BROCADE

WHITE PAPER

Remove the Distance Barrier: Achieve Secure Local Replication Performance over Long Distance for IP Storage

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The Pillars of IP Extension

The Brocade® IP Extension solution for IP Storage is an evolutionary technology that enhances the ability of storage and mainframe administrators to perform day-to-day operations, close support issues faster, maintain Service-Level Agreements (SLAs), secure data, and optimize the use of Wide-Area Network (WAN) bandwidth. IP Extension technology is constructed on four foundational pillars: performance, security, availability, and operations. These pillars are paramount to every IT organization.

Superior Performance

Simply put, IP storage applications can gain significant increases in performance across the WAN between two data centers when they use a Brocade IP Extension solution. The more latency and packet loss between the data centers, the greater the gain. The Brocade 7840 Extension Switch and the Brocade SX6 Extension Blade provide performance gains up to 50 times the performance of native Transmission Control Protocol/Internet Protocol (TCP/IP) stacks. Such performance gains enable use cases that were not previously feasible.

Brocade IP Extension technology helps IP storage devices achieve the fastest speeds possible, by leveraging local TCP acknowledgements (TCP acceleration). The Brocade 7840 Extension Switch and the Brocade SX6 Extension Blade do this by terminating the end-device TCP sessions locally. Data is then optimally and rapidly transported across the WAN using WAN-optimized TCP technology from Brocade. At the remote site, another local TCP session is established to communicate with the destination end device by using local acknowledgements.

Adaptive Rate Limiting (ARL) is used to maximize WAN utilization while sharing a link with other nonstorage applications. Native TCP/IP stacks on IP storage applications do not have the ability to adaptively alter rate limiting based on conditions in the IP network, but the Brocade 7840 Extension Switch and the Brocade SX6 Extension Blade do have this ability. Brocade Adaptive Rate Limiting dynamically adjusts shared bandwidth between minimum and maximum rate limits and drives maximum I/O even with a downed redundant system.

For more details on ARL, please refer to the Brocade white paper titled *Brocade Adaptive Rate Limiting*.

The Brocade 7840 Extension Switch and the Brocade SX6 Extension Blade use aggressive deflate compression, making the most out of available bandwidth. Typically, aggressive deflate mode achieves 4:1 compression[1]. Brocade IP Extension compression offloads from hosts and appliances the need to perform compression or adds compression to flows that cannot be compressed by the application. On a host running Virtual Machines (VMs), IP Extension-based compression permits the processor capacity of the host server to be utilized more efficiently for additional VMs.

Increased Security

All data leaving the confines of a data center should be secured. The Brocade 7840 and the Brocade SX6 have a robust hardware-based IPsec implementation to provide assurance that security compliance requirements are met. The use of a hardware-based IPsec implementation that encrypts data flows over distance without a performance penalty allows ultra-low added latency (5 µs) and line rate operation for four 10 gigabit per second (Gbps) connections. When using IPsec, there is no need for intermediate firewalls, which tend not to provide equivalent performance. Intermediate firewalls also affect throughput, increase complexity, add points of failure, and increase Total Cost of Ownership (TCO)—in other words, they reduce Return on Investment (ROI). The Brocade implementation of IPsec protects data from end to end and minimizes exposure to data breaches to avoid unwanted publicity. The Brocade 7840 Extension Switch and the Brocade SX6 Extension Blade include IPsec in the base unit, and there are no additional licenses or fees. IPsec on the Brocade 7840 and the Brocade SX6 implements Advanced Encryption Standard (AES) 256 encryption, Internet Key Exchange version 2 (IKEv2), Secure Hash Algorithm (SHA)-512 Hashed Message Authentication Code (HMAC), and frequent nondisruptive rekeying.

Continuous Availability

Extension Trunking is a Brocade technology originally developed for mainframes and now broadly used in open systems environments. Extension Trunking shields end devices from IP network disruptions, making network path failures transparent to replication traffic. Multiple circuits (two or more) from the Brocade 7840 and the Brocade SX6 are applied to various paths across the IP network. The most common example of this is redundant Data Center Local-Area Network (DC-LAN) switches. For instance, one circuit goes over DC-LAN Switch A, and the other circuit goes to DC-LAN Switch B. This is a simple and effective architecture for redundancy and increased availability. Of course, as needs dictate, the application of circuits over various paths and service providers (up to eight circuits per IP extension tunnel) can establish a highly available infrastructure for IP storage.

Extension Trunking supports aggregation of multiple WAN connections with different latency or throughput characteristics (up to a 4:1 ratio), allowing you to procure WAN circuits from multiple service providers with different physical routes, to ensure maximum availability. If all WAN circuits are from the same service provider, then chances are high that a single failure event (for example, equipment failure, power loss, or cable cut) can take down all WAN circuits at one time. With Extension Trunking, you can protect your replication traffic from these kinds of outage events.

Extension Trunking offers more than the ability to load balance and failover/failback data across circuits. Extension Trunking is always a lossless function, providing in-order delivery within an extension trunk (defined by a Virtual Expansion_Port, or VE_Port). Even when data in-flight is lost due to a path failure, data is retransmitted over remaining circuits via TCP and placed back in-order before it is sent to Upper Layer Protocol (ULP). IP storage applications are never subjected to lost data or out-of-order data across the WAN.

Normally, when Brocade IP Extension is not used, packet loss in the IP network results in extremely low performance on native IP Storage TCP/IP stacks. These stacks have little to no tolerance for packet loss across the IP network. On popular Network-Attached Storage (NAS) platforms during periods of 0.1 percent packet loss and 5 milliseconds (ms) Round Trip Time (RTT) latency, the reduction in throughput is 95 percent or more.

ARL is used with Extension Trunking to maintain available bandwidth to storage applications. For example, if DC-LAN Switch A goes down, then as long as DC-LAN Switch B remains online and has ample bandwidth connectivity, it should be able to maintain all the original

[1] Brocade makes no claims, promises or guarantees as to the compression ratio achievable to customer specific data.

bandwidth to the application. In this case, it is necessary for rate limiting to readjust upward and compensate for the lost pathway. Rate limiting is used to prevent oversubscribing the WAN and any associated contention or congestion. Congestion events force TCP to perform flow control, which is extremely inefficient, slow to react, and results in poor performance. ARL adjusts from a normal condition that is not oversubscribed to an outage condition that maintains the same bandwidth. Clearly, this is essential to continuous availability.

Operational Excellence

Storage and mainframe administrators need to have visibility, monitoring, and reporting and diagnostic tools to help them gain operational excellence. Brocade provides features and functionality that help administrators more efficiently perform their jobs and maintain SLAs within their organizations.

In most cases, handing off IP storage connections to the IP network creates operational boundaries that are difficult to manage. Refer to Figure 1. If the IP network goes completely down, the situation is not difficult to prove. However, if the network is only degraded or suboptimal, what do you do? Is it obvious when there is a degraded condition? How do you back up your suspicions? How do you document the situation? Where is the problem located: in the end devices, local IP network, remote IP network, service provider, or somewhere else? How should you respond to a suspected problem? Can you rely on the network team to do their due diligence without providing documentation and proof to back up the storage/mainframe operational issues? A large percentage of storage and mainframe administrators encounter these and similar major problems with storage applications across the IP network.

Consolidating just IP storage flows or both IP storage and Fibre Channel/ Fiber Connectivity (FC/FICON) flows into a single tunnel significantly increases operational excellence. Operationally, the managed tunnel offers the advantages of Brocade Fabric Vision™ technology, the Monitoring Alerting Policy Suite (MAPS), the WAN testing tool (Wtool), and Brocade Network Advisor.

IP Extension enables consolidated flows from heterogeneous devices and multiple protocols. The increased insight gained with a holistic view and correlation, instrumentation, and granularity simplifies management across data centers. Custom browser-accessible dashboards for IP storage or combined FC and IP storage provide storage administrators with a centralized management tool to monitor the health and performance of their network. Brocade Fabric Vision technology extends proactive monitoring between data centers, to automatically detect WAN anomalies and avoid unplanned downtime. This simplifies troubleshooting: administrators can quickly identify issues and ownership, resulting in quicker resolutions. The Brocade 7840 and the Brocade SX6 provide a built-in traffic generator and WAN test tool to prevalidate and troubleshoot the physical infrastructure, streamlining deployments and preventing issues from arising.

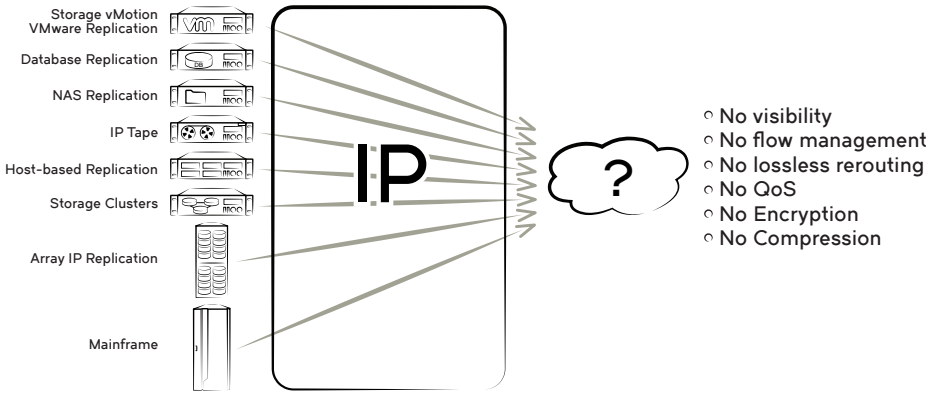

Figure 1: IP storage handoff without Brocade IP Extension.

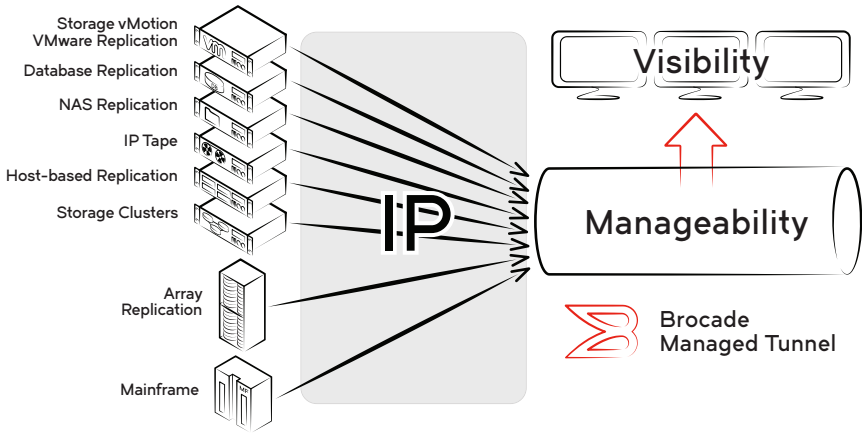

Figure 2: IP Storage handoff with Brocade IP Extension.

The Situation

A wide variety of storage applications use native IP as the transport between data centers. Storage administrators hand off these IP connections to LAN network administrators for transport from the local data center to remote data centers. Ultimately, storage and mainframe administrators are held responsible for their applications, regardless of the IP network's behavior (over which they have no control and often no visibility or diagnostic capability). This creates an awkward situation in which storage and mainframe administrators are responsible for something that is not within their control. Brocade and our OEMs understand this situation and are taking steps to help administrators "take control."

How can administrators take control of IP storage flows? Clearly, the IP network must continue to transport data between data centers across the WAN infrastructure. Fortunately, this does not change. The fundamental difference lies in the handoff of IP storage flows to the network. Packaging all flows—FC, FICON, and IP—into a single managed tunnel provides some key benefits: visibility, acceleration, security, and prioritization of IP Extension flows as well as bandwidth management and pooling.

Visibility

Making flows visible across the network requires a hardware system (the Brocade 7840 platform with Gen 5 Fibre Channel technology or the Brocade SX6 Extension Blade with Gen 6 Fibre Channel technology), an operating system (Brocade Fabric OS®), and a management platform (Brocade Network Advisor). These Brocade technologies include Brocade Fabric Vision technology, MAPS, and Wtool. Knowing information about specific flows empowers storage and mainframe administrators by ensuring that relevant conversations with network administrators concerning nonoptimal or degraded application conditions are documented. Additionally, leveraging visibility and network tools resolves support tickets significantly more quickly.

Brocade makes many aspects of monitoring the extension tunnel over the IP network available. These statistics are captured over time and displayed on graphs. Brocade Network Advisor allows you to play back the behavior of your environment, since all monitored statistics are timestamped and held in a database. The database can play back timed events so that storage and mainframe administrators can actually see and correlate events as they happened. For example, you might see that an unusual number of dropped packets and duplicate ACKs (Acknowledgements) occurred before a circuit bounced. This indicates that the IP network was unable to deliver datagrams to the remote side during this period of time, which correlates with the circuit going down. The support team can interpret such information furnished by Brocade tools to help pinpoint and resolve conditions within a troubled environment. Monitored statistics include:

- RTT
- RTT variance (jitter)
- Dropped packets
- Out-of-order segments
- Duplicate ACKs
- Compression ratio
- Fast retransmits
- Slow starts
- Circuit bounces
- Interface states
- Data rates per Quality of Service (QoS) priority
- Number of flows

In addition, monitored characteristics of the IP network are part of MAPS, therefore, actions alert users to degraded conditions across the IP network. Armed with this service-level information, storage and mainframe administrators now can open trouble tickets with their internal network administrator counterparts to restore optimal operations across the IP network.

For additional information, refer to the Brocade white paper *The Benefits of Brocade Fabric Vision Technology for Disaster Recovery*.

Acceleration of IP Extension Flows

Acceleration of flows across the WAN improves IP storage performance dramatically. Long distance increases latency and is prone to packet loss. Tested applications have demonstrated improvements of up to 50 times, due to the ability to handle latency and packet loss without performance degradation. This performance has nothing to do with compression; any compression achievable is in addition to flow acceleration. Flow acceleration is purely a function of enhanced protocol efficiency across the network.

IP Extension on the Brocade 7840 and the Brocade SX6 terminates IP storage TCP flows locally and transports the data across the WAN using a specialized TCP transport, called WAN-Optimized TCP (WO-TCP). The primary benefit here is the local ACK. By limiting ACKs to the local data center, TCP that originates from an end IP storage device has to be capable of merely high-speed transport within the data center. Most native IP storage TCP stacks are capable only of high speeds over short distances. Beyond the limits

Figure 3: Tunnel dashboard showing monitored statistics.

of the data center, "droop" becomes a significant factor. Droop refers to the inability of TCP to maintain line rate across distance. Droop worsens progressively as distance increases.

WO-TCP is an aggressive TCP stack designed for Big Data movement, operating on the purpose-built hardware of the Brocade 7840 Extension Switch and the Brocade SX6 Extension Blade. The Brocade 7840 and the Brocade SX6 offer 64 processors and 128 gigabytes (GB) of RAM to support WO-TCP. In comparison, WO-TCP has no droop across two 10 Gbps connections, up to 160 ms RTT per data processor. This is equivalent to two fully utilized 10 Gbps WAN connections (OC-192) between Los Angeles and Hong Kong.

Another benefit is the absence of Head of Line Blocking (HoLB) or Slow Drain Device (SDD) problems with WO-TCP streams. WO-TCP on the Brocade 7840 and the Brocade SX6 implements a feature called "streams." Streams are used to mitigate HoLB and SDD problems across the IP network and WAN. If all IP storage flows are flow controlled using a single TCP Receiver Window (rwnd), then all those flows slow or halt in the event that the TCP Receiver Window is shut or closed. This situation is detrimental to all applications except for the one that flow control is meant for.

It is not practical to create a separate TCP connection for each flow, as this consumes excessive resources. Instead, autonomous streams are created using virtual TCP windows for each stream. The

Brocade 7840 and the Brocade SX6 can accommodate hundreds of streams per data processor. Two data processors are present for each Brocade 7840 switch and each Brocade SX6 blade. Because a virtual TCP window is used for each stream, if a flow needs to slow down or stop, no other flows are affected; they continue to run at their full rate.

It is not the responsibility of IP storage end devices to solve IP network problems, even if native IP ports are available on those products. IP is supplied as a protocol of convenience, not for line rate performance across a WAN. Also, the cost of adding hardware to various end-device products solely to solve network performance and security issues is prohibitive, as is the cost of the software component that requires a particular skill set. The process of placing specialized engineering into every IP storage device that sends data to another data center across the WAN proves to be impractical. Alternatively, it is much easier to run IP storage flows from many IP storage devices through a pair of Brocade 7840 switches or a pair of Brocade SX6 blades at each data center.

Security of IP Extension Flows

IPsec secures data end-to-end, to ensure that flows leaving the confines of the local or remote data centers and connecting into a service provider are secure from eavesdropping and attack. The WAN infrastructure for a service provider in itself is not secure. The most common mistake is assuming that a "private" WAN connection is secure and cannot be eavesdropped or attacked. Data encryption services such as the IPsec provision on the Brocade 7840 and the Brocade SX6 prevent eavesdropping, altering, and outsider attacks of all kinds. IPsec also prevents the need for costly and complex firewalling. Because firewalls are software-based, they tend to provide poor performance.

The Brocade 7840 and the Brocade SX6 with IPsec encourage the use of encrypted data protection and do so with no performance penalty. The Brocade IPsec capability is hardware-implemented and operates at line rate (20 Gbps) per data processor with 5 microseconds (µs) of added latency. IPsec is included in the Brocade 7840 and the Brocade SX6 base units, with no additional licenses or fees.

Prioritization of IP Extension Flows

Prioritization of flows across the WAN using QoS can be achieved in various ways. The first and simplest method is to configure priorities on the Brocade 7840 or the Brocade SX6 and feed the prioritized flows into the IP network. There are three priorities for Fibre Channel over IP (FCIP): high, medium, and low, and three for IP Extension: high, medium, and low, for a total of six priorities. In addition, the percentage of bandwidth during contention that is apportioned to IP Extension and FCIP is configurable. When there is no contention for bandwidth, all available bandwidth can be utilized by a flow. This first method prioritizes flows that are connected to the LAN side of the Brocade 7840 or the Brocade SX6. The Brocade 7840 and the Brocade SX6 manage bandwidth when sending data to the WAN. The only network device that requires QoS configuration with this method is the Brocade 7840 or the Brocade SX6. It is up to the IP network and WAN to perform First In, First Out (FIFO) operations, so that QoS works properly.

The second method is to mark data flows as they exit the Brocade 7840 or the Brocade SX6 and enter the IP network. Data flows can be marked with IEEE 802.1P, part of 802.1Q VLAN tagging or Differentiated Services Code Point (DSCP), or end-to-end IP-based QoS. The difficulty in using this method is that it requires the IP network to be configured to perform the proper actions based on the marking. If the IP network is not configured to do so, it does not prioritize the data flows. This usually involves a complex and sizable project on the IP network side to categorize a diverse number of flows and assign priorities to the flows. A problem with this approach is that QoS in the IP network does not remain stable. Applications and priorities change over time.

On the Brocade 7840 and the Brocade SX6, features such as QoS, 802.1P, and DSCP marking are fully supported. Typically, Brocade 7840 and Brocade SX6 users prioritize their flows within the FCIP+IP extension tunnel. It is then possible to create an SLA for the tunnel itself, so that users can deploy QoS in the manner best suited for the environment.

Bandwidth Management and Pooling

Bandwidth management and bandwidth pooling form a feature set that provides aggregate bandwidth from multiple sources, including high availability, and management of that bandwidth. Bandwidth management and pooling use the exclusive Extension Trunking technology on the Brocade 7840 and the Brocade SX6. Please refer to the Brocade white paper *Extension Trunking* for more details on this technology.

Extension Trunking has evolved to include IP Extension flows. Extension Trunking bundles multiple circuits together into a single logical trunk. Those circuits can span multiple service providers and different data center LAN switches for redundancy. Bandwidth is managed in such a way that if a data center LAN switch

goes offline or encounters any disruption along the path, the bandwidth of the remaining paths adjusts to compensate for the offline path. With the proper design, bandwidth can be maintained during outages of various devices in the pathway.

With each added circuit, even more bandwidth is added to the pool. Extension Trunking performs a Deficit Weighted Round Robin (DWRR) schedule when placing batches into the egress. Batches are an efficiency technique used by Brocade to assemble frames into compressed byte streams for transport across the WAN. A feature of Extension Trunking called Lossless Link Loss (LLL) ensures lossless data transmission across the trunk in the event that data is lost in-flight due to an offline circuit, and a WO-TCP is no longer operational across that circuit. WO-TCP itself recovers lost or corrupted data across a link, if that circuit is still operational. All data is delivered to the ULP in-order.

Extension Trunking performs failover and failback, and no data is lost or delivered out-of-order during such events. Circuits can be designated as backup circuits, which are passive until all the active circuits within the failover group have gone offline. This protects users against a WAN link failure and avoids a restart or resync event.

The Brocade 7840 switch and the Brocade SX6 blade also support jumbo frames. Even if the IP network or WAN does not support jumbo, replication devices can still use LAN-side jumbo frames, which should offload CPU on the device and accelerate replication.

IP Storage Applications

The Brocade 7840 Extension Switch and the Brocade SX6 Extension Blade are purposely designed to facilitate the efficient, secure, and high-speed transport of IP storage applications across the WAN infrastructure between data centers. The following sections describe some of the IP storage applications that either are supported or will be supported in the future by Brocade IP Extension.

NAS Replication

It is not uncommon to use back-end NAS for server storage. Many applications that are critical to an enterprise rely on a NAS network with replication of data to a safe remote location. Common NAS platforms that replicate between data centers include: HDS NAS (H-NAS), EMC Isilon SyncIQ, and NetApp SnapMirror/SnapVault. Additionally, many storage administrators take control of their environments and SLAs by building out dedicated and isolated Ethernet fabrics for the purpose of back-end NAS, as well as other storage-specific IP communications (such as Internet Small Computer Systems Interface [iSCSI], extension, and backups).

Backups

All types of backups use native IP as their transport between data centers. Some of the more common backup platforms are: Symantec NetBackup, Commvault Simpana, EMC Avamar, EMC Data Domain, IBM TSM (Tivoli Storage Manager), and HP StoreOnce, StoreAll, and StoreEver. Host-based database backups include Oracle DataGuard and GoldenGate. VM-specific backups include Zerto, VMware SRM (Site Recovery Manager), and EMC NetWorker.

Tape

Common tape systems include: IBM TS7700 GRID, HDS Sepaton, and EMC DLm.

Use Cases

A number of high-return use cases apply when deploying the Brocade 7840 Extension Switch and the Brocade SX6 Extension Blade for Data Center Interconnect (DCI) of IP storage applications. The following sections describe some of these IP storage use cases.

High-Performance Extension

Similar to FCIP extension across the WAN, the value proposition is to provide high performance, high availability, strong encryption, and operational excellence to IP-based storage flows. This is essentially the same performance that is expected locally, just over distance.

Another aspect of this use case is the ability to manage applications that operationally use a combination of FC+IP or FICON+IP. One such example is using FCIP and IP Extension with virtual tape systems, as shown in Figure 4. In high availability architectures, it is necessary for the local tape system to communicate with the remote tape system, and possibly the remote tape system with the local tape system. In the event that either the local or remote tape system is offline, tape processing can continue for mission-critical applications, such as SAP. Both hosts have connectivity to the remote tape system control unit. The FICON connection across the WAN uses FCIP extension over the same tunnel. Bandwidth and prioritization are managed by the Brocade 7840 and the Brocade SX6 to ensure reliable operation.

As for the IP connection between local and remote tape systems, instead of sharing the WAN connection with FCIP, which often is contentious and has to be continuously monitored and managed, the tape system IP connectivity is managed by a single WAN scheduler and is joined into the extension tunnel on the Brocade 7840 and the Brocade SX6. The Brocade 7840 and the Brocade SX6 optimally manage both the FCIP and IP Extension flows for optimal performance without

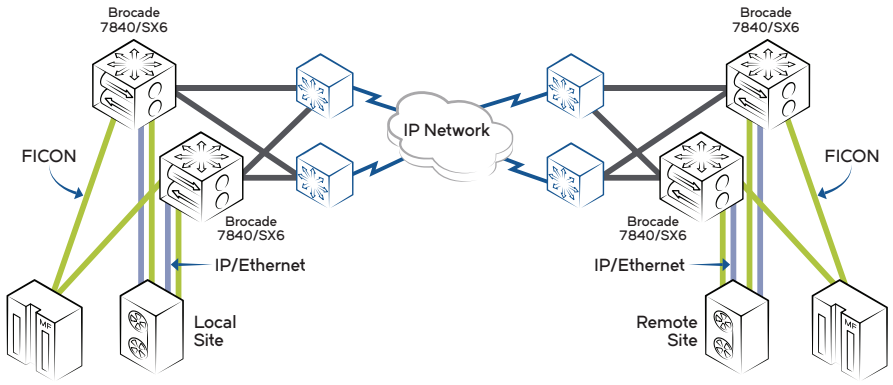

Figure 4: Using IP Extension for high-performance extension of FICON+IP.

contention or oversubscription on the WAN. Flows can further be managed with QoS, compression, IPsec, and ARL without involving long complex projects on the network side that might cause ongoing operational issues. The Brocade 7840 and the Brocade SX6 accelerate data transfers across the WAN by using Brocade WO-TCP.

Tape Replacement

Tape libraries are common in most data centers. IP extension opens up opportunities to replace tape libraries and their associated offsite storage costs (for example, Iron Mountain) with NAS storage solutions that leverage practical and efficient replication across data centers using the Brocade 7840 Extension Switch or the Brocade SX6 Extension Blade, as shown in Figure 5. 10 Gbps WAN costs have dropped to unprecedented levels, enabling cost-effective backups across the WAN into the cloud. Tape replacement by replication is compliant with offsite storage requirements, eliminates offsite storage costs, and improves Recovery Point Objective and Recovery Time Objective (RPO/RTO). High performance of NAS replication, data security, and high availability across distance with the Brocade 7840 and the Brocade SX6 enable this use case.

Private Cloud Storage (PCS)

PCS is an architecture in which customers have arrays in data centers adjacent to leading cloud providers like Rackspace, Amazon, and Azure. Replication is performed from the customer's primary data center to the remote site. The replication traffic is encrypted, compressed, and accelerated and has the availability of multiple paths and ARL. Customers benefit from data replication

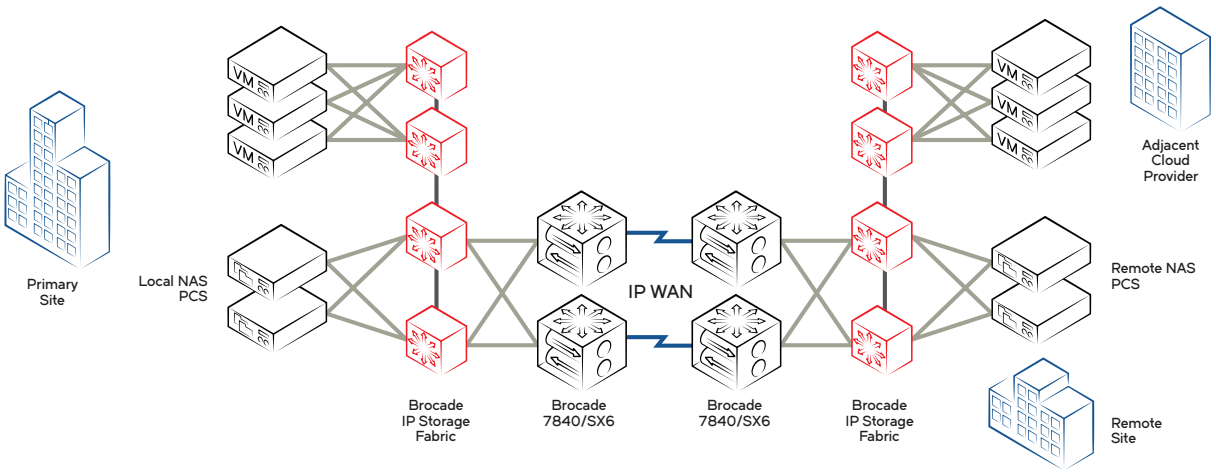

Figure 5: Remote data replication using NAS private cloud storage.

to a secondary site without having to own and operate that Disaster Recovery (DR) facility. Moreover, VMs can be spun-up at the adjacent cloud provider that accesses their PCS. These VMs can then be used to add interim capacity or for business continuance in the event of a disaster.

IP Extension Deployment

At a high level, and generally speaking, connectivity of IP storage devices to the WAN are as shown in Figure 6. The IP storage devices connect into a data center LAN switch. The LAN switch is either the IP gateway or connects to it. The gateway routes data from various subnets directly onto or towards the WAN.

When Brocade started to investigate how to deploy IP Extension, customers made their requirements clear. If cabling, IP subnets, or VLANs had to change, then IP Extension would not be usable to them. IP Extension design criteria requires no changes in cabling to the current data center LAN switch, no changes in IP addresses or subnets, and no changes to VLANs. The only requirement is a change to the gateway IP address for those subnets located across the tunnel. On local subnets, the gateways do not change. The new gateway address is a Software Virtual Interface (SVI) on the Brocade 7840 and the Brocade SX6. Data arriving at the SVI interface is placed onto the tunnel and transported across to the remote data center, using WO-TCP.

The Brocade 7840 and the Brocade SX6 can connect to data center LAN switches using a Link Aggregation Group (802.1ax LAG). This is supported on most data center LAN switches in use today. LAG allows for a generous amount of bandwidth between the Brocade 7840 or the Brocade SX6 and the data center LAN switch, and it provides for link redundancy and high availability.

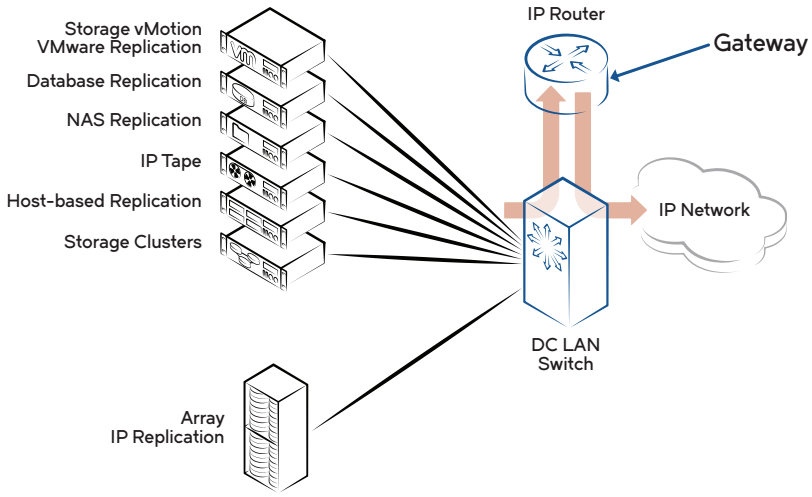

Figure 6: Common IP storage connectivity to the gateway and WAN.

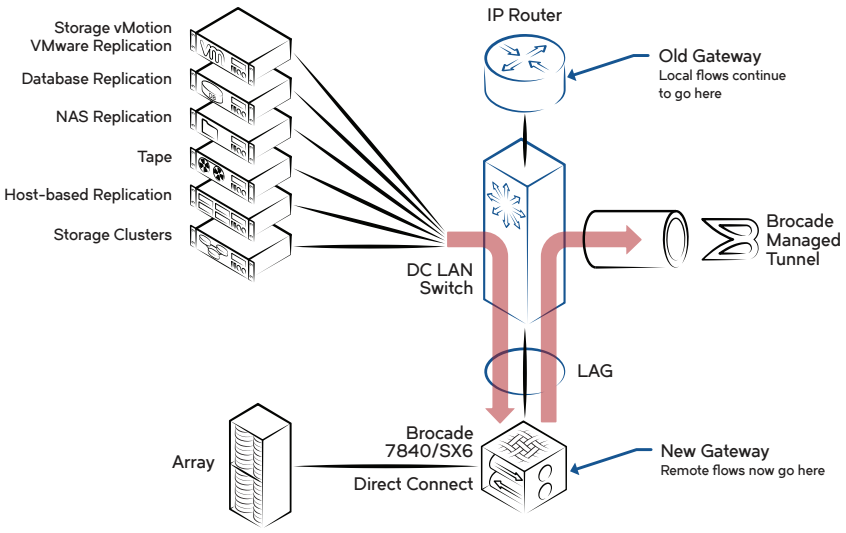

Figure 7: IP storage connectivity using the Brocade 7840 Extension Switch or the Brocade SX6 Extension Blade.

Another choice available to storage and mainframe administrators is to make direct connections to the Brocade 7840 and the Brocade SX6 from the IP storage device or host-based replication, as shown in Figure 7. The same, or different, SVI gateway and subnet can be used for direct connections.

Summary

The Brocade 7840 Extension Switch and the Brocade SX6 Extension Blade are purpose-built extension solutions that securely move more data over distance faster while minimizing the impact of disruptions. With Gen 5 Fibre Channel, IP extension capability, and Brocade Fabric Vision technology, these platforms deliver unprecedented performance, strong security, continuous availability, and simplified management to handle the unrelenting growth of data traffic between data centers in Fibre Channel, FICON, and IP storage environments. The Brocade 7840 switch and the Brocade SX6 blade are purposely engineered systems of hardware, operating system, and management platforms that provide capabilities that native storage IP TCP/IP stacks cannot provide. For example, many native storage TCP/IP stacks cannot adequately provide the following features that the Brocade 7840 and the Brocade SX6 Extension Blade provide: consolidated management platform for multiprotocol storage applications, operational excellence (especially across the IP network), bandwidth pooling and management, security, protocol acceleration, lossless continuous availability, and network troubleshooting tools.

IP Extension benefits a wide variety of IP storage applications that are found in most data centers. The consolidation of these applications into a single managed tunnel between data centers across the WAN offers real operational, availability, security, and performance value.

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