CISCO VALIDATED PROFILE

Routing
Standard Branch Vertical

April 2016

Table of Contents

Profile Introduction

Cisco is transforming the network edge with Cisco ASR 1000 Series Aggregation Services Routers and Cisco 4000 Series Integrated Services Routers (ISRs), new lines of midrange routers that establish a new price-to-performance class offering, benefiting both enterprises and service providers. These routers provide a great opportunity for simplifying the WAN edge and significantly decreasing network-operating expenses (OpEx). By efficiently integrating a critical set of WAN edge functions such as WAN aggregation, Internet edge services, firewall services, VPN termination, etc. into a single platform, enterprises can meet their business objectives by facilitating deployment of advanced services in a secure, scalable, and reliable manner while minimizing the total cost of ownership (TCO).

Cisco WAN aggregation solutions distinguish themselves from other solutions by offering multiservice routers with the highest performance, availability, and density for concurrent data, security, voice, and application-acceleration services with maximum headroom for growth. The solutions feature embedded security, performance, and memory enhancements, and high-performance interfaces featuring the latest WAN technologies can help enterprises meet the needs of the most demanding WAN network.

This Standard Branch profile outlines a typical deployment in a small & medium branch office. Branches are typically deployed with an Internet link; hence, security is a major concern. Cisco provides a secure branch-in-a-box solution equipped with features described in this document.

CISCO CLOUD WEB SECURITY

Cisco Cloud Web Security (CWS) provides security and control for the distributed enterprise across one of the top attack vectors: the web. Cisco worldwide threat intelligence and advanced threat defense capabilities help protect users on any device and in any location.

Defend Against Web-Based Threat

Get near-real-time web protection, plus granular application visibility and control.

Cisco CWS offers:

- Zero-day defense through heuristics engines, signatures, and more in a single cloud-delivered service.
- Analysis of more than 100 TB of security intelligence and 13 billion web requests daily to detect and mitigate threats.
- Granular visibility and control of more than 150,000 applications and micro-applications.

Identify Breaches and Reduce Total Time to Remediation

Integrations with Advanced Malware Protection (AMP) and Cognitive Threat Analytics (CTA) allow increased visibility and intelligence into malware and breaches that could be present in your network. The integrated solutions provide:

- Advanced security for advanced threats to defeat unknown threats.
- Protection across the attack continuum—before, during, and after an attack.
- Threat scores and identification of the threat to help prioritize the security response.

Reduce TCO

Moving to an OpEx model lowers complexity for IT while getting more out of your existing Cisco investment:

- Our product's service is built on next-generation tower architecture that boasts 99.999 percent uptime.
- You can integrate with current Cisco infrastructure to reduce bandwidth costs at your branch.
- You can re-direct traffic to the proxy through Cisco firewalls and secure mobility clients.
- Bandwidth and seat-based options are available.

Protection for Software-as-a-Service Applications

Cisco Cloud Access Security delivers Software-as-a-Service (SaaS) visibility, extended granular control, and intelligent protection. Use it to embrace the benefits of cloud applications while maintaining strict security policies before, during, and after an attack.

VPN

Remote branch offices are connected with the head office through Internet cloud, and it is very import to protect the data they exchange. Cisco provides the solution for this kind of deployment—a DMVPN where the static secure tunnel is formed between branch and head offices and a dynamic secure tunnel is formed branch-to-branch when required.

QOS

Bandwidth use is critical, and this can directly impact employee productivity if bandwidth use is not planned properly. Cisco recommends that you configure QoS on the WAN or LAN interface, so that more bandwidth is used for Intranet traffic and critical applications and less bandwidth is used for non-critical & Internet traffic.

WAN OPTIMIZATION

Cisco Wide Area Application Services (WAAS) is a set of WAN optimization solutions that minimize enterprise bandwidth use and accelerate application performance. You can use it to optimize use of your existing bandwidth, while seeing to it that each application gets the resources it needs to deliver high-quality user experiences across the WAN. Cisco WAN optimization includes TCP optimization and network sequence caching, as well as byte and bit level compressions.

Cisco Intelligent WAN with Akamai Connect helps businesses deliver high-quality digital experiences with minimal bandwidth impact, regardless of device, connectivity, or cloud. It delivers next-generation application optimization to speed up Cisco IWAN by extending the Akamai Intelligent Platform directly into the branch router. This fully integrated solution helps organizations improve customer engagement and employee productivity while reducing network infrastructure costs through lower bandwidth consumption.

Table 1 *Profile feature summary*

Deployment areas	Features
Security	DMVPN, IKEV2, CWS
Services	QoS, AVC, FNF, ZBFW, NAT, IP SLA, EEM Script, ACL, EIGRP, WAAS & Single side optimization
IPv6 migration	IPv4 only
Network planning & trouble-shooting	Flexible NetFlow (FNF) Application Visibility & Control (AVC) Embedded Packet Capture (EPC) MPLS, BGP, WAAS Central Manager (WCM)
Network management	Cisco Prime, LiveAction

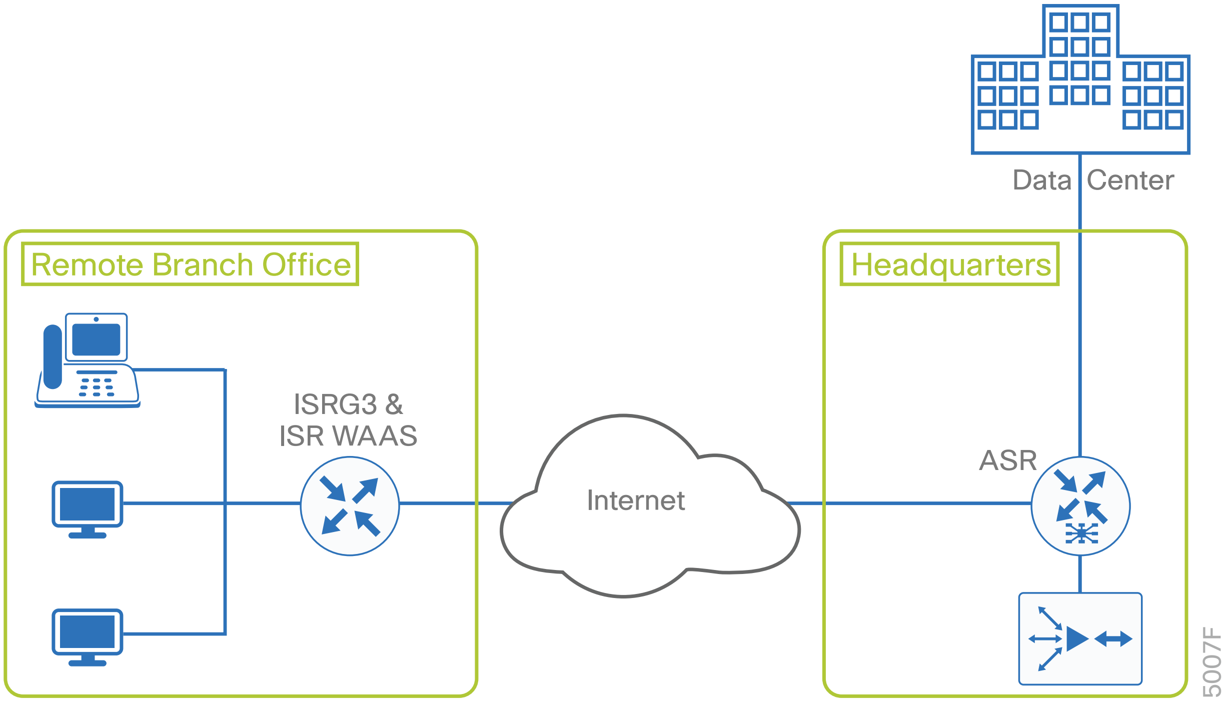
Network Profile

Based on the research and customer feedback and configuration samples, the DMVPN profile is designed with a generic deployment topology that you can easily modify to fit any specific deployment scenario.

TOPOLOGY DIAGRAM

Figure 1 shows the topology for Standard Branch profile.

Figure 1 *Topology overview*



HARDWARE & FEATURE SPECIFICATIONS

This section of the guide describes the 3-D feature matrix where the hardware platforms are listed along with their place-in-network (PIN).

Key Vertical Features

Table 2 defines the 3-D hardware, PIN, and the features deployed. The scale of these configured features, the test environment, the list of endpoints, and the hardware/software versions of the network topology are defined later.

Table 2 *3-D feature summary with hardware and PIN*

Deployment layer (PIN)	Platforms	Critical vertical features
Head office	ASR1000	DMVPN, IKEV2, WCCP
Datacenter WAVE	WAVE 594	TCP & all application optimizations and WCCP
Branch office	ISR4451 ISR4331 ISR4321	QoS, AVC, FNF, ZBFW, NAT, IP SLA, EEM Script, ACL, EIGRP
ISR-WAAS	WAAS-OVA	TCP & all application optimizations, APPNAV, single-side optimization

Hardware Profile

Table 3 defines the set of relevant hardware, servers, test equipment, and endpoints that are used to complete the end-to-end deployment.

This list of hardware, along with the relevant software versions and the role of these devices, complement the actual physical topology defined in Figure 1.

Table 3 *Hardware profile of servers and endpoints*

VM and HW	Software versions	Description
Ixia	IxNetwork and IxExplorer version X	Generate traffic streams
Spirent	Spirent Test Center	Generate L7 traffic
LiveAction	Version 4.0	To collect the FNF statistics
Windows	Windows 7	Generate real-time Internet traffic
Windows Server	2003 server	Datacenter Server

TEST ENVIRONMENT

This section describes the features and the relevant scales at which the features are deployed across the physical topology. Table 4 lists the scale for each feature.

Table 4 *Standard branch: feature scale validated in this profile*

Feature	Scale
ISR4451 as DMVPN HUB	ISR4451, phase 2, 4000 EIGRP neighbor with minimal route, 179 Sec convergence time ISR4451, phase 3, 4000 EIGRP neighbor with minimal route, 242 Sec convergence time
ISR-WAAS	ISR-WAAS 200, 175 bidirectional flows for datacenter, 200 Internet flows with single side optimization & CWS
ISR4451 NAT overload	26k App mix flows—without single side optimization

Use Case Scenarios

TEST METHODOLOGY

The use cases listed in Table 5 are executed using the Topology defined in Figure 1, along with the test environment shown in Table 4.

With respect to the longevity for this profile setup, the CPU and memory use are monitored overnight as well as during the weekends, along with any mem-leak checks. In order to test the robustness, specific negative events are triggered during use case testing.

USE CASES

Table 5 describes the use cases that are executed on the Standard Branch profile. These use cases are divided into buckets of technology areas to show the complete coverage of the deployment scenarios.

These technology buckets are composed of system upgrade, security, network services, monitoring & troubleshooting, simplified management, and system health monitoring, along with system and network resiliency.

Table 5   List of use case scenarios

No.	Focus area	Use cases
System upgrade		
1	Remote branch	Network admin wants to upgrade remote branch office DUT to latest CCO image. ▪ All of the configuration should be migrated seamlessly during the upgrade/downgrade operation.
2	Head office	Network admin wants to upgrade head office DUT to latest CCO image. ▪ All of the configuration should be migrated seamlessly during the upgrade/downgrade operation.
3	WAAS	Network admin wants to upgrade WAAS DUT to latest CCO image. ▪ All of the configuration should be migrated seamlessly during the upgrade/downgrade operation.
Security		
4	Secure DMVPN	Network admin wants to have secure DMVPN between the branch and head offices. ▪ Configure DMVPN ▪ Configure IKEV2, DMVPN will be secure over Internet with IKEV2 profile

Table 5 continued

5	DMVPN overlay routing	Network admin wants to advertise private subnets with EIGRP. ▪ All private subnets are advertised through EIGRP if the DMVPN session is successful. ▪ Branch and head office can communicate each other.
6	Cisco Cloud Web Security	Network admin wants to protect the branch office from Internet traffic. ▪ Configure CWS on WAN and LAN interfaces and all Internet traffic is redirected to a CWS tunnel after the CWS tunnels are up. ▪ Whitelisted traffic shouldn’t be redirected to CWS tunnels. ▪ All Internet traffic is blocked or not blocked based on the CWS fail open close config.
7	WAAS	Network admin wants to save bandwidth by enabling WAAS. ▪ Deploy ISR-WAAS OVA on the branch side. ▪ Configure APPNAV as redirection method. ▪ Deploy WAVE in head office. ▪ Enable all TCP optimization in both ISR-WAAS and WAVE.
Network services		
8	QoS	Network admin needs to enhance user experience by ensuring traffic and application delivery using QoS policies for DMVPN and LAN interfaces. ▪ Traffic types: VOIP, video, data. ▪ Policing and shaping
9	ZBFW	Network admin to secure the traffic using Zone-Based Firewall. ▪ Inspect traffic based on type of traffic or source/destination address
10	NAT	Network admin wants to enable NAT to reach out Internet from branch. ▪ Enable NAT on primary ISP connection ▪ Enable ip nat inside on LAN and ISR-WAAS interfaces.
Monitoring & troubleshooting		
11	EPC	Network admin should be able to troubleshoot the network by capturing and analyzing the traffic. ▪ Embedded Packet Capture ▪ Wireshark
12	NetFlow	Enable IT admins to determine network resource use and capacity planning by monitoring IP traffic flows using Flexible NetFlow. ▪ Traffic types: IPv4 ▪ LiveAction
13	SNMP	Network admin should be able to use SNMP for monitoring. ▪ SNMP mibwalk

Table 5 continued

14	AVC	Enable IT admins to determine network resource use and capacity planning by monitoring IP traffic flows using Application Visibility and Control. - Traffic types: IPv4, HTTP - LiveAction
15	IPSLA & EEM script	Network admin should be able to troubleshoot the network by enabling the IPSLA. - IPSLA Probe from branch to ISP - EEM script to change the DMVPN tunnel source
Simplified management		
16	Manageability	Simplified network troubleshooting and debugging for IT admins - Monitor network for alarms, syslogs, and traps
System health monitoring		
17	System Health	Monitor system health for CPU use, memory consumption, and memory leaks during longevity
System & network resiliency, robustness		
18	System resiliency	Verify system level resiliency during the following events: - WAN/LAN interface flaps - DMVPN tunnel interface flaps
19	Network resiliency	Verify that the system holds well during a network-level resiliency - CWS tunnel IKEV2 session - Single side optimization sessions
20	Negative events, triggers	Verify that the system holds well and recovers to working condition after the following negative events are triggered: - Config changes–add/remove config snippets, config replace - Routing protocol interface flaps - IPSec, IKEv2 events like clear gdoi sessions, clear sa counters - QoS events such as adding/removing QoS policy, modifying the ACL, modifying the class map - Adding/deleting/appending/prepending ACEs in the KS ACL and issuing rekey

Appendix A

You can find example configurations at the following location:

http://cvddocs.com/fw/cvpconfig-routing

Please use the feedback form to send comments and suggestions about this guide.

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