White Paper

Accurate End-to-End Performance Management Using CA Application Delivery Analysis and Cisco Wide Area Application Services

What You Will Learn

IT departments are increasingly relying on best-in-class end-to-end performance analysis and management tools to validate application performance and isolate problem areas. Application acceleration and WAN optimization solutions have not historically been interoperable with such solutions because of a fundamental lack of network-layer transparency and TCP proxy architectures. Cisco® Wide Area Application Services (WAAS) is a solution that provides industry-leading interoperability with any such solution.

Cisco WAAS is a comprehensive, cost-effective, cloud-ready WAN optimization solution that accelerates applications, optimizes bandwidth, provides local hosting of branch-office IT services, and enables cloud services, all with industry-leading network integration. Cisco WAAS allows IT departments to centralize applications and storage while maintaining productivity for branch-office and mobile users.

Cisco and CA have created the industry's first integrated management interface to overcome the TCP proxy architecture limitation. CA Application Delivery Analysis (formerly known as CA NetQoS SuperAgent) uses a management interface on all Cisco WAAS devices to provide customers end-to-end real-time application response time reports that quantify precisely the benefits of their Cisco WAAS deployments. CA NetQoS is a network performance monitoring vendor, and integration with Cisco WAAS enables customers to accurately and transparently monitor end-to-end application response time improvements before and after the Cisco WAAS deployment.

Challenges in Monitoring Application Performance

Most WAN optimization solutions implement a nontransparent TCP proxy architecture or a nontransparent tunnel architecture to provide optimization to user flows. Although this approach may help overcome application performance barriers, these architectures create challenges when an organization attempts to use most end-to-end application performance analysis tools. These challenges are mainly the result of the following problems:

- **Lack of network layer transparency:** With deployment of acceleration solutions that do not preserve critical network-layer and transport-layer information (such as IP addresses and TCP ports), end-to-end performance monitoring systems such as CA Application Delivery Analysis may not be able to distinguish application flows from one another or may see only flows between accelerators rather than between end nodes.
- **Localized handling of TCP:** With deployment of acceleration solutions that employ a TCP proxy to locally manage TCP at each accelerator near each endpoint, end-to-end performance monitoring systems lose visibility to the actual round-trip time (RTT) of a given flow because of the localized TCP handling. Such systems see immediate TCP acknowledgment as the accelerator close to the end node acknowledges TCP segments that have been received prior to optimization and transmission.

These two problems together are called WAN optimization controller (WOC) distortion.

Figure 1 shows a nontransparent accelerator solution deployed in a network. Notice that the original IP addresses and TCP port information for optimized user-to-server connections are not preserved by such a solution. Thus, this solution affects the visibility of the end-to-end performance management solution and could negatively affect its ability to accurately report and graph information. Furthermore, with a TCP proxy architecture, local accelerators acknowledge TCP segments that have been received before sending the actual data across the network. This behavior skews response time analysis, because the performance management solution sees near-immediate acknowledgment of data even though the data has not yet been transmitted over the WAN.

Figure 1. WOC Distortion: Nontransparent TCP Proxy Architecture

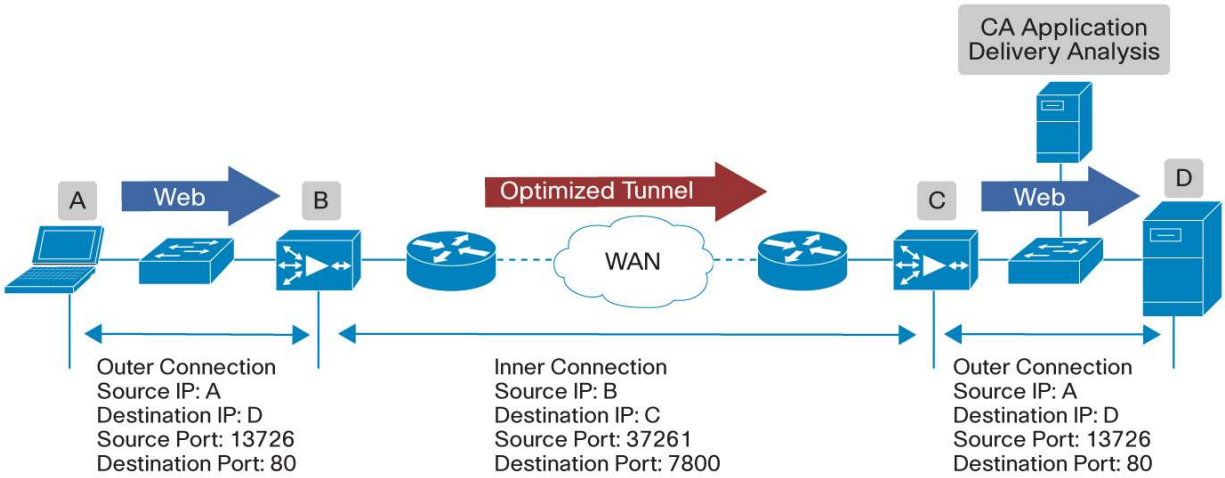


Figure 2 shows the effect of using a TCP proxy architecture on response time analysis. The left part of the figure shows the response time analysis prior to deployment of the accelerator solution. The performance management solution (such as CA Application Delivery Analysis) measures the amount of time taken to receive an acknowledgment to a TCP segment that has been transmitted; thus, the response time composition is largely related to the latency encountered in the WAN. The middle part of the figure shows the inaccurate response time analysis after deployment of an accelerator solution that uses a TCP proxy: that is, when the local accelerator immediately acknowledges TCP data that has been received. This measurement is deceptive, because the data has not yet traversed the WAN and has simply been placed in the TCP receive buffer on the local accelerator, and the sender has been acknowledged. The actual user response time, shown at the right of the figure, accurately represents the user experience.

Figure 2. WOC Distortion: Deceptive Response Time Reporting

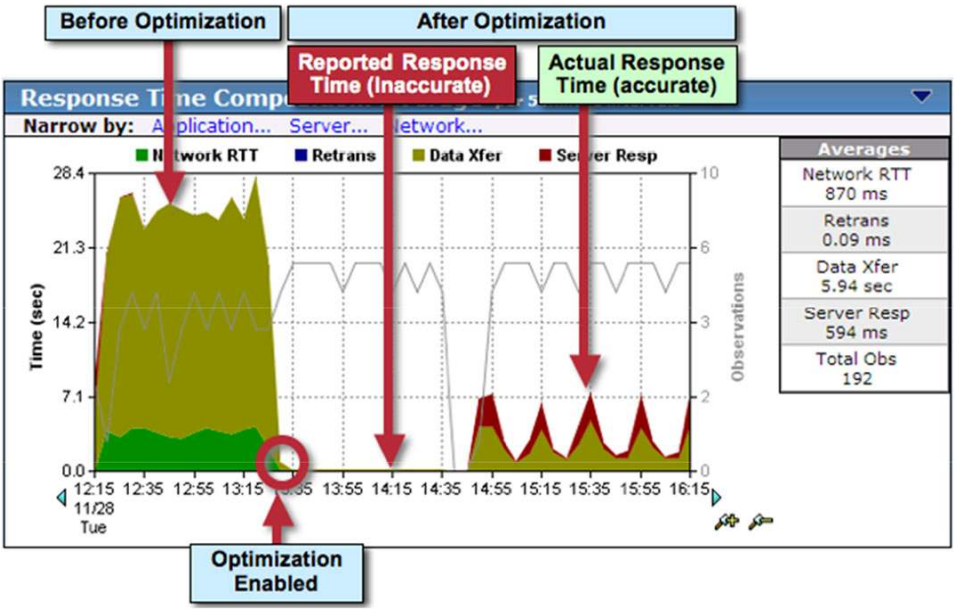
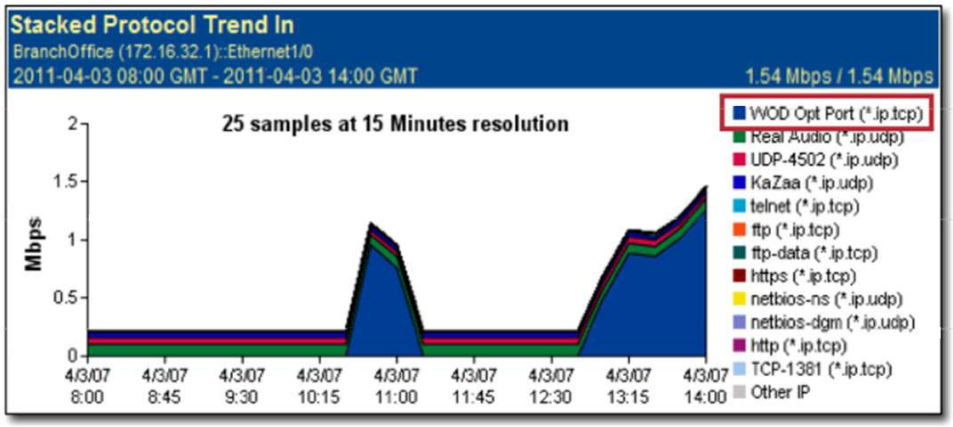


Figure 3 shows the effect of a nontransparent accelerator solution. As shown in the figure, flows that are optimized by the nontransparent accelerator solution are bundled into a single category because of the lack of transparency and use of service ports.

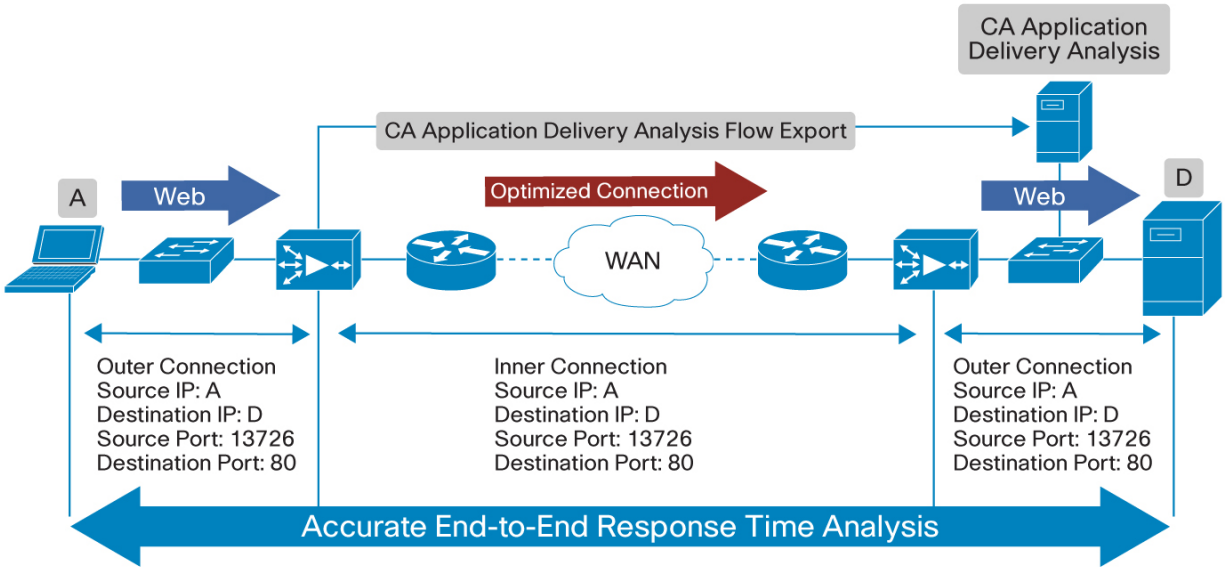
Figure 3. WOC Distortion: Loss of Application Visibility for Optimized Flows



WOC distortion presents a significant challenge to IT departments that need accurate end-to-end performance analysis. Cisco WAAS is a transparent solution that provides network transparency without compromising performance, giving such systems application visibility. However, much like other nontransparent solutions, Cisco WAAS implements a TCP proxy that, in the past, caused response time analysis to be skewed because of the localized handling of TCP. Cisco WAAS and CA have created the industry's first integrated management interface to overcome this limitation.

CA Application Delivery Analysis uses the new management interface on all Cisco WAAS devices to measure end-to-end response time, from the client to the server, over a link optimized by Cisco WAAS. Cisco WAAS devices have the capability to export the necessary TCP/IP information to CA Application Delivery Analysis through the management interface. This approach helps ensure that end-to-end application response time reporting is accurate even in the presence of WAN acceleration devices that implement TCP proxy architecture (Figure 4).

Figure 4. Cisco WAAS with CA Application Delivery Analysis Flow Export Enables End-to-End Response Time Analysis



The integration between Cisco WAAS and CA Application Delivery Analysis offers a solution that can accurately measure performance of crucial metrics in specific segments such as the LAN (outer connection A or D), WAN (inner connections), and server (outer connection D) sides. The remainder of this document examines some of the main graphs.

Integration Details

Central to the integration of Cisco WAAS and CA Application Delivery Analysis is a Cisco WAAS Software feature called the Cisco WAAS Flow Agent. This feature is part of the standard Cisco WAAS Software image and is an integral component of the management interface. This feature is typically configured on the remote-office Cisco Wide Area Virtualization Engine (WAVE) appliance or the router-integrated Cisco Services-Ready Engine (SRE) Module, and when configured, it collects relevant data on the LAN side and sends the flow information to the CA Application Delivery Analysis management console (shown in Figure 4). The CA Application Delivery Analysis Aggregator receives the data sent by the Cisco WAAS Flow Agent module, processes it, and sends it to the CA Application Delivery Analysis management console for storage and reporting. This feature can be configured on the Cisco WAAS Central Manager selectively for a single device or for multiple (or all) devices using device groups.

As a result of the network transparency, Cisco WAAS is fully compatible with tools that depend on Cisco IOS® NetFlow such as CA NetQoS ReporterAnalyzer (RA). Cisco WAAS maintains the TCP/IP header information necessary for visibility, thereby helping ensure compliance and interoperability with these tools. The integration with CA Application Delivery Analysis builds on this foundation to allow IT departments to examine and validate performance metrics before and after Cisco WAAS is deployed. These performance metrics include the following:

- Average response time: The amount of time taken to complete a transaction between client and server
- Network RTT (NRTT): The amount of time taken to move data from one node to another and receive an acknowledgment that the data has been received
- Server response time (SRT): The amount of time between a server's receipt of a request to the time when the response is sent from that server
- Data rate: The throughput achieved at a particular point in time, measured in bits per second (bps) or packets per second (pps)

The following figures show how Cisco WAAS both provides compatibility with the performance measurements taken by CA Application Delivery Analysis and helps mitigate the negative effects of the WAN on end-to-end application performance. The graphs show that Cisco WAAS dramatically reduces the effects of network latency while improving network throughput and overall application performance.

Figure 5 shows how Cisco WAAS with the Flow Agent feature enabled helps ensure that CA Application Delivery Analysis can accurately measure end-to-end response time.

Figure 5. Cisco WAAS Flow Agent Helps Ensure Accurate Performance Reporting with CA Application Delivery Analysis

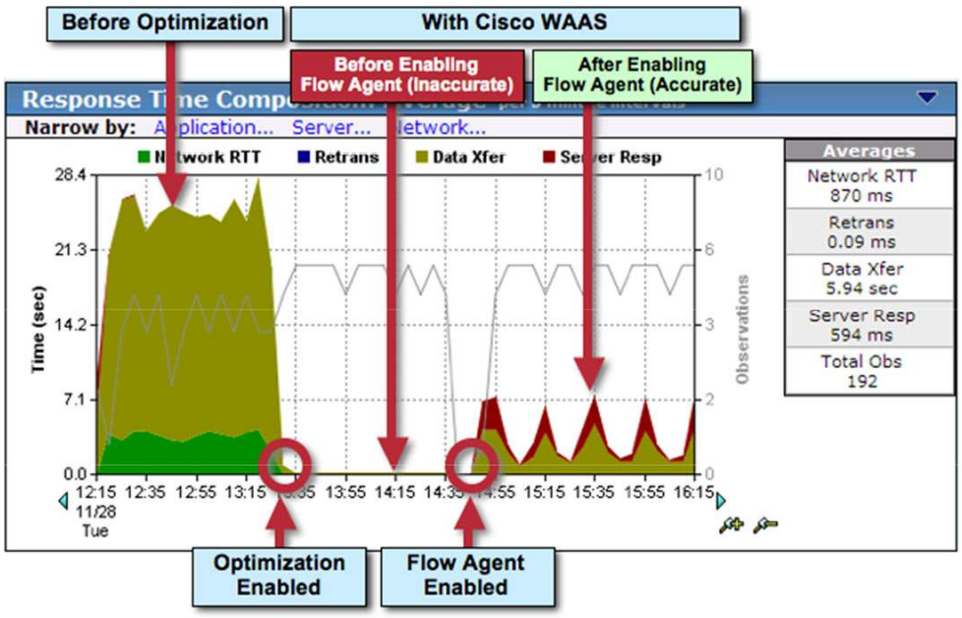
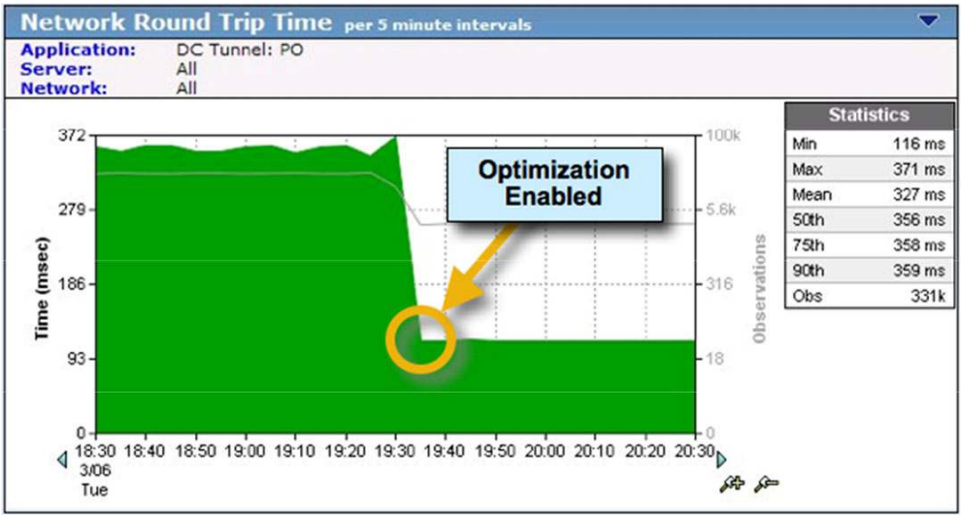


Figure 6 shows how Cisco WAAS optimizations improved application performance and WAN utilization efficiency. By improving efficiency, Cisco WAAS can alleviate congestion encountered on the network, thereby reducing the perceived RTT encountered on the WAN caused by congested router queues and inefficient bandwidth consumption.

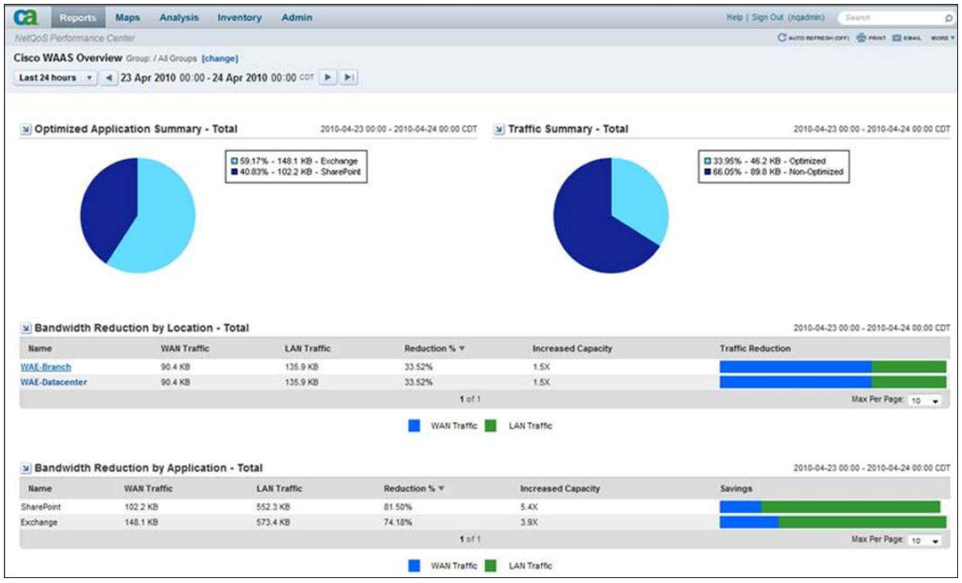
Figure 6. NRTT Before and After Cisco WAAS Deployment



The CA NetQoS Performance Center allows reporting through a single console for both CA Application Delivery Analysis and the Cisco WAAS Central Manager (Figure 7). This complementary capability provides an exclusive integrated solution for understanding the effect of WAN traffic optimization on bandwidth reduction and true end-user experience. From a single dashboard report, you can:

- Understand the overall health and device availability of your Cisco WAAS deployment
- Quantify bandwidth savings and response time improvements per location and application
- Compare current end-user response times to baseline metrics
- Diagnose and troubleshoot any version of Cisco WAAS by understanding optimization loads
- Perform before-and-after analysis for response time improvements

Figure 7. Preset Reports in CA NetQoS Performance Center That Use Cisco WAAS Central Manager and CA Application Delivery Analysis Data



Conclusion

Cisco and CA have created the industry's first integrated management interface to overcome the limitation posed by TCP proxy architecture (which exists in all WAN optimization and application acceleration solutions) to achieve accurate reporting of end-to-end application response time. CA Application Delivery Analysis uses the management interface on all Cisco WAAS devices to measure end-to-end latency, from the client to the server, over a link optimized by Cisco WAAS. As a result of this integration, users of Cisco WAAS can quantify precisely the benefits of their Cisco WAAS deployments through reports that accurately monitor and quantify end-to-end application response time monitoring by using CA Application Delivery Analysis. In addition, this solution can be used in the evaluation phase to showcase the performance benefits of Cisco WAAS and in phased deployments to identify locations that will benefit from Cisco WAAS. Over the long term, the solution can be used to baseline the improved application performance.

This solution is easy to deploy and manage successfully over a large network, and it is compatible with all the supported redirection mechanisms, including inline redirection, Web Cache Communication Protocol (WCCP), and Cisco vPath technology on Cisco Nexus® 1000V Series Switches.

For More Information

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