

Cisco Wide Area Application Services Optimizations for 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 concerns, many customers have used products from vendors such as Data Domain, which provide a comprehensive set of data deduplication and replication technologies to help ensure efficient use of storage capacity and movement of data. The award-winning Cisco® Wide Area Application Services (WAAS) solution can be deployed as a complement to Data Domain solutions to provide additional layers of optimization to minimize bandwidth consumption and improve performance, while also helping IT organizations consolidate distributed infrastructure.

Data Domain Solution Overview

Data Domain delivers powerful, proven enterprise protection storage systems designed to optimize data protection and disaster recovery performance while reducing costs and simplifying data recovery. The Data Domain product portfolio includes self-contained arrays (DDX Array Series), high throughput and cost-effective appliances (Appliance Series), gateway devices, and software. Through these products and the data invulnerability architecture, Data Domain provides compatibility with existing enterprise backup software while also employing a technique called Global Compression, which is a highly efficient algorithm for removing redundancy found in data storage systems.

Cisco Wide Area Application Services

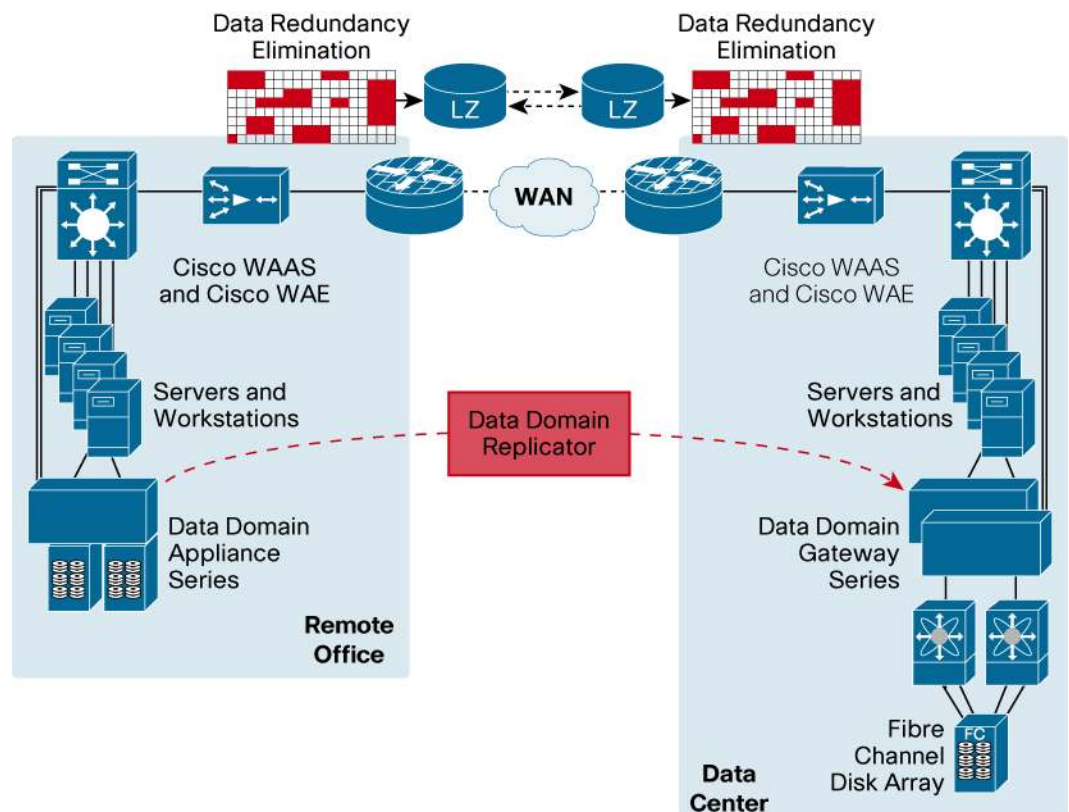
Cisco WAAS provides a solution that not only allows consolidation of distributed servers and storage, but also improves the performance of applications that traverse the WAN while minimizing the amount of WAN bandwidth consumption required. Whereas Data Domain provides a means of removing redundancy 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 eliminates redundancies found within data being exchanged between Data Domain devices. In this way, Cisco WAAS provides 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 utilization 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 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 for 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). Cisco WAAS 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 deployment of Cisco WAAS with Data Domain.

Figure 1. Deployment of Data Domain with Cisco WAAS



Cisco WAAS Optimizes Data Domain

When IT organizations deploy Data Domain and Cisco WAAS together, the following benefits are realized:

- Improved performance while accessing applications, data, and content over the WAN
- More efficient utilization of existing network resources
- Better storage economics through unique redundancy elimination techniques
- Consolidated infrastructure, yielding lower costs and simplified manageability
- Better posture toward data protection, including backup, recovery, replication, and compliance

Cisco WAAS provides up to an 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 for a 60-GB volume. The test results described here were achieved in an environment with a T-1 connection between two locations with 80 milliseconds (ms) of round-trip time (RTT) latency and 0.1% packet loss. Data Domain data deduplication achieved a 20X global configuration factor and tremendous improvements in throughput compared to the native WAN, and Cisco WAAS provided additional optimization to further increase throughput. Figures 2 and 3 show the performance improvement provided by Cisco WAAS. Please note that performance improvements depend 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

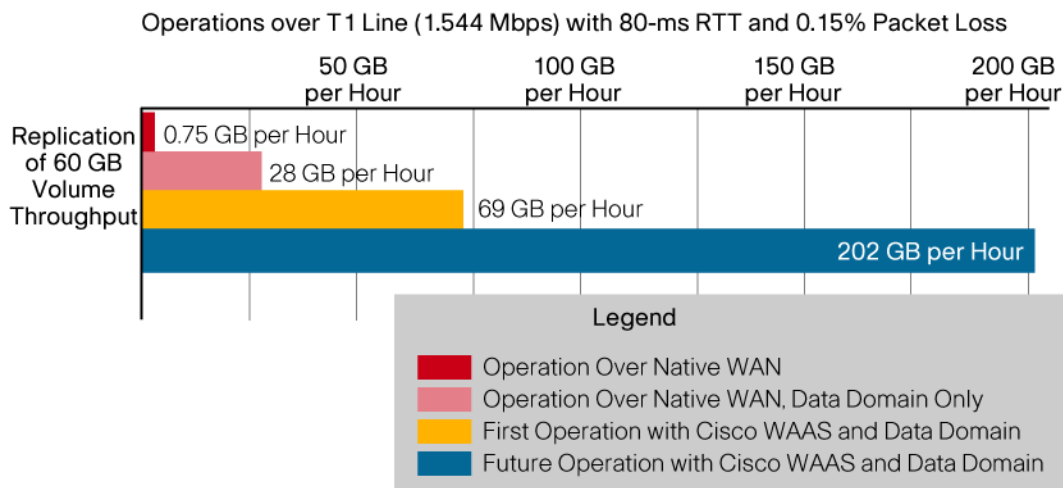


Figure 3. Cisco WAAS Improves Data Domain Response Time

