

# Cisco Wide Area Application Services

## What You Will Learn

This document describes the Cisco® Wide Area Application Services (WAAS) solution for WAN optimization. You'll learn how WAAS features work together to reduce your WAN bandwidth usage and lower your network service costs. You'll also learn how WAAS keeps networked applications - often developed for use on LANs - performing as expected when they operate across farther-reaching and latency-prone WANs. WAAS is available in a wide variety of form factors to match the budgets and sizes of your various work locations. Those form factors are also detailed in this document.

## Overview: Cisco WAAS 101

- **What is the solution?** Cisco WAAS is a collection of WAN optimization capabilities with accompanying centralized management. The feature set forms a key component of the Cisco Intelligent WAN (IWAN) solution. IWAN enables businesses to use less expensive Internet transport connections in branch offices without affecting performance, security, or reliability.

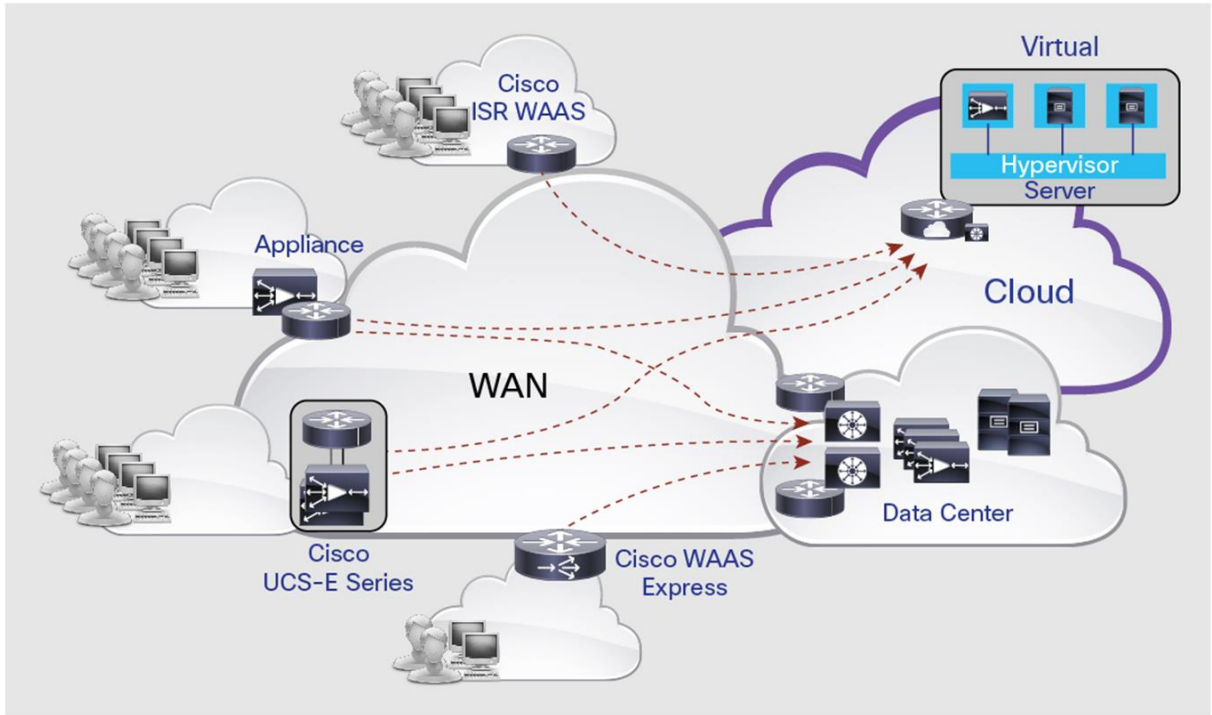
For its part, WAAS reduces the amount of WAN bandwidth you consume and optimizes the performance of your applications across the WAN. The solution is available in several form factors, which scale from small branch offices to large data centers. The deployment options range from router-integrated alternatives to dedicated hardware appliances and virtual appliances. You can configure and manage all WAAS deployments across data centers and branches using a common centralized management system.

- **How it works.** To optimize your use of WAN bandwidth, the solution applies data compression to network traffic and removes redundant data from the WAN. It also adjusts TCP window sizes to correct for packet loss and to reduce the number of data retransmissions necessary. Together, these features substantially reduce the size of your WAN traffic loads. And less traffic on the WAN means lower bandwidth consumption and smaller network services bills each month.

To accelerate application performance, Cisco WAAS uses additional software techniques such as application-specific protocol acceleration and content prepositioning and caching. These features are intended to ensure that an application behaves as intended across WAN distances - such as between a corporate site and a cloud service - to make sure users get the fast application response times they need to stay productive.

To get the full benefit of all WAAS capabilities, you must deploy WAAS at both ends of a WAN connection. However, the WAAS form factors at the two ends of the connection do not have to match (Figure 1).

**Figure 1.** Lots of WAAS Deployment Options



- **Business value.** There are two main reasons organizations find value in WAAS. First, WAN bandwidth represents a significant portion of network operating expenses. That's because WAN usage is escalating, as users increasingly access both cloud services and their corporate data centers from remote and mobile locations. They're also regularly using video, collaboration, virtual desktops, and other apps that consume very large volumes of network capacity. WAAS pares down the capacity these apps consume, however, using compression, de-duplication, and other efficiency techniques. As a result, many enterprises can move ahead with these applications but defer investments in additional WAN bandwidth. In effect, Cisco WAAS lets you squeeze the most out of the capacity you already have. That's money in the bank.

WAAS's other primary strength is in network application performance. The geographically long reach of the WAN introduces distance-based latency, often accompanied by jitter and packet loss, into data transmissions. If left unmanaged, these factors can degrade users' application experiences, especially with real-time apps that are sensitive to delays. In a domino effect, unsatisfying app experiences decrease users' acceptance of the apps, which lowers their productivity and, ultimately, impacts your business. In fact, poor application response time experienced by users in remote sites is often cited as one of the main inhibitors to cloud adoption. The WAAS solution helps counteract these negative application experiences with sophisticated acceleration techniques.

## Solution Components

Cisco WAAS core features span bandwidth optimization and application acceleration functions. They are detailed in Table 1. In addition, you can license optional, add-on WAAS capabilities to further improve your WAN usage and performance and to centrally manage your distributed WAAS deployments. These capabilities are listed in the table in the “WAAS Add-On Components” section of Table 1.

**Table 1.** Cisco WAAS Components and Benefits

WAN Optimization Feature	Description	Benefit(s)
<b>TCP flow optimization (TFO)</b>	Improves application packet flow under unfavorable WAN conditions such as during packet loss and small initial windows while helping ensure fairness.	<ul style="list-style-type: none"> <li>• Maintains consistent network performance and application session quality.</li> </ul>
<b>Context-aware data redundancy elimination (DRE)</b>	Identifies previously seen TCP traffic and replaces redundant patterns with very small signatures. Provides up to 100:1 compression depending on the data being examined for dramatically reduced WAN traffic loads.	<ul style="list-style-type: none"> <li>• Reduces your WAN traffic loads and associated monthly services bill.</li> <li>• Saves money by helping you to avoid or postpone new bandwidth investments.</li> </ul>
<b>Adaptive persistent session-based Lempel-Ziv (LZ) compression</b>	Provides up to an additional 5:1 compression on top of DRE (see previous entry) for further WAN traffic reduction.	<ul style="list-style-type: none"> <li>• Reduces your WAN traffic loads and associated monthly services bill.</li> <li>• Saves money by helping you to avoid or postpone new bandwidth investments.</li> </ul>
<b>Per-application optimization</b>	Application-specific acceleration is available for Microsoft Windows file sharing (Common Internet File System [CIFS]); Microsoft Exchange (Messaging API [MAPI] and MAPI over SSL); encrypted MAPI [EMAPI], HTTP, and HTTPS applications such as Oracle, SAP, and Microsoft SharePoint and Outlook Web Access (OWA); Microsoft Windows print services; UNIX Network File System (NFS); and Citrix ICA.	<ul style="list-style-type: none"> <li>• Helps ensure that much-used business apps initially designed to operate on faster, shorter-distance LANs continue to perform as expected across slower and longer-distance WANs.</li> </ul>
WAAS Add-On Component	Description	Benefit(s)
<a href="#">AppNav</a>	Creates a pool of virtual WAAS resources out of all your physical WAAS service deployments. This way, WAAS traffic can be “load balanced” across available WAAS resources for optimum use.  AppNav is available as a standalone hardware appliance, as a module for WAAS appliances, and as integrated software for Cisco 4451-X Integrated Services Routers (ISRs) and Cisco ASR 1000 Series Aggregation Services Routers (ASRs).	<ul style="list-style-type: none"> <li>• Allows for easy scalability as traffic loads increase.</li> <li>• Delivers persistent uptime and WAAS resource availability.</li> </ul>
<a href="#">Cisco IWAN with Akamai Connect</a>	Performs HTTP (Internet) content caching and repositioning to make rich-media content from the web available on demand with high quality. The caching intelligence from Cisco partner Akamai comes embedded in Cisco ISRs and Cisco Wide Area Virtualization Engine (WAVE) appliances.	<ul style="list-style-type: none"> <li>• Provides a boost to performance of all business and web applications, including point of sale (POS), HD video, digital signage, and in-store online ordering.</li> </ul>

## How the Solution Is Packaged for Purchase

### • WAAS Core Functions

There are two Cisco WAAS packages of core functions that you may purchase:

1. **Traditional Cisco WAAS**, which contains all the core WAN optimization and application acceleration features described in Table 1. The full package of features is available in a wide variety of form factors, detailed in the next section.
2. **[Cisco WAAS Express \(WAASx\)](#)**, which contains a subset of traditional Cisco WAAS components. Targeted at smaller sites, Cisco WAASx is integrated natively into Cisco IOS Software on Cisco 800, 1900, 2900, and 3900 Series ISRs. WAASx supports data compression and TCP acceleration.

- **WAAS Management**

Cisco WAAS Central Manager is an add-on to core WAAS features, sold separately. Cisco WAAS Central Manager is required to manage your WAAS installation.

Workflow-based WAAS Central Manager manages configuration, provisioning, fault management, logging, and customized reporting. It can create scheduled reports for Cisco WAAS devices and ISRs running Cisco WAASx. User-friendly HTML5 interfaces provide detailed visibility into application performance, pass-through traffic, and the control and monitoring of specific context-aware devices, including clusters. You can run the management system directly on Cisco WAAS appliances or as a virtual server, called Cisco vWAAS Central Manager (vCM).

## Form Factors

After you decide what set of WAAS functions you require, you can choose from the many form factors described as follows. Consider how large the site is and how many concurrent users and traffic flows are typical when choosing your deployment options:

- **Router-integrated form factors (3):**







1. Integrated directly into the Cisco IOS XE Software image of Cisco 4451-X ISRs. You launch WAAS on this platform using EZConfig, a single command-line interface (CLI) command that makes initial provisioning simple, quick, and easy
2. Plug-in WAAS modules for certain Cisco ISR models
3. Integrated directly into the Cisco IOS Software image of Cisco ISR Generation 2 routers (WAASx functions only)

- **An appliance form factor called Cisco Wide Area Virtual Engine (WAVE).** This is the most powerful option in terms of WAAS throughput. Note that the Cisco WAVE appliance can alternatively be deployed as a WAAS Central Manager node. WAVE can function in either full WAAS appliance mode or in full WAAS Central Manager mode; it cannot perform both roles concurrently.

- **A virtual appliance called [vWAAS](#),** which is software that can run on Cisco ISR Services-Ready Engine (SRE) and [Unified Computing System E-Series Server](#) modules or on x86 servers

Tables 2 through 8 summarize each form factor and its recommended location in the network.

**Table 2.** Cisco WAVE Appliance Options

WAVE Platform	WAVE 294	WAVE 594	WAVE 694	WAVE 7541	WAVE 7571	WAVE 8541
						
<b>Network Location</b>	Small Branch Office	Large Branch Office or Campus	Large Branch Office, Data Center, or Campus	Data Center or Campus	Data Center or Campus	Data Center or Campus
<b>Target WAN Bandwidth (Mbps)</b>	10-20	50-100	200	500	1,000	2,000
<b>Number of Optimized TCP Connections Supported</b>	200-400	750-1,300	2,500-6,000	18,000	60,000	150,000
<b>Optimized LAN Throughput (Mbps)</b>	100-150	250-300	450-500	1,000	2,000	4,000

**Table 3.** ISR Services-Ready Engine (SRE) and Cisco UCS E-Series Server Blade Options

Module	SRE 710	SRE 910	UCS E-Series120	UCS E-Series 140/160/180
<b>Network Location</b>	Small to Medium-Sized Branch Office	Medium-Sized to Large Branch Office	Small to Medium-Sized Branch Office	Medium-Sized to Large Branch Office
<b>Target WAN Bandwidth (Mbps)</b>	20	50	20-200	20-200 per WAAS instance <sup>*</sup>
<b>Number of Optimized TCP Connections</b>	500	1,000	200-2500	200-6,000 per WAAS instance <sup>*</sup>
<b>Optimized LAN Throughput (Mbps)</b>	200	300	100-400	100-400 per WAAS instance <sup>*</sup>

<sup>\*</sup>It's possible to run multiple vWAAS instances on each E-Series module, and multiple modules can run on each router for greater WAAS density.

**Table 4.** Cisco vWAAS Suite of Licenses

Cisco vWAAS License	vWAAS 200	vWAAS 750	vWAAS 1300	vWAAS 2500	vWAAS 6000	vWAAS 12000	vWAAS 50000
<b>Network Location</b>	Small Branch Office, Data Center, or Campus	Small Branch Office, Data Center, or Campus	Branch Office, Data Center, or Campus	Branch Office, Data Center, or Campus	Branch Office, Data Center, or Campus	Large Branch Office, Data Center, or Campus	Large Branch Office, Data Center, or Campus
<b>WAN Bandwidth (Mbps)</b>	20	50	80	200	200	310	700
<b>Number of Optimized TCP Connections Supported</b>	200	750	1,300	2,500	6,000	12,000	50,000
<b>Optimized LAN Throughput (Mbps)</b>	100	250	300	400	400	425	1,000

**Table 5.** Cisco ISR Series Routers Supporting WAAS Express

Cisco ISR Platform	880	890	880 or 890 with 1-GB DRAM	1921	1941	2901	2900 Series (except 2901)	3900 Series
<b>Network Location</b>	Teleworker or Small Branch Office	Teleworker or Small Branch Office	Teleworker or Small Branch Office	Small Branch Office	Small Branch Office	Small Branch Office	Small-to-Medium Sized Branch Office	Large Branch Office
<b>Target WAN Bandwidth (Mbps)</b>	1.5	2	5	0.512	4	6	6	10
<b>Number of Optimized TCP Connections</b>	75	75	125	50	150	150	200	400
<b>Optimized LAN Throughput (Mbps)</b>	3	4	11	1	8	12	12	20

**Table 6.** Cisco ISR Application Experience (AX) Series Routers

Cisco ISR Platform	1921-AX	1941-AX	2901-AX	2900-AX Series (except 2901)	3900-AX Series	4400-AX Series
<b>Network Location</b>	Small Branch Office	Small Branch Office	Small Branch Office	Small to Medium-Sized Branch Office	Large Branch Office	Large Branch Office
<b>Target WAN Bandwidth (Mbps)</b>	0.512	4	6	6-200	10-200	10-200 <sup>*</sup>
<b>Number of Optimized TCP Connections</b>	50	150	150	200-6,000	200-6,000	200-6,000 <sup>*</sup>
<b>Optimized LAN Throughput (Mbps)</b>	1	8	12	12-400	12-400	12-400 <sup>*</sup>

<sup>\*</sup>It's possible to run multiple WAAS instances on each 4451 by adding additional UCS-E-Series modules.

**Table 7.** Cisco WAAS Central Manager

Cisco WAAS Model <sup>*</sup>	WAVE 294 with 4-GB DRAM	WAVE 594 with 8-GB DRAM	WAVE 694 with 16-GB DRAM
Number of Managed WAAS Nodes	250	1000	2000

<sup>\*</sup>Central Manager licensing is included with each WAVE platform.

**Table 8.** Cisco vWAAS Central Manager (vCM)<sup>\*</sup>

Cisco vCM License	vCM 100	vCM 2000
Number of Managed WAAS Nodes	100	2,000

<sup>\*</sup>Central Manager licensing is included with each WAVE platform. vCM licenses may be purchased separately and run on Cisco UCS or other x86 server with VMWare ESXi.

## Deployment Requirements and Options

Deploy WAAS on each side of the WAN connection to provide application-specific acceleration and WAN optimization capabilities. Depending on your preference for management or network topology, you can deploy Cisco WAAS appliances out of the data path or physically in-path in the data center or in the remote branch office. You can deploy Cisco WAAS network modules as well as service modules out-of-path in the branch office. Regardless of the deployment model, Cisco WAAS provides application performance improvements and enables centralization without compromising high availability and scalability.

## Service and Support

Cisco offers a wide range of services programs to accelerate customer success. These innovative services programs are delivered through a unique combination of people, processes, tools, and partners, resulting in high levels of customer satisfaction. Cisco Services offerings help you protect your network investment, optimize network operations, and prepare your network for new applications to extend network intelligence and the power of your business. For more information about Cisco Services, refer to [Cisco Technical Support Services](#) and [Cisco Advanced Services](#).

## Why Turn to Cisco?

Cisco offers the greatest variety of WAN optimization form factors in the industry, including router-integrated options. Thus customers have the flexibility to deploy WAN optimization where needed, on-demand, with the lowest footprint in the industry.

As part of the Cisco Intelligent WAN solution, WAAS can help IT navigate today's challenges around cloud, mobility, and video. Cisco offers the most comprehensive solution at a cost-effective price with validated designs to help ensure customer success.

## For More Information

For more information, please visit <http://www.cisco.com/go/waas> or contact your local Cisco account representative.




---

**Americas Headquarters**  
Cisco Systems, Inc.  
San Jose, CA

**Asia Pacific Headquarters**  
Cisco Systems (USA) Pte. Ltd.  
Singapore

**Europe Headquarters**  
Cisco Systems International BV Amsterdam,  
The Netherlands

Cisco has more than 200 offices worldwide. Addresses, phone numbers, and fax numbers are listed on the Cisco Website at [www.cisco.com/go/offices](http://www.cisco.com/go/offices).

 Cisco and the Cisco logo are trademarks or registered trademarks of Cisco and/or its affiliates in the U.S. and other countries. To view a list of Cisco trademarks, go to this URL: [www.cisco.com/go/trademarks](http://www.cisco.com/go/trademarks). Third party trademarks mentioned are the property of their respective owners. The use of the word partner does not imply a partnership relationship between Cisco and any other company. (1110R)