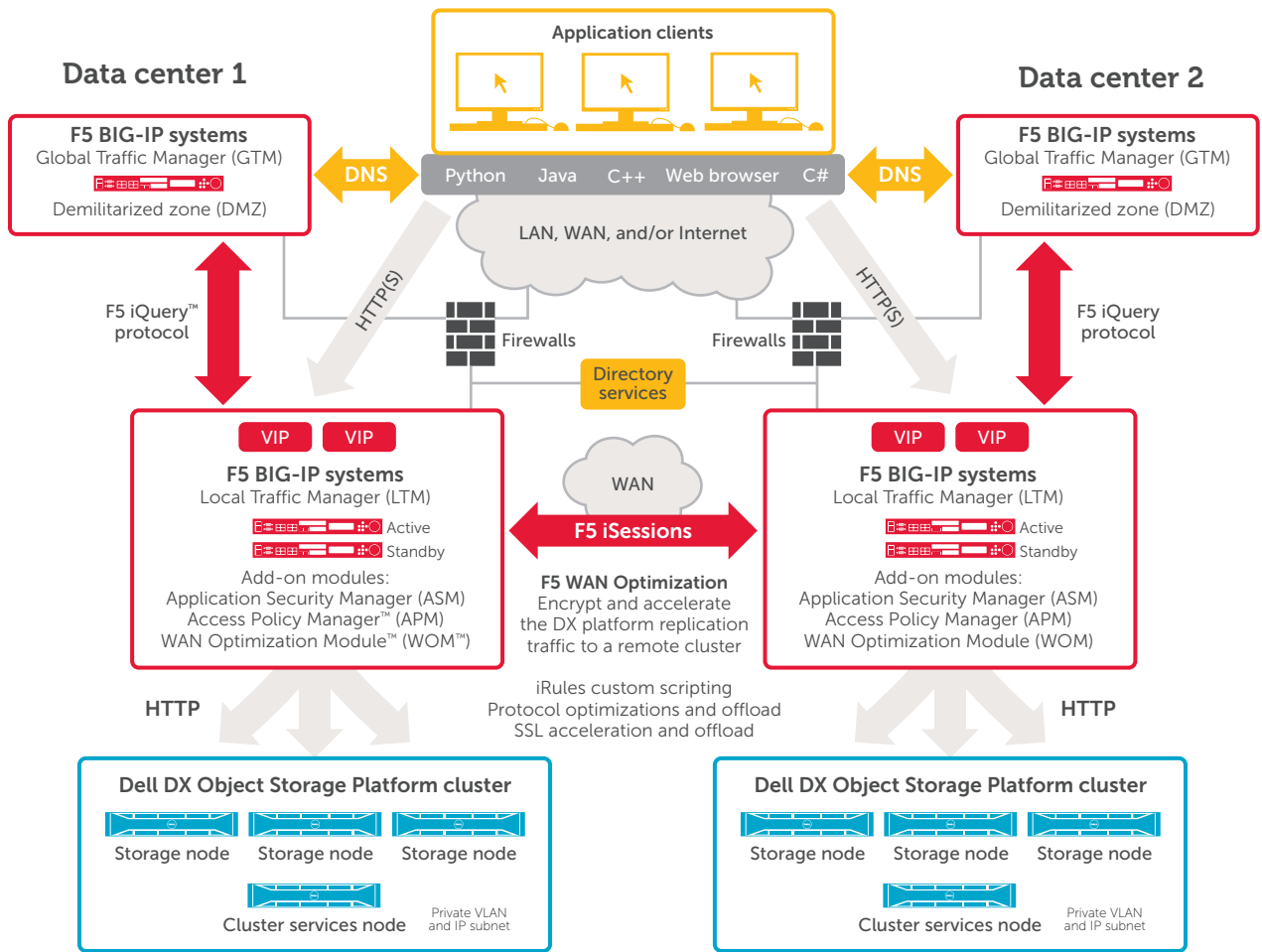


Figure 1. Example Dell DX Object Storage Platform reference architecture traffic flow through two geographically diverse clusters with F5 BIG-IP system front ends

access, management, and enforcement (see Figure 1). Residing in each data center are two VIP addresses that provide access to a shared cluster for organizations. The example shown in Figure 1 also applies to physically separate, nearby clusters (such as those within the same campus). Some key features for multi-tenancy and compliance are available through software add-on modules.

As the application clients make requests to the object store, the Global Traffic Manager™ (GTM™) performs data-center load balancing and transparent failover. The GTM intelligently resolves Domain Name System (DNS) name queries to the BIG-IP Local Traffic Manager™ (LTM®) VIP addresses based on configuration policies, yielding an optimal

global distribution of client traffic. Clients, regardless of geography, may reference a single DNS name to access their highly available storage resources.

The LTM monitors data-center resource pools, actively assessing DX Object Storage Platform cluster availability and sharing this information with the GTM. As client traffic arrives at the VIP address, the LTM distributes the load to the appropriate available storage nodes. Using F5 iRules® event-driven scripting language, LTM can dynamically adapt the load-balancing decision on the basis of cluster redirect responses (for more information on managing IP traffic using a scripting language, see the sidebar, "Using scripting language to manage IP

application traffic"). This capability allows the BIG-IP application delivery controller to send traffic to the optimal storage node, as determined by advanced load-balancing methods, while making real-time adjustments for content location and storage node utilization, as determined by the DX Object Storage Platform cluster. Combining the DX Object Storage Platform and BIG-IP application delivery controllers helps create a highly reliable, easily accessible storage system.

Creating a strategic point of control

The position of the F5 BIG-IP application delivery controller in the network—in front of the cluster—creates a strategic control point and critical layer of additional security:



every client request destined for the Dell DX Object Storage Platform cluster passes through the VIP address before being distributed to the storage nodes. Here, the DX Object Storage Platform and BIG-IP application delivery controller integrate multi-tenancy, security, and compliance to create a versatile cloud storage system.

To concentrate many organizations onto a shared storage cluster, administrators can create one or several VIP addresses that use the same resource pool containing the storage nodes in a single DX Object Storage Platform cluster (that is, many VIP addresses to one cluster). Each VIP address is dedicated to a specific organization and has unique security, access, and network policies based on the security requirements of the organization.

As their HTTP requests come in to the different VIP addresses, they are processed and the policies are applied. If, for example, authentication fails or a capacity limit has been reached, then service to the cluster can be rejected, the client request fails or

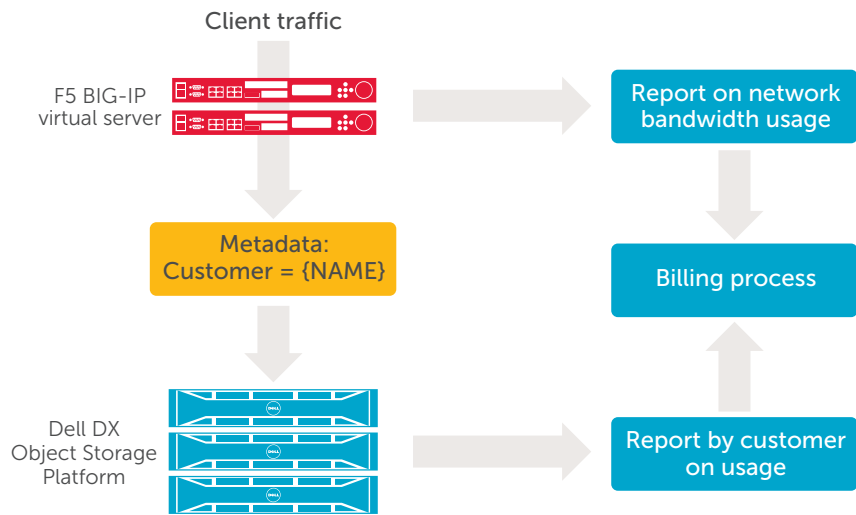


Figure 2. Example information flow for chargeback reporting

an alert can be sent, and the cluster does not see the request. Successful requests can be load balanced and then received by the selected storage node in which data is normally stored, without any changes to the DX Object Storage Platform configuration. This storage system can support large-scale,

complex access models for a shared cluster storage resource. The following features illustrate additional capabilities:

- **Authentication, access control, and reporting:** Authenticate traffic against directory services before allowing client access to the cluster; report on end-user logon activity.
- **Secure Sockets Layer (SSL) acceleration:** Require end-to-end SSL encryption to help ensure the privacy of network communications, reduce utilization, and improve performance by offloading encryption and TCP processing overhead from storage nodes.
- **Rate shaping:** Apply rate shaping—quality of service (QoS)—to enforce bandwidth utilization limits.
- **Metadata:** Link network access to stored-object access through metadata tags and iRules for enhanced security, control, and reporting.
- **Web application firewall:** Enable F5 BIG-IP Application Security Manager™ (ASM™) to protect DX Object Storage Platform Web services, help increase visibility, and help improve Payment Card Industry Data Security Standard (PCI DSS) compliance.

Using scripting language to manage IP application traffic

A Tool Command Language (Tcl) scripting feature of F5 BIG-IP devices allows inspection and manipulation of application network traffic as it passes through the system. Often used to customize BIG-IP device behavior or fix application problems, this advanced feature facilitates platform integration between systems without additional product development. For the Dell DX Object Storage Platform, Dell and F5 have developed a base iRule that is meant to create a cohesive approach to storage. The script supports local cluster access.

IT staff may further customize this script to support advanced requirements.

```

when HTTP_REQUEST {
  if { condition is true } {
    do this ...
  } else {
    do that ...
  }
}

```

This script is available for download from the Dell Enterprise Technology Center Web site at delltechcenter.com/page/f5. For more information about iRules, visit devcentral.f5.com/irules.

- **Compliance:** Meet industry and federal standards such as the Federal Information Processing Standard (FIPS) and Network Equipment-Building System (NEBS) Level 3 certifications on specific hardware appliance models.
- **Administrative boundaries:** Maintain strict separation of traffic flows and administrative access between organizations using route domains and partitions.

For enhanced flexibility, the F5 BIG-IP Virtual Edition LTM (VE) is a software appliance for highly dynamic environments that have reduced performance requirements. The VE runs on Dell servers and standard hypervisors to provide local traffic management that allows administrators to create separate BIG-IP VE virtual machines for organizations.

Managing chargeback and monitoring

Building effective management and billing systems requires a comprehensive view of the Dell DX Object Storage Platform infrastructure. Relying on standards like Simple Network Management Protocol (SNMP) and robust application programming interfaces (APIs), such as the F5 iControl® API, help increase flexibility and enable programmatic, automated chargeback and monitoring using a variety of management tools.

Usage information can be provided to a billing system by reporting on the F5 BIG-IP virtual server network usage statistics and the DX Content Router software in-place usage statistics for a specific organization (see Figure 2). By using F5 iRules to insert an HTTP header in the request, administrators can then use custom metadata associated with the stored objects to report on disk usage by organization. The example shown in Figure 2 provides a combined network (bytes in/bytes out) and disk usage (bytes stored) chargeback report to a billing system that can be tied back to an organization.

Additionally, administrators can apply flat-rate chargeback using the F5 BIG-IP L7 Rate Shaping™ capability, which creates per-organization network bandwidth utilization

Dell Services: Managing object-based storage

Dell Services provides consulting based on experience gained through thousands of engagements with organizations in a variety of industries. Dell can collaborate with organizations to help them plan, assess, and implement data management projects—helping organizations keep projects focused and on schedule. Dell offers a wide range of customized consultation services offering robust design and implementation that helps organizations achieve a successful deployment of the Dell DX Object Storage Platform for cloud storage and archiving needs.

limits on the BIG-IP virtual server. This feature is designed to enable a simpler billing model that also protects organizations by enforcing minimum and maximum network bandwidth limits in a multi-tenant environment.

Gaining strategic control of cloud storage

The Dell DX Object Storage Platform goes beyond traditional object storage by deploying the F5 BIG-IP as a strategic control point. This storage configuration extends multi-tenancy and security functions to the network while providing deployment options designed to be extremely flexible, manageable, scalable, and easily accessed. Through the Dell Services data management consulting practice (see the sidebar, “Dell Services: Managing object-based storage”), Dell helps organizations assess their need for cloud-based object storage as part of a comprehensive intelligent data management strategy. **PS**



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