White Paper

Cisco AppNav Technical Overview

Introduction

Today's network provides an information and multimedia conduit handling a wide range of critical business applications to facilitate many aspects of business processes. This increased integration of business processes with networks puts extensive demands on network-based services such as WAN optimization. Such demands increase the need for WAN optimization services that can be deployed with flexibility to meet the requirements of the dynamic applications of today, with scalability to increase performance for constantly expanding enterprises and with agility and availability to meet the on-demand and resiliency requirements. In addition, certain trends in the market are demanding a new type of network services handling. One example is cloud services, for which a WAN optimization solution is needed to intelligently pool and provision resources elastically in a simplified manner with better manageability for enterprise wide deployments. Furthermore, "bring your own device" (BYOD) computing in the workplace has become an expectation for many consumers. BYOD requires more than enabling people to move place to place with a device; it also requires the capability to deliver critical applications such as email and web connection (with some devices connected through virtual desktop infrastructure [VDI]) efficiently while maintaining the expected user experience. Generally, these trends require more bandwidth in the branch office and require the capability to rapidly and transparently add data center WAN optimization at the headend to meet that demand.

New Cisco® AppNav virtualization technology provides network-integrated WAN optimization in the data center that allows elastic pooling of resources in a manner that is policy based and on demand, with the best scalability, performance, and resiliency available today.

The Cisco AppNav solution is available as part of Cisco Wide Area Application Services (WAAS) Software Release 5.0.

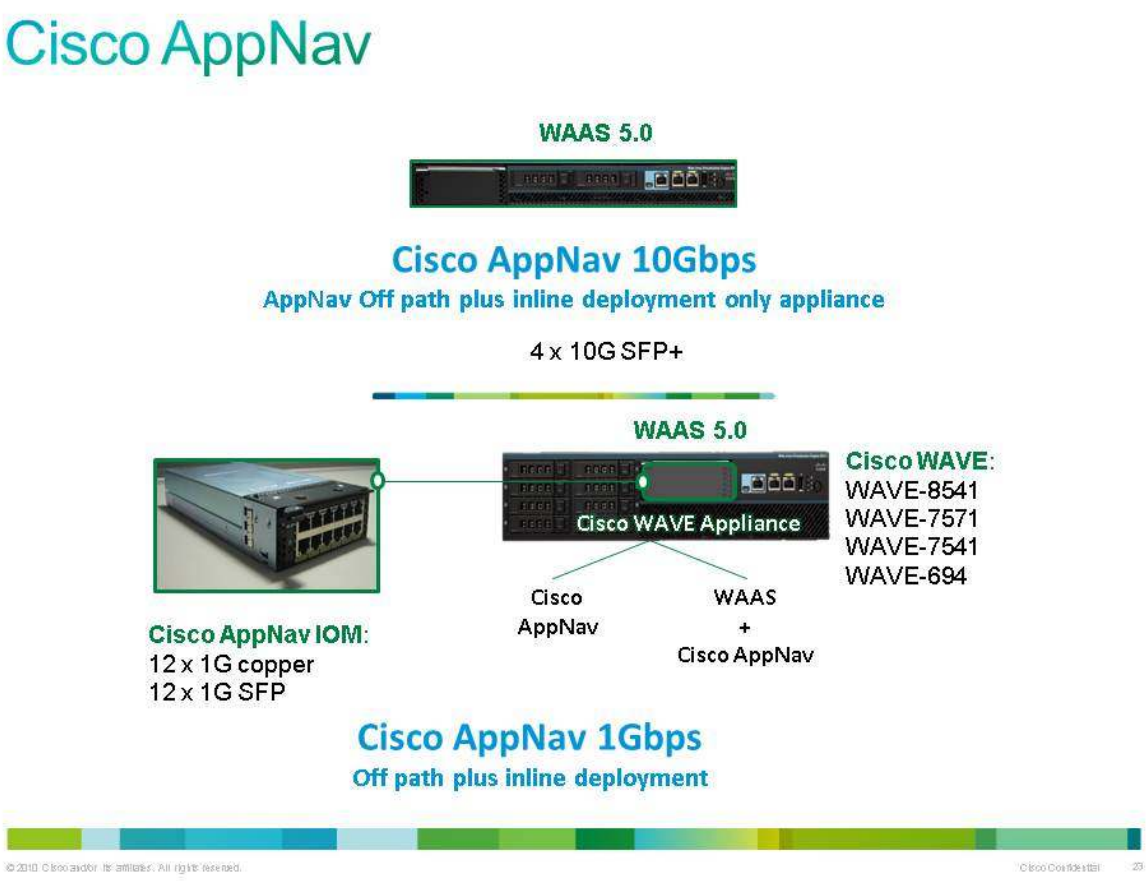
Cisco AppNav Solution for Data Center or Cloud

The Cisco AppNav solution is a comprehensive and network-integrated WAN optimization solution available with virtualization technology that drastically reduces operational complexity in enterprise wide WAN optimization deployments. Cisco AppNav technology enables customers to virtualize WAN optimization resources in the data center by pooling them into one elastic resource in a manner that is policy based and on demand with the best available scalability and performance. It integrates transparently with Cisco WAAS physical and virtual network infrastructure, supporting more than a million connections, providing significant investment protection for existing network design objectives as well as the capability to expand the WAN optimization service to meet future demands. Because the Cisco AppNav solution enables organizations to pool elastic resources, it lays the foundation for migration to cloud services as well. Cisco AppNav technology provides the following benefits:

- Efficient and cost-effective expansion of WAN optimization services within a company: The Cisco AppNav solution provides an on-demand pool of Cisco WAAS instances (consisting of appliances or virtual appliance or a mixture of both) that can be used in all data center deployment models.
- Flexibility in WAN optimization deployment to address various business needs: The Cisco AppNav solution enables the use of flexible policy definitions that dynamically bind business logical constructs to a set of Cisco WAAS pools, and it makes intelligent flow distribution decisions based on the state of the nodes currently providing services.
- Improve business continuity by providing highly available Cisco WAAS services: The Cisco AppNav clustering mechanism allows redundancy in the pool of Cisco WAAS instances and Cisco AppNav services.
- Facilitate migration to the cloud: Cisco AppNav elastic provisioning and deployment of WAN optimization services and the upcoming integration of Cisco AppNav technology with the Cisco Cloud Services Router (CSR) provides a transparent and optimized connection from the branch office to the cloud.
- Address challenges posed by today's data center infrastructure: Cisco AppNav native solutions address directional asymmetry in the data center multipath environment while preserving the user's intended network path (network path affinity).

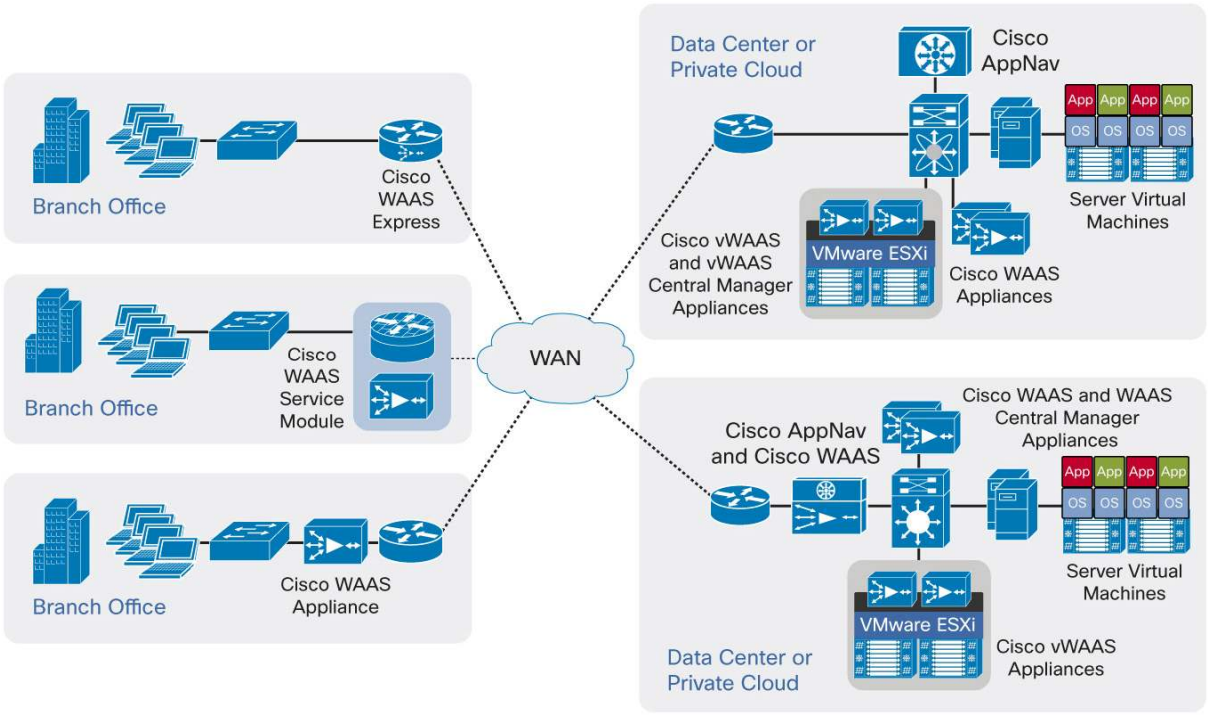
Cisco AppNav technology is deployed on the new-generation Cisco Wide Area Virtualization Engine (WAVE) appliances in the data center or private cloud. The 1-Gbps solution is offered with two types of I/O modules (IOMs) in copper and Small Form-Factor Pluggable (SFP) form factors that can be plugged into Cisco WAVE 8541, 8571, 7541, and 694 devices. These solutions can run purely as Cisco AppNav solutions or as Cisco AppNav and Cisco WAAS on the same platform. The 10-Gbps package runs exclusively in Cisco AppNav mode, consists of the chassis as well as AppNav IOM and provides high performance, high availability (dual power supply), and cost effectiveness in a single form factor. Both 1Gbps and 10Gbps solutions run Cisco WAAS Software 5.0. These options are summarized in Figure 1.

Figure 1. Cisco AppNav Solution and Data Center WAVE Appliance



The Cisco AppNav solution can be deployed out of the data path as well as in data path, depending on user business and network requirements. Figure 2 shows the current in-path and off-path options for Cisco AppNav in data center and private cloud deployments.

Figure 2. Cisco AppNav and Cisco WAAS Network Deployment Architecture



Cisco AppNav in-path and off-path deployments provide a comprehensive yet similar level of solution flexibility, scalability, and availability, summarized in Figure 3.

Figure 3. Cisco AppNav In-Path and Off-Path Technology

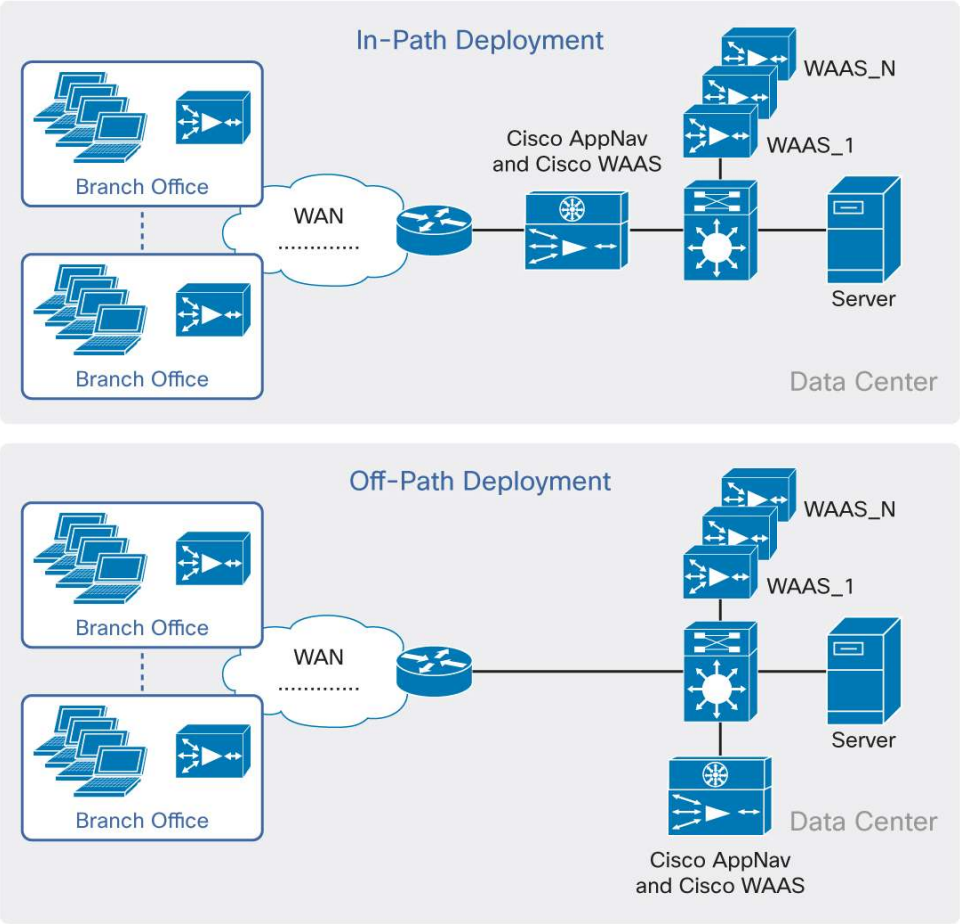
	Cisco AppNav Solution	
	In Path	Off Path
Hardware-based traffic classifier	✓	✓
Hardware-based flow distribution	✓	✓
Scalability up to 8 Cisco AppNav and 32 Cisco WAAS devices (more than 1 million connections)	✓	✓
High availability (AppNav and WAAS)	✓	✓
Asymmetry handling with path preservation	✓	✓
Elastic pooling mix of physical and virtual Cisco WAAS Appliances	✓	✓

The differentiation between in path and off path mainly reflects the network characteristics of the deployment type:

- Cisco AppNav in path: Reduces configuration changes required on adjacent network devices
- Cisco AppNav off path: Eliminates network throughput bottlenecks that can result from changing interface speeds; less disruptive to deploy and add capacity during the lifecycle of the deployment

Figure 4 shows examples of Cisco AppNav in-path and off-path deployments.

Figure 4. Cisco AppNav In-Path and Off-Path Deployment Examples



Cisco AppNav Technology Enables Flexible, Intelligent, On-Demand WAN Optimization

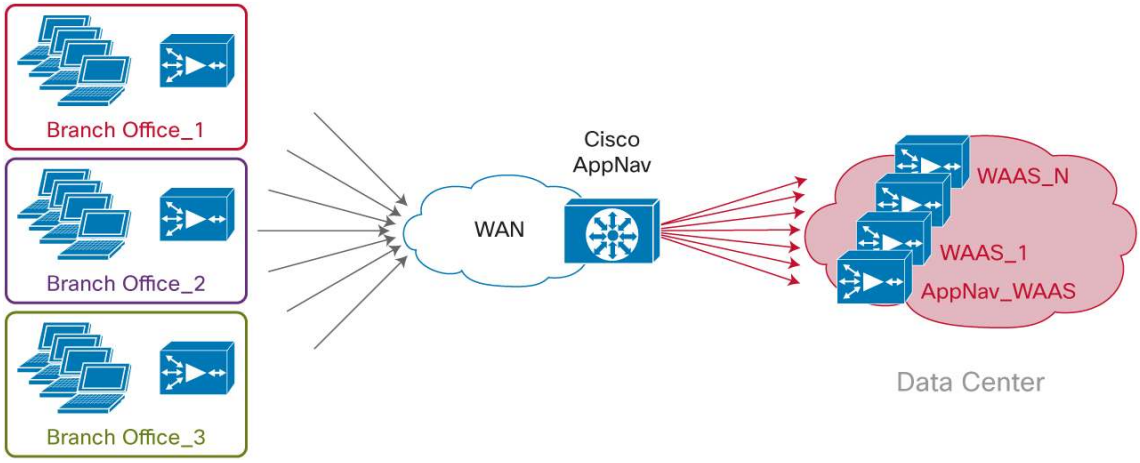
Cisco AppNav technology provides a foundation for addressing the many demands placed on WAN optimization solutions by today's emerging technologies such as BYOD and cloud services and constantly evolving applications to support business needs and business continuity and their disparate infrastructures. The Cisco AppNav solution can apply flexible and intelligent policies to address the dynamic needs of WAN optimization. These policies can distribute the user traffic flows based on business constructs (such as application or remote location) and deploy new groups of Cisco WAAS devices on demand or based on dynamic load feedback from active Cisco WAAS devices. The Cisco AppNav solution also provides a clustering mechanism that can address the network resiliency that highly available business services need and natively address the challenges posed by today's multipath data centers, which may cause directional asymmetry of user traffic.

Cisco AppNav Comprehensive and Intelligent Flow Distribution Policy

Cisco AppNav technology provides mechanisms that allow the user to choose traffic of interest and distribute that traffic among a number of Cisco WAAS nodes that are logically grouped together. The user has complete flexibility in classifying the traffic and grouping the Cisco WAAS nodes deployed in data center (using physical or virtual appliance form factors and any Cisco WAAS model). This classification and flow-distribution mechanism is implemented in the Cisco AppNav hardware based IOM. Figure 5 shows an example of a scenario. In this

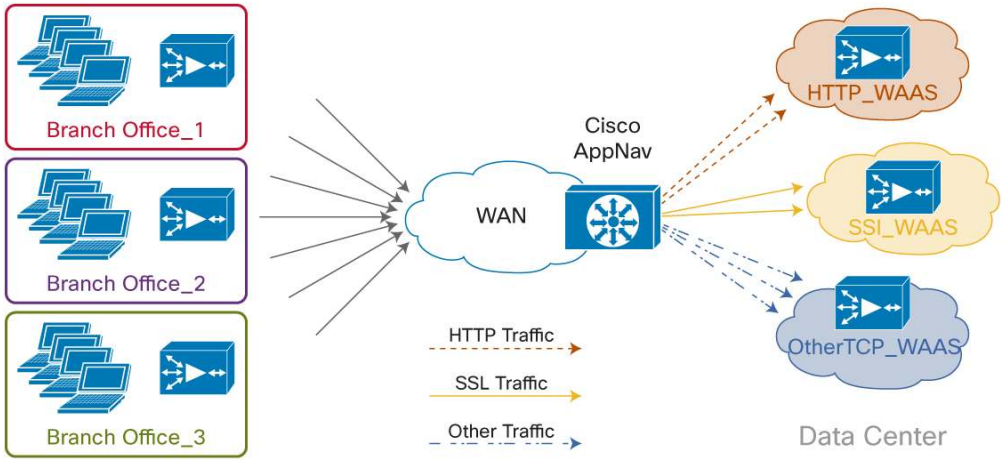
example, all the selected traffic is distributed among the single grouping containing all Cisco WAAS nodes. Note that the behaviors listed here are applicable to both in-path and off-path deployments.

Figure 5. Cisco AppNav Simple Classification and Flow-Distribution Example



The Cisco AppNav solution allows intelligent policy-based flow distribution that can address today's business needs. For example, an organization may have different funding or performance and scalability objectives depending on the applications that are deployed. The Cisco AppNav solution allows you to bind application-based polices and Cisco WAAS groupings to address such needs. In the example in Figure 6 the user can bind certain applications that have greater volume and scalability requirements to a group that consists of the new generation of highly scalable Cisco WAAS platforms, and direct other traffic to less scalable platforms. In this example, the HTTP traffic due to its high volume is distributed among Cisco WAAS nodes in one group with highly scalable platforms, the SSL traffic is distributed among Cisco WAAS nodes in another group due to internal security audit mandates, and the remaining TCP traffic is distributed among Cisco WAAS nodes in the third common pool. This behavior is applicable to both in-path and off-path deployments.

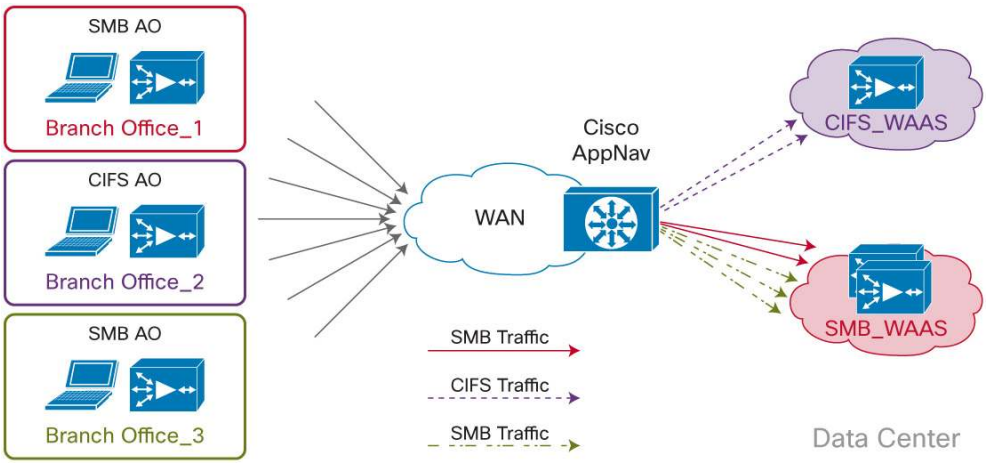
Figure 6. Cisco AppNav Application-Based Classification and Flow Distribution



The Cisco AppNav solution can address business rollout plans that are based on remote locations of the enterprise. For example, in Figure 7 the traffic for branch office 1 that has adopted the new Server Message Block Version 2 (SMBv2) protocol can be directed to a group of Cisco WAAS devices that support the new Cisco WAAS

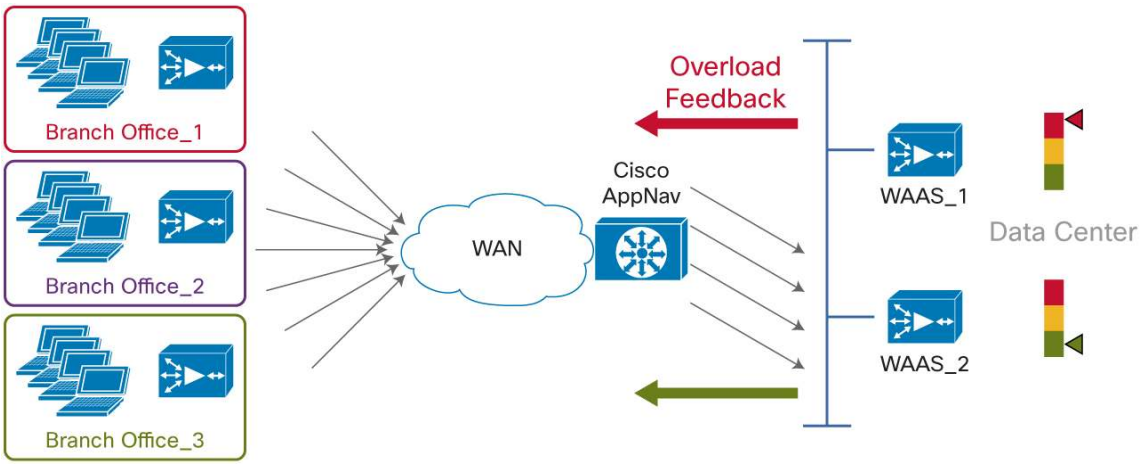
5.0 SMB application optimizer, and the traffic from branch office 2 and other traffic that is not ready for adoption of SMBv2 can be directed to the Cisco WAAS group that supports the Common Internet File System (CIFS) application optimizer.

Figure 7. Cisco AppNav Branch-Office-Based Classification and Flow Distribution with SMB AO Migration



The Cisco AppNav solution can perform intelligent flow distribution that is based on dynamic and live load feedback that is fed into it by Cisco WAAS platforms. This feature allows the solution to address cases in which the resources and liveliness of monitored application resources from Cisco WAAS are reaching their threshold limits and for which the user has chosen to redistribute the traffic to other Cisco WAAS nodes. In the example illustrated in Figure 8 the SSL resources for the Cisco WAAS device that was initially targeted to handle that traffic has reached its limits. The Cisco AppNav solution can distribute the flows to another set of Cisco WAAS devices that the user has defined as part of the flow-distribution policy.

Figure 8. Cisco AppNav Intelligently Distributes User Traffic Based on Load Feedback from Cisco WAAS



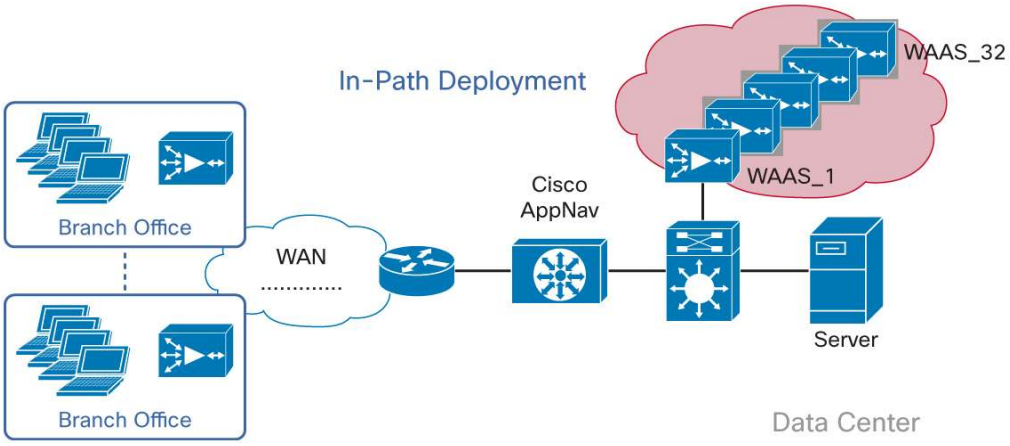
Cisco AppNav Addresses Business Growth, Continuity, and Infrastructure Challenges

Scalability and Operational Simplicity in WAN Optimization

The Cisco AppNav solution provides a clustering mechanism that includes 1 to 32 Cisco WAAS nodes (physical or virtual appliances of any size or model) in single instance or multiple groups. This feature allows the solution to

scale up transparently without affecting the underlying flow-distribution policies. As illustrated in Figure 9 the newly deployed Cisco WAAS platforms can enter the cluster as needed.

Figure 9. The Cisco AppNav Solution Offers Transparent Scaling of Cisco WAAS

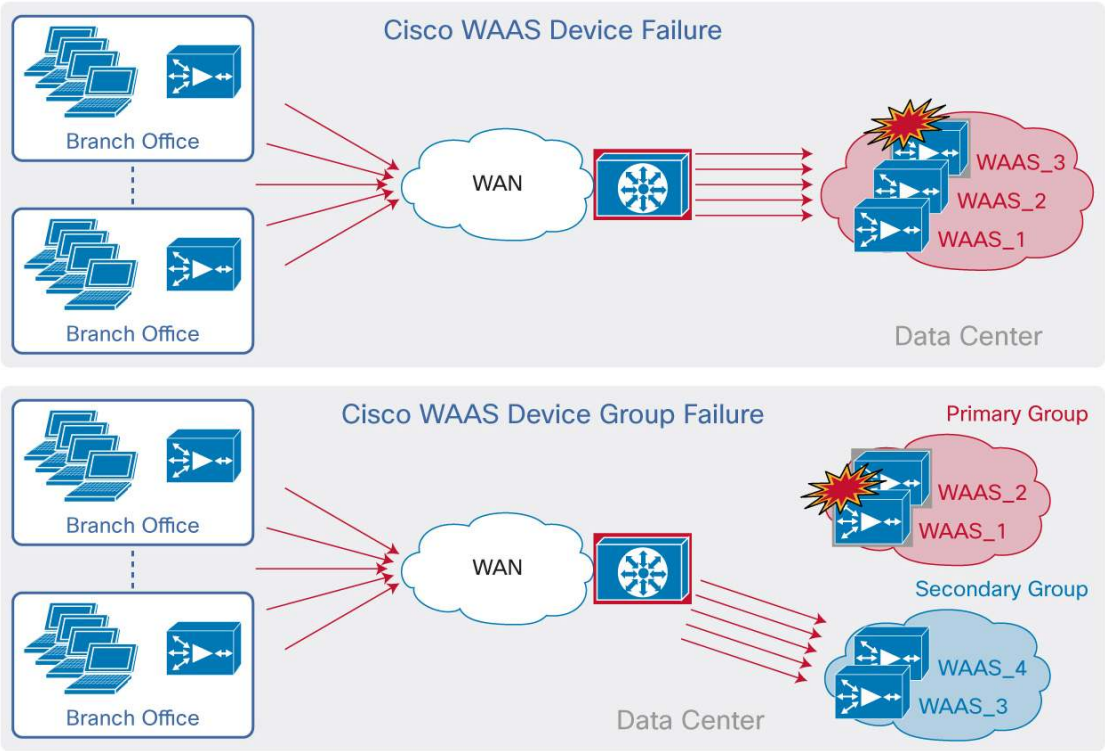


The capability to scale up to 32 off-path Cisco WAAS devices regardless of the Cisco AppNav deployment (in path or off path) is important for solution consistency, and it offers less disruption in the main network path, which is significant from an operational point of view.

Cisco AppNav Technology and High Availability in WAN Optimization

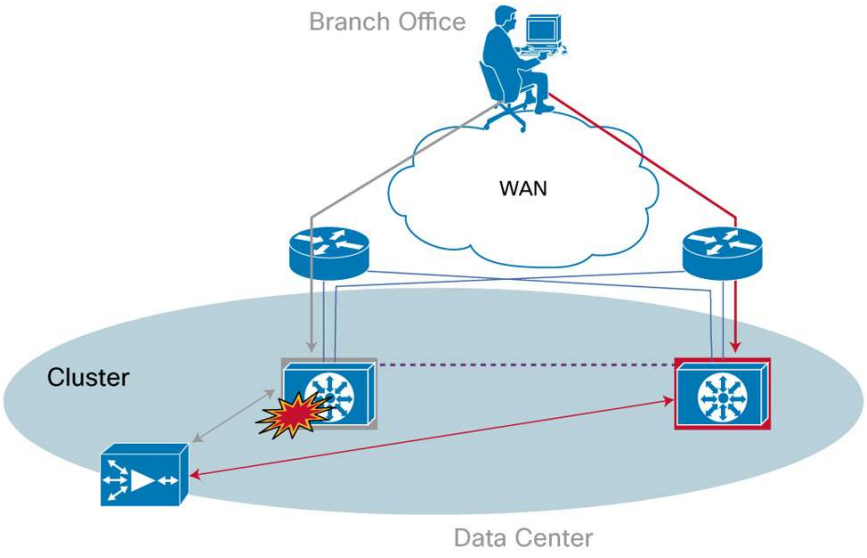
The grouping and clustering of Cisco WAAS nodes allow the Cisco WAAS nodes in a single group to back up each other; in addition, another Cisco WAAS group can take over in the event that all the nodes in the primary group fail. This feature provides availability at both the Cisco WAAS device and the device group levels. This would allow having redundancy within a WAAS group as well as cases in which a common WAAS group can be used as back up for multiple other WAAS groups. Figure 10 illustrates such cases.

Figure 10. Cisco AppNav Clustering to Protect Against Cisco WAAS Device Failures



The Cisco AppNav clustering solution allows one to eight Cisco AppNav instances to be included in a single group. These peers are aware of how flows are handled through Cisco WAAS devices, and if one of the Cisco AppNav devices has a failure, others can take over transparently and without interrupting user traffic handling. Figure 11 shows how the user traffic is handled by a peer Cisco AppNav instance when the original Cisco AppNav instance fails.

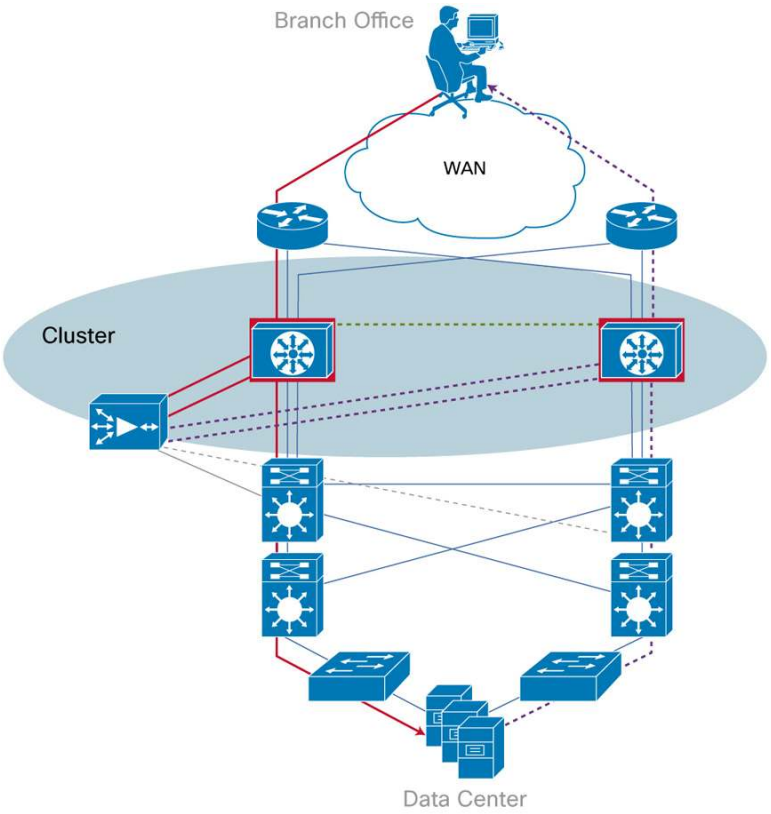
Figure 11. Cisco AppNav High Availability Example



Network Asymmetry Challenges

The Cisco AppNav clustering model offers native solutions for deployment scenarios that have directional asymmetry with the user traffic. This solution is applicable to cases in which directional asymmetry occurs in a single data center or across data centers that are geographically dispersed and are interconnected through data center Interface. The members of the Cisco AppNav cluster are flow aware; therefore, peers are aware of flows that are being handled by others and furthermore can query each other as needed. This approach allows correct handling of user traffic regardless of the path that the traffic takes. Additionally, this solution preserves the user's intended network paths, and it does not alter them to handle network directional asymmetry. Figure 12 illustrates intra-data center traffic in which the user-forward traffic takes a different path than the reverse. Cisco AppNav will send the traffic to the intended WAAS despite asymmetrical traffic and, furthermore, the original user network traffic path is preserved (user traffic enters and exits the network without alteration).

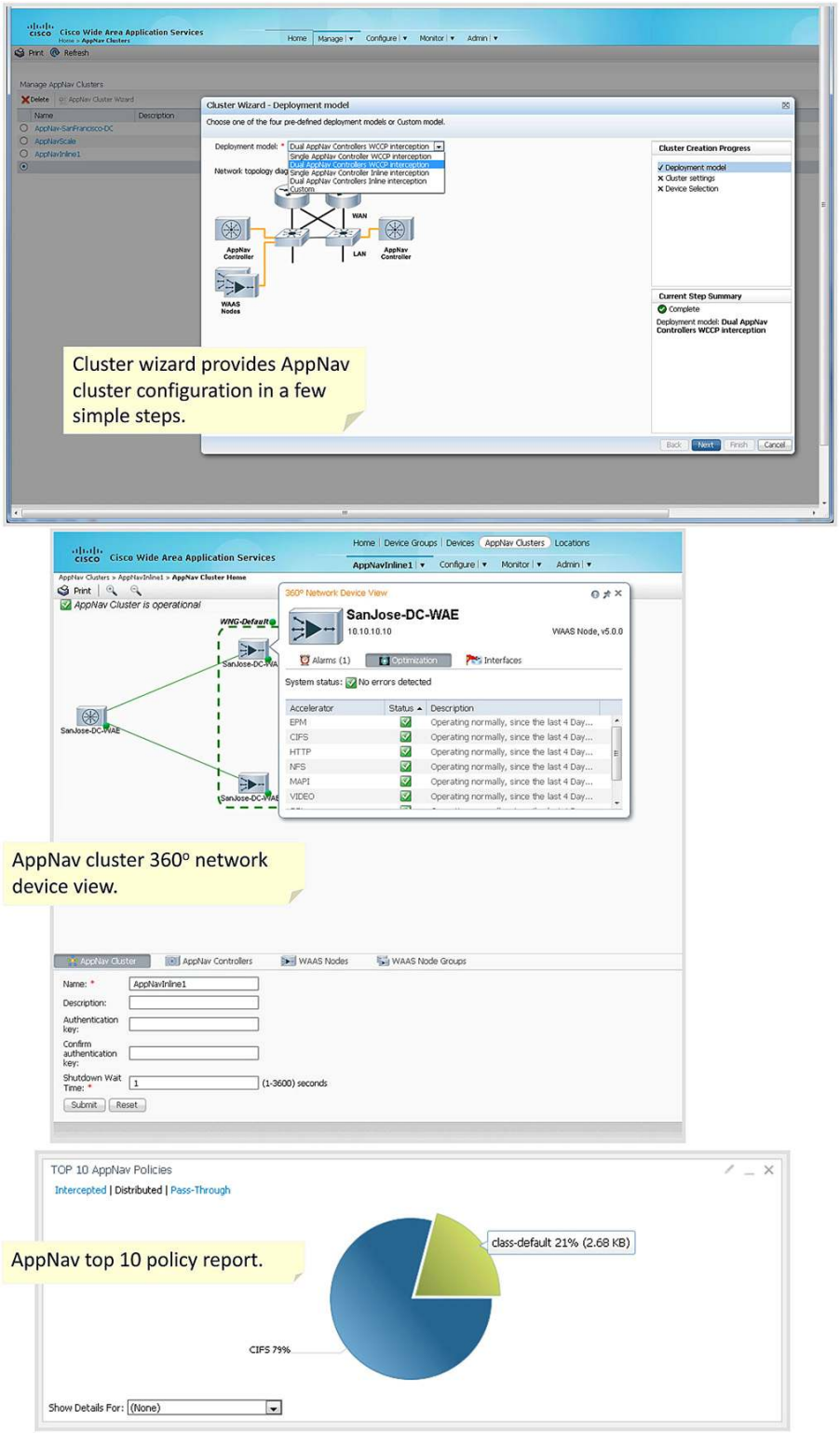
Figure 12. Cisco AppNav Natively Handles Directional Asymmetry in Intra- and Inter-Data Center Traffic



Cisco WAAS Central Manager: Comprehensive, Simple Cisco AppNav Management and Monitoring

The Cisco AppNav configuration and monitoring tool integrates transparently with the new and powerful Cisco WAAS Central Manager 5.0 with HTML 5 user friendly interfaces and improved navigation. This integration provides a comprehensive, cohesive, and simple interface for configuring, monitoring, and troubleshooting the entire Cisco AppNav cluster. Figure 13 shows screen images of the wizard-based Cisco AppNav configuration and the complete (360^{o}) monitoring of the Cisco AppNav cluster at multiple levels.

Figure 13. Cisco AppNav Cluster Configuration/Monitoring and AppNav top 10 Policy Report



Conclusion

The Cisco AppNav solution is a virtualization technology for WAN optimization. It allows pooling of WAN optimization resources into an elastic resource in a manner that is policy based and on demand with the best scalability, performance and availability. It integrates transparently with Cisco WAAS physical and virtual network infrastructure and because of its ability to pool elastic resources; it lays the foundation for migration to cloud services as well.

For More Information

For more information please visit http://www.cisco.com/go/waas

Americas Headquarters
Cisco Systems, Inc.
San Jose, CA

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

Europe Headquarters
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The Netherlands

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