



Cisco Validated Profile (CVP)

Cisco ASR 9000 Series Video SIT Profile

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1. Profile Introduction

The Cisco® ASR 9000 Series is a true carrier-class solution. It features the modular, microkernel-based Cisco IOS® XR Software operating system, comprehensive system redundancy, and a full complement of network resiliency schemes. Cisco ASR 9000 Series Routers also offer the services and application-level intelligence you need for optimized video delivery and mobile aggregation. ASR9000 intelligently blends with the following technology/ deployment solutions:

- Cable MSO
- Carrier Ethernet
- Mobile backhaul
- Web OTT
- Multiservice edge
- DCI gateway
- Broadband gateway
- Large enterprise WAN

This document is intended as a reference for an example of the ASR9K video/multicast deployment profile with a focus on multicast solutions. In addition to legacy multicast features, multicast VPN supports customer multicast traffic using RFC2547 VPN infrastructure and provides a scalable architecture based on native IP multicast in the core with GRE- and/or MPLS-based core networks. With MPLS technology extensions, the multicast VPN supports two types of mVPNs: multicast LDP (mLDP, draft-ietf-mpls-ldp-p2mp-13) and P2MP RSVP TE (RFC 4861) based. As part of this profile analysis, this document provides a representative feature mix most commonly used in such a deployment role, the associated scale of these features, and an analysis of the router health and performance.

Table 1 summarizes the key areas on which this profile focuses.

Table 1. ASR9K Video SIT Profile Feature Summary

Deployment Areas	Features
Layer 3 multicast	PIM SM/SSM, auto RP/BSR/static RP, PIM bidir, IGMP, MLD
Multicast VPN	Legacy Rosen-GRE, mLDP, and P2MP RSVP-TE-based mVPN profiles
Layer 2 VPN and multicast	VPLS, VPLS BGP-AD, VPLS BGP and LDP signaling, IGMP/MLD snooping, VPLS LSM
Multicast FRR	Ti-MoFRR, P2MP-TE FRR, mLDP MoFRR
Multicast QoS	Microflow policer or UBRL, flow-aware CAC (aka VideoQ), QoS offload on satellite
Network monitoring and troubleshooting	VideoMon IP-CBR, RTP, and MDI metrics, smart license, netflow, SPAN
Network management	SNMP, Telnet, SSH, ASR9k Craft Tool (ACT via XML)

2. Network Profile

2.1 Topology Diagram

Figure 1 shows the basic topology used in Video SIT Profile.

Figure 2 shows the Layer 2 multicast topology used in Video SIT Profile.

Figure 3 shows the VideoMon monitoring topology used in Video SIT Profile.

Figure 1. ASR9k Video SIT Profile: Basic Topology Overview

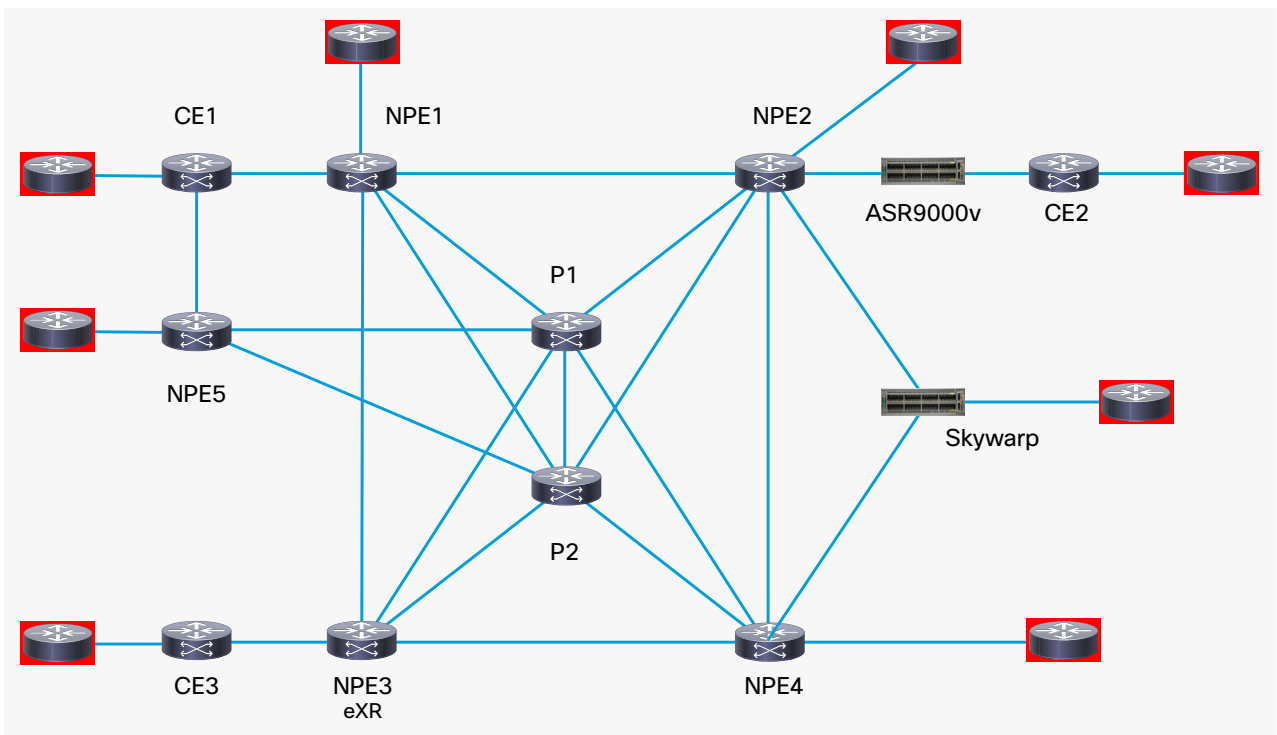


Figure 2. ASR9k Video SIT Profile: Layer 2 Multicast Overview

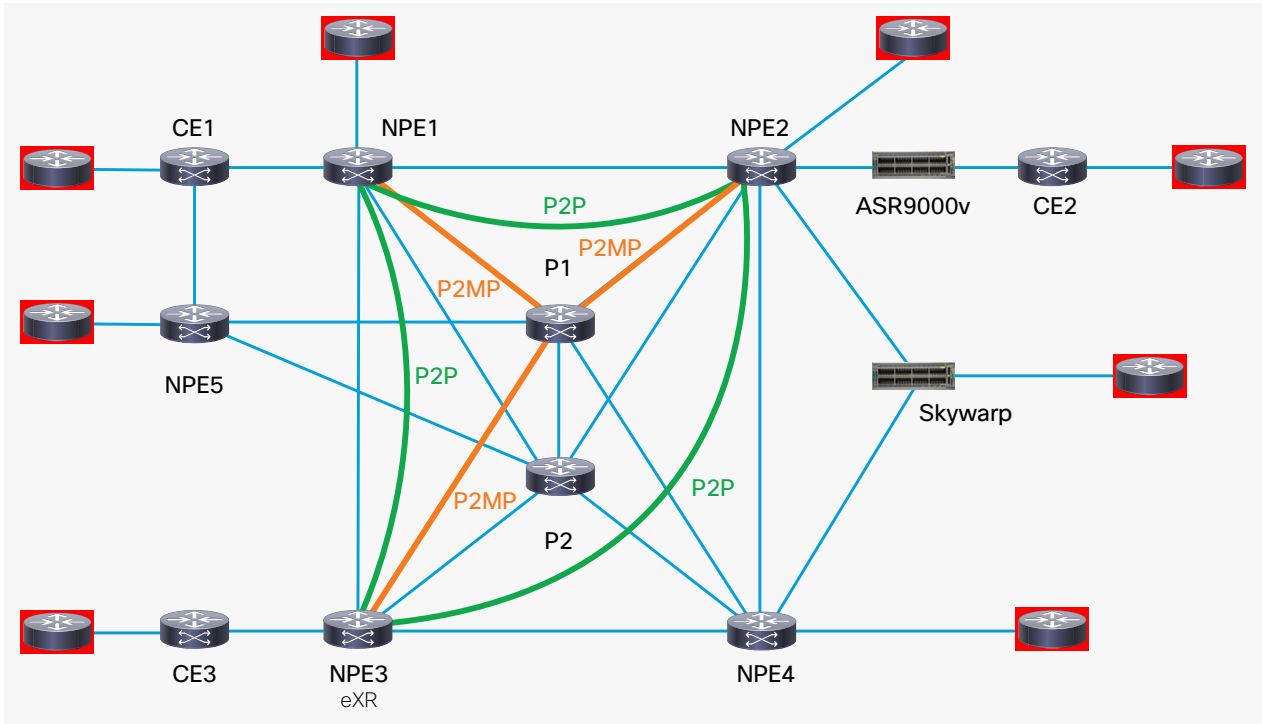
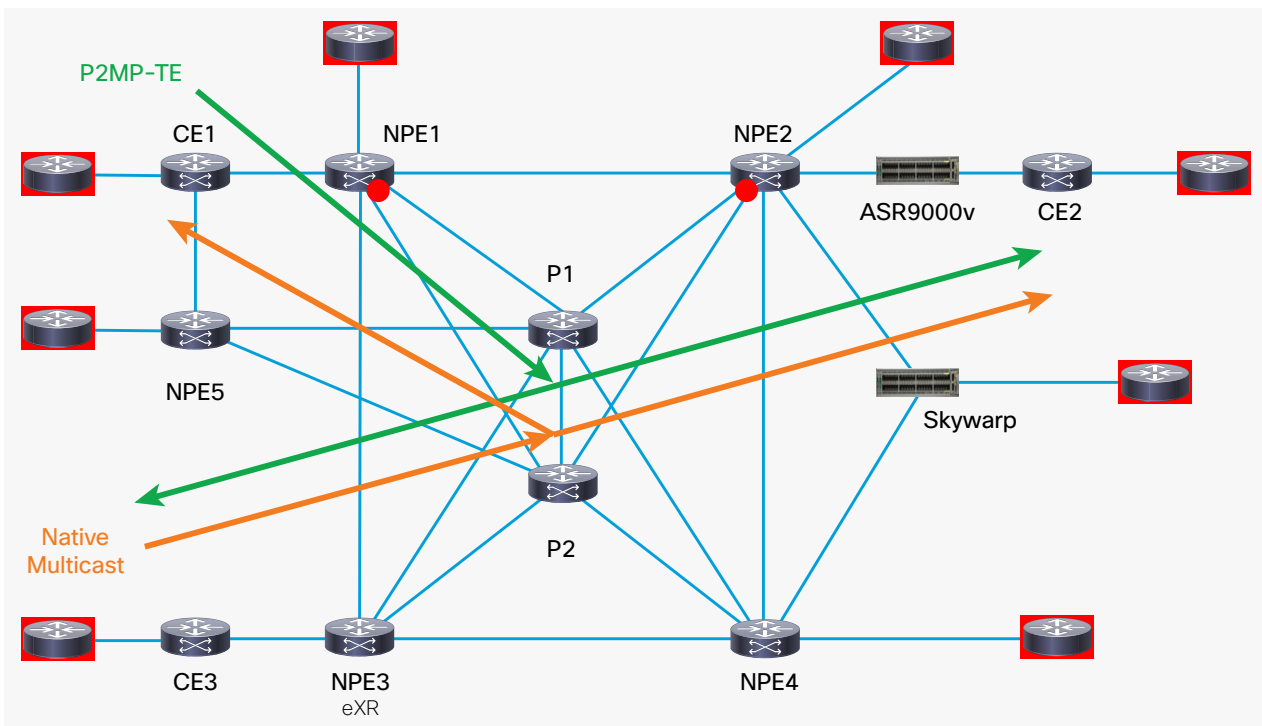


Figure 3. ASR9k Video SIT Profile: VideoMon Monitoring Overview



2.2 Hardware and Feature Specifications

This section of the guide details the 3D feature matrix where the hardware platforms are listed along with their place in network (PIN) and the relevant education vertical deployed.

2.2.1 Key Video SIT Features

Table 2 defines the new features being deployed and incorporated in Video SIT Profile since 5.3.x.

Table 2. Feature Summary with Hardware

Note	Releases	Critical Multicast Features
HW/SW	5.3.0	Tomahawk feature parity VPLS LSM P2MP TE with LDP signaling
HW/SW	5.3.1	ASR9K nV satellite Tomahawk support
HW/SW	5.3.2	Satellite bundle over bundle PIM allow RP mLDP LFA FRR

2.2.2 Hardware Profile

Table 3 defines the set of relevant hardware used to complete the end-to-end Video SIT Profile deployment.

Table 3. Hardware Profile of Edge and Core Devices

Hardware	Software Versions	Description
ASR 9K	XR 06.01.03	For edge and core functionality

2.3 Test Environment

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

Table 4. Video SIT Profile: Feature Scale Validated

Feature	Scale
L3 interfaces	4000
mVPN	
IPv4 mVRF	500
IPv6 mVRF	500
IPv4 mroute	32K
IPv4 mroute	8K
mVPN profiles	23
PIM BSR RP	100
L3 VPN	
IPv4 VRFs	4000

Feature	Scale
IPv4 prefixes	1M
PE-CE routing	
eBGP	1500
OSPF	100
Static	1000
6VPE	
IPv6 VRFs	500
IPv6 prefixes	30K
PE-CE routing	500
eBGP	500
Static	1000
L2 VPN	
VPLS BDs	2000
BGP-AD-enabled VPLS BDs	1000
BGP signaling	500
LDP signaling	500
Layer 2 multicast	
VPLS-LSM BDs	1000
IGMP snooping-enabled BDs	1000
MLD snooping-enabled BDs	1000
P2MP tunnel	
P2MP static head	500
P2MP autotunnel	1000
mVPN	800
VPLS	200
Vidmon IP-CBR, RTP, MDI streams	4000
Ti-MoFRR streams	1000
MoGRE tunnel	200
PIM bidir mroutes	800
PIM allow-RP mroutes	200
CAC flows	1000
UBRL flows	1000

Table 5. Video SIT Profile: mVPN Profiles Validated

Profile	Description
0	Rosen GRE with MDT SAFI
1	Rosen mLDP MP2MP (no BGP-AD)
2	Partitioned mLDP MP2MP (no BGP-AD)
3	Rosen GRE with BGP-AD + PIM signaling
4	Partitioned mLDP MP2MP with BGP-AD + PIM signaling
5	Partitioned mLDP P2MP with BGP-AD + PIM signaling
6	VRF-inband mLDP
7	Global-inband mLDP
8	Global static P2MP-TE
9	Rosen mLDP MP2MP with BGP-AD + PIM signaling
10	VRF static P2MP-TE with BGP-AD
11	Rosen GRE with BGP-AD + BGP signaling
12	Rosen mLDP P2MP with BGP-AD + BGP signaling
13	Rosen mLDP MP2MP with BGP-AD + BGP signaling
14	Partitioned mLDP P2MP with BGP-AD + BGP signaling
15	Partitioned mLDP MP2MP with BGP-AD + BGP signaling
16	Rosen static P2MP-TE with BGP-AD + BGP signaling
17	Rosen mLDP P2MP with BGP-AD + PIM signaling
18	Rosen static P2MP-TE with BGP-AD + PIM signaling
20	Rosen-P2MP-TE with BGP AD + PIM C-multicast
22	Rosen-P2MP-TE with BGP C-multicast
24	Partitioned-P2MP-TE with BGP AD + PIM C-multicast
26	Partitioned-P2MP-TE with BGP C-multicast

3. Use Case Scenarios

3.1 Test Methodology

The use cases listed in Table 6 will be executed using the topology defined in Figure 1, Figure 2, and Figure 3 along with the test environment, Table 4 and Table 5, already explained in this document.

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

3.2 Use Cases

Table 6 describes the use cases that were executed on the Video SIT Profile. These use cases are divided into buckets of technology areas to provide complete coverage of the deployment scenarios.

Table 6. Use Case Scenario

Number	Focus Area	Use Cases
Bootup and Management		
1	Bootup	<p>Service provider should be able to boot up ASR9k nodes via TURBOBOOT as well as PIE upgrade to the target IOXR images successfully.</p> <p>The following scenarios were validated in this profile:</p> <ul style="list-style-type: none"> • Turboboot • Pie upgrade (upgrade, downgrade, FPD, config backup/restore) • SMU activation • nv satellite upgrade
2	System infra/management	Validate that syslog, SNMP, SSH, Telnet, and NTP are functioning well after node bootup.
3	Smart licensing	Validate that the smart licenses client on the node is registered with the node and the correct number and type of the licenses are being consumed.
Video/Multicast Solution		
4	Multicast	<p>In the profile, the following global/native multicase features are configured:</p> <ul style="list-style-type: none"> • PIM RP: autoRP, BSR, and static • PIM SM/SSM • PIM bidir • PIM allow-RP • SSM mapping <p>This profile verifies the system-level resiliency during the following events:</p> <ul style="list-style-type: none"> • PIM RP change • Core router failover • IGMP/MLD join and leave • Edge and core interface flap

Number	Focus Area	Use Cases
5	Rosen GRE mVPN	<p>The following Rosen GRE mVPN profiles are validated:</p> <ul style="list-style-type: none"> • Rosen GRE with MDT SAFI • Rosen GRE with BGP-AD + PIM signaling • Rosen GRE with BGP-AD + BGP signaling
6	Rosen mLDP mVPN	<p>The following Rosen mLDP mVPN profiles are validated:</p> <ul style="list-style-type: none"> • Rosen mLDP MP2MP • Rosen mLDP P2MP
7	Partitioned mLDP mVPN	<p>The following partitioned mLDP mVPN profiles are validated:</p> <ul style="list-style-type: none"> • Partitioned mLDP MP2MP • Partitioned mLDP MP2MP • Partitioned mLDP P2MP
8	Inband mLDP	<p>The following inband mLDP mVPN profiles are validated:</p> <ul style="list-style-type: none"> • VRF-inband mLDP • Global-Inband mLDP
9	P2MP-TE	<p>The following P2MP-TE profiles are validated:</p> <ul style="list-style-type: none"> • Global static P2MP-TE • VRF static P2MP-TE • Rosen static P2MP-TE • Rosen-P2MP-TE autotunnel • Partitioned-P2MP-TE autotunnel
10	mLDP features	<p>The following mLDP features are validated:</p> <ul style="list-style-type: none"> • Root node redundancy (RNR) • BGP autodiscovery • MLDP traffic turnaround and LSP switch • C-multicasting
11	Multicast FRR	<p>The following multicast FRR features are validated:</p> <ul style="list-style-type: none"> • Ti-MoFRR • P2MP-TE FRR • MoFRR/MBB
12	Layer 2 multicast	<p>The following Layer 2 multicast features are validated:</p> <ul style="list-style-type: none"> • IGMP snooping • MLD snooping • VPLS LSM P2MP TE with BGP/LDP signaling • Default IGMP snooping profile

Number	Focus Area	Use Cases
13	Multicast redundancy/failover case	<p>This profile validates the following user cases (with VRF inband mVPN configuration):</p> <ul style="list-style-type: none"> • Dual-home satellite failover in case of host/ICL link failure • MoFRR switchover in case of core node/link failure • Dual-source PEs in case of source PE failure
Convergence, HA, and Network Resiliency		
14	Process start	This profile verifies that during process restart, the features mentioned earlier are recovered with minimal system effect.
15	Link flap	This profile verifies that during a link flap event (link down and link up), the features mentioned earlier are recovered with minimal system effect.
16	LC OIR	This profile verifies that during LC OIR (soft OIR or physical plug out and plug back in), the features mentioned earlier are recovered with minimal system effect.
17	RSP FO	This profile verifies that during redundant RSP/RP failover, the features mentioned earlier are recovered with minimal system effect.
18	Node failure	This profile verifies that during node failure (soft reload or physical power off and power back on), the features mentioned earlier are recovered with minimal system effect.
System Health Monitoring		
19	System health	Monitor system health for CPU usage, memory consumption, and memory leaks during longevity.