



White Paper

Cisco Wide Area Application Services Optimizations for Remote Offices with Data Domain

IT organizations are increasingly faced with the challenge of maintaining an always-on infrastructure, which requires data to be fully protected and accessible under any circumstances. IT organizations also are challenged to keep backup copies of potentially redundant data to facilitate recovery for everything from the desktop to high-end application servers. Furthermore, many organizations face pressure from regulatory bodies that require audits to make sure that information is protected to maintain industry or government compliance. To address these issues, many customers have leveraged products from vendors such as Data Domain, which provide a comprehensive set of data deduplication and replication technologies to ensure efficient utilization of storage capacity and movement of data. Cisco's award-winning Wide Area Application Services (WAAS) solution can be deployed as a complement to Data Domain to provide additional layers of optimization to further minimize bandwidth consumption and improve performance, while also helping I/T organizations consolidate distributed infrastructure.

DATA DOMAIN SOLUTION OVERVIEW

Data Domain is a leading provider of Enterprise Protection Storage systems that deliver scalable, high-throughput data protection. Data Domain optimizes storage capacity, making retention and replication of backup data extremely cost and bandwidth-efficient by providing up to 20X data reduction. Enterprises can now retain months of full and incremental backup data in nearline storage, lowering the overall price per Gigabyte and simplifying management. In addition, through the Data Invulnerability Architecture, the Data Domain systems perform continuous data integrity verification to ensure that the data being protected is available and recoverable.

CISCO WIDE AREA APPLICATION SERVICES

Cisco WAAS provides a solution that not only allows consolidation of distributed servers and storage, but also improves the performance of applications that traverse the WAN while minimizing the amount of WAN bandwidth consumption required. Whereas Data Domain provides a means of removing redundancy found on data storage systems, Cisco WAAS removes redundancy found on data traversing the network. Cisco WAAS Data Redundancy Elimination (DRE) provides extremely high levels of granularity and is able to eliminate additional redundancies found within data being exchanged between Data Domain devices. In this way, Cisco WAAS is able to provide value to nearly any TCP-based application, including applications provided by Data Domain.

Cisco WAAS couples application acceleration and WAN optimization capabilities so that remote-office workers can access centralized servers, storage, and application infrastructure with LAN-like performance. Its features include the following:

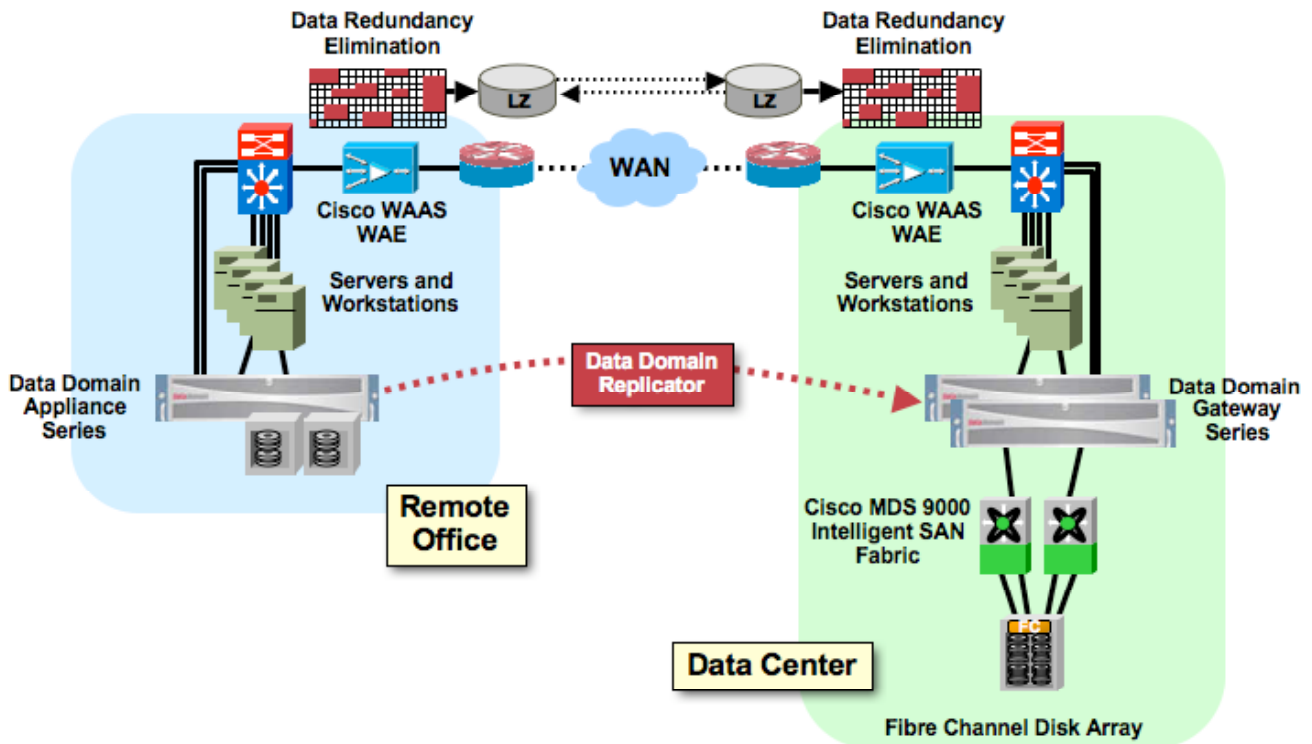
- **Application-specific acceleration**—By applying acceleration to specific application protocols, Cisco WAAS can effectively overcome the limitations of application operation in WAN environments, such as bandwidth usage and application-layer latency. Cisco WAAS employs a variety of features for application-specific acceleration, including read ahead, message prediction, safe data caching, and operation batching to provide LAN-like application performance over the WAN.
- **Advanced compression**—Cisco WAAS employs two forms of advanced compression to minimize the bandwidth consumed on the WAN. Cisco WAAS Data Redundancy Elimination (DRE) allows Cisco Wide Area Application Engine (WAE) Appliances to store application-independent blocks of data found in TCP traffic and use them to reduce the need to send the same data twice within the compression history, providing up to 100:1 compression. Persistent Lempel-Ziv (LZ) compression is applied to further reduce bandwidth consumption and provides up to an additional 5:1 compression for data in transit, even data that has been optimized by

DRE. With Cisco WAAS, WAN bandwidth is preserved and consumption is minimized, thereby improving application throughput and performance.

- **Transport optimizations**—Cisco WAAS provides optimizations for TCP with a suite of features called Cisco WAAS Transport Flow Optimization (TFO). TFO improves TCP performance and efficiency in WAN environments. By transparently scaling TCP windows and using intelligent congestion-management algorithms, Cisco WAAS helps TCP perform more efficiently and effectively over the WAN, improving application performance.

Figure 1 shows a typical remote office deployment of Cisco WAAS with Data Domain.

Figure 1. Remote Office Deployment of Data Domain with Cisco Wide Area Application Services.



CISCO WAAS OPTIMIZES DATA DOMAIN

When I/T organizations deploy Data Domain and Cisco Wide Area Application Services together, the following benefits are realized:

- Decrease WAN bandwidth consumption by up to 99%
- Increase end-user experience, performance, and productivity
- Centralize all applications, storage, and file services
- Increase compliance through elimination of tape backup and data replication
- Compress backup data to disk at ratios of up to 20X
- Reduce data restoration times from days to minutes
- Understand the full transparency advantages provided by centralized management

Data Domain’s deduplication capabilities provide up to 20X reduction in storage utilization, up to 40X throughput improvement and reduction in total time to completion for the operations presented below. Cisco WAAS provided additional optimizations that worked cohesively with those provided by Data Domain to realize an additional 8X increase in throughput (measured in Gigabytes per hour) and up to a 5X improvement in total time to completion for data replication operations performed against a 60-GB volume. Combined, the two were able to provide nearly a 200X increase in replication throughput and reduction in total time to completion.

The following test results were achieved in an environment with a T-1 connection between two locations with 80-ms of round trip latency and .1% of packet loss. Please note performance improvements are subjective based on WAN conditions, data, and other factors. The optimization you encounter in your environment may be different.

Figure 2. Cisco WAAS Improves Data Domain Throughput.

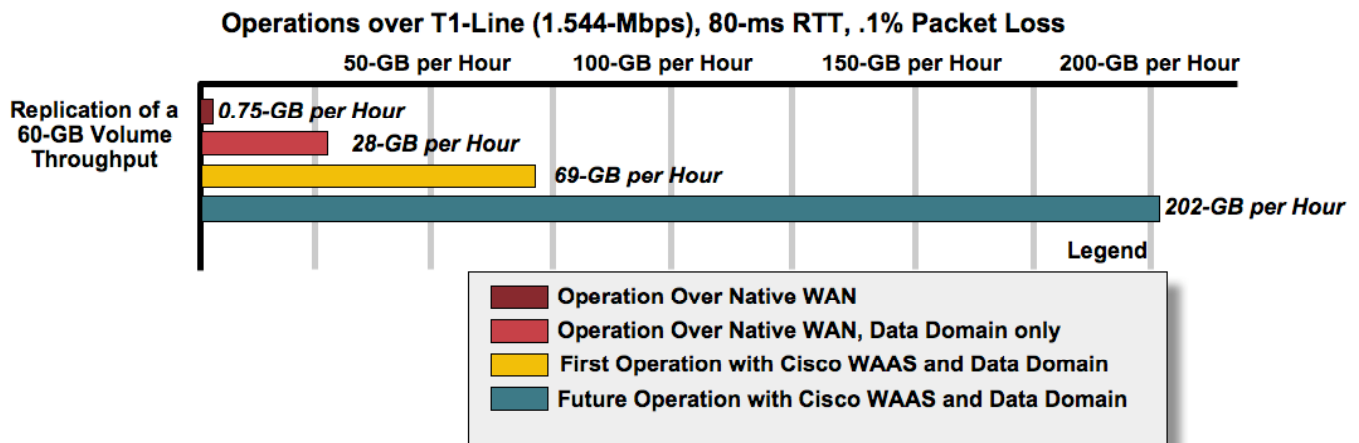
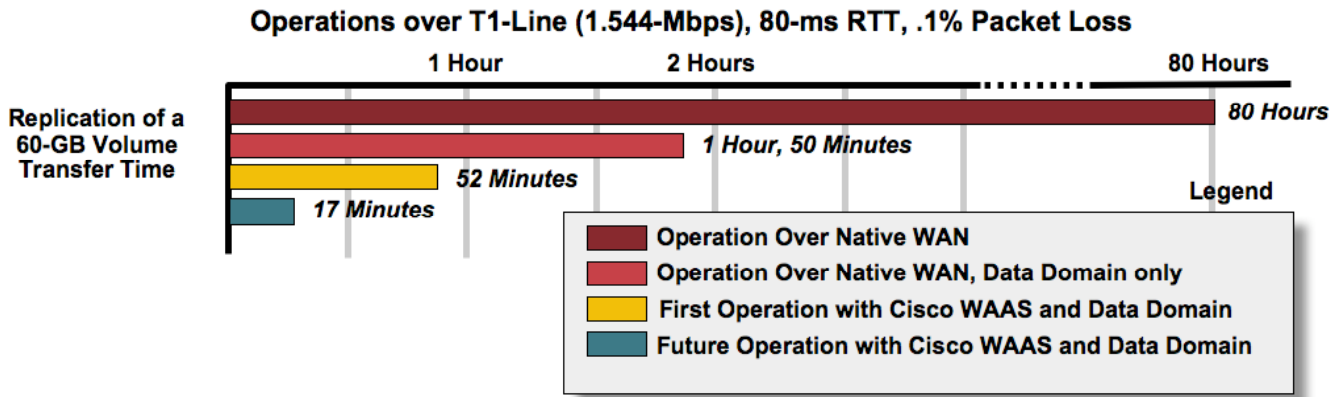


Figure 3. Cisco WAAS Improves Data Domain Response Time.



SUMMARY

Enterprise IT organizations are challenged to control costs, facilitate data availability and recoverability, and use technology to help enterprises overcome potential disasters. By employing the robust application acceleration and WAN optimization capabilities of Cisco WAAS in combination with the deduplication capabilities of Data Domain, IT organizations can achieve server and storage consolidation, thereby improving data protection and management. With fewer servers and data silos to protect, organizations can more effectively implement disaster-recovery and business-continuation technologies and procedures. Cisco WAAS can also optimize data protection and data deduplication applications such as those provided by Data Domain to better position I/T organizations toward data protection requirements.



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