Cisco RSVP Agent

Cisco® RSVP Agent is a Cisco IOS® Software feature that uses the network to deliver call admission control and quality of service with Cisco Unified Communications Manager deployments. Cisco RSVP Agent enables dynamic adjustment to changes in the network, supports complex network topologies, and enables unified data, voice, and video network designs.

The Cisco Unified Communications system of voice and IP communications products and applications enables organizations to communicate more effectively—helping them to streamline business processes, reach the right resource the first time, and impact the top and bottom line. The Cisco Unified Communications portfolio is a key part of the Cisco Business Communications Solution-an integrated solution for organizations of all sizes which also includes network infrastructure, security, and network management products, wireless connectivity, and a lifecycle services approach, along with flexible deployment and outsourced management options, end-user and partner financing packages, and third-party communications applications.

Cisco RSVP Agent provides call admission control (CAC) and quality of service (QoS). With CAC, your network can accept or reject a call based on bandwidth and policy considerations. Resource Reservation Protocol (RSVP), an IETF standards-based signaling protocol for reserving resources in the IP network, secures and reserves bandwidth across the WAN for calls accepted by Cisco RSVP Agent. The resulting user experience is characterized by superior QoS and reliability for calls amid meshed and multitiered networks.

Cisco RSVP Agent is supported on the Cisco 2800, 2900, 3800, and 3900 series integrated services routers. Call setup is initiated between the IP phone, IP videophone or gateway, and Cisco Unified Communications Manager. Cisco Unified Communications Manager classifies a call based on parameters such as application (voice or video) and Multilevel Precedence and Preemption (MLPP), and signals to Cisco RSVP Agent in the access router. Bandwidth pools are preconfigured in the router on a per-application and per-interface basis. Using the classification provided by Cisco Unified Communications Manager, Cisco RSVP Agent attempts to set up a call within the appropriate bandwidth pool and across the WAN to a far-end Cisco RSVP Agent for the receiving party. If RSVP bandwidth is secured, Cisco RSVP Agent signals back to Cisco Unified Communications Manager. Cisco Unified Communications Manager in turn signals to the IP phone, IP videophone, or gateway and the call proceeds. Cisco RSVP Agent can apply Differentiated Service Code Point (DSCP) marking to media packets based on instruction from Cisco Unified Communications Manager. DSCP packet marking may be applied to place the RSVP secured media stream into the router priority queue. If RSVP bandwidth cannot be secured, Cisco RSVP Agent signals back to Cisco Unified Communications Manager, which administers policies. The call is either disallowed or allowed to proceed with a lower priority DSCP packet marking applied by Cisco RSVP Agent as instructed by the Cisco Unified Communications Manager. Mid-call policies may also be applied for handling of changes to the media stream such as transfers during a call.

Network design using Cisco RSVP Agent allows voice and video calls to proceed as part of a single unified network together with data. This allows for support of meshed designs, multitiered designs, adjustment to dynamic link changes, and redundant links. This single design helps reduce the costs for both infrastructure and management. Because CAC is managed and secured and QoS is applied as a network component, there is no reliance on end-user devices. Cisco RSVP Agent functions independently of the call signaling protocol, and hence, SIP, SCCP, H.323, and MGCP are all supported.

Key Features and Benefits

- **Complex network topologies**—Cisco RSVP Agent provides CAC for complex and dynamically changing network topologies. Both the logical and physical network design for data, voice, and video can now be the same. This simplifies deployments and reduces the cost for both infrastructure and management.
- **Locations capability**—Cisco RSVP Agent functions may be enabled and disabled based on location. This enables Cisco RSVP Agent to co-exist with location-based CAC and eases migration to Cisco RSVP Agent implementations. Locations awareness also allows for a choice whether or not to use Cisco RSVP Agent for local calls that do not cross the WAN.
- **End-user device independent**—Cisco RSVP Agent is managed and secured as part of the network and does not rely on end-user devices to secure CAC. This eliminates concerns of end-point trust, and also preserves investment in existing phones.
- **Call signal independence**—Cisco RSVP Agent supports calls made using SIP, SCCP, H.323 and MGCP.
- **Application ID**—Cisco RSVP Agent allows separate bandwidth pools to be established based on application. As a call is initiated, Cisco Unified Communications Manager assigns the call an application ID and signals this to the router. The call is then placed using the appropriate bandwidth pool. This feature helps ensure that a single application (such as video) does not overwhelm the available reserved bandwidth.
- **Interface configuration**—RSVP bandwidth pools can be configured on a per interface level.
- **Integration with Differentiated Services (DiffServ) QoS**—RSVP is used to manage admission to a bandwidth pool. After admission QoS parameters are applied to ensure prioritization of the admitted media flow. The Cisco RSVP Agent can provide Differentiated Service Code Point (DSCP) marking to place the media packets into the priority queue. Cisco RSVP Agent also prevents media flows that fail admission from entering the priority queue.
- **DSCP marking of media where RSVP not secured**—When an RSVP reservation can not be secured, Cisco Unified Communications Manager policy determines whether or not the call is allowed to proceed. If the call is allowed to proceed, Cisco Unified Communications Manager can provide instruction to Cisco RSVP Agent to mark the packets with a lower priority (best effort) DSCP label.
- **New call policy**—A choice of policies may be configured in Cisco Unified Communications Manager to either require RSVP, or if RSVP can not be secured to allow calls to proceed, but using lower priority (best effort) DSCP packet marking. Separate policies may be configured for audio and video.
- **Mid-call policy**—A separate set of policies may be configured in Cisco Unified Communications Manager to provide for handling of changes to the media stream during a call. Transfer, conference, MLPP preemption, and loss of a network connection are examples of when these policies become important.
- **Retry reservation**—Cisco Unified Communications Manager can instruct multiple retries to secure RSVP in the event RSVP is not initially secured. Retry reservation may be used in conjunction with both new call and mid-call policies.
- **PSTN failover**—Alternate automatic routing (AAR) may be employed to route calls over the PSTN when an RSVP secured connection can not be obtained.
- **Music on Hold (MoH) and Annunciator**—Cisco RSVP Agent support is extended to Cisco Unified Communications Manager MoH and Annunciator features.
- **Shared lines optimization**—In the case of shared lines only one RSVP connection is established to a site.
- **SRTP**—Secure media using SRTP is supported with Cisco RSVP Agent.
- **Multilevel Precedence and Preemption (MLPP)**—Cisco RSVP Agent works in conjunction with MLPP to allow high-priority calls to take precedence and receive guaranteed bandwidth when needed.

- **RSVP not required on every hop**—Cisco RSVP Agent secures a reservation across the WAN. Routers along the media path that support RSVP provide a bandwidth guarantee. Routers along the path that do not have RSVP enabled (e.g. in the network core) do not guarantee bandwidth but do pass the RSVP reservation. Therefore, Cisco RSVP Agent serves to control admittance to the network and secures bandwidth across elements of the network where this is critical. Networks may be designed to implement RSVP at the edge and combine this with packet marking in the network core.
- **Cisco IP to IP Gateway**—Cisco RSVP Agent provides CAC for Cisco Unified Communications Manager intracluster calls. The Cisco IP to IP Gateway can be used to provide RSVP-based CAC for Cisco Unified Communications Manager intercluster calls. Cisco RSVP Agent and Cisco IP to IP Gateway can both be enabled on a single integrated services router platform.
- **Trusted DSCP marking**—Cisco RSVP Agent allows the network to mark media packets. End-user devices such as softphones, Cisco Unified Video Advantage, and SIP phones lack a trusted mechanism for ensuring appropriate DSCP priority. Cisco RSVP Agent provides a point of trust in the network and when used with Cisco Unified Communications Manager can assure media flows receive the desired QoS treatment. DSCP packet marking may be implemented with other Cisco RSVP Agent functionality or on its own.

QOS in Cisco IOS Provided Using RSVP

Cisco IOS® Software supports two fundamental QoS architectures: Differentiated Services (DiffServ) and Integrated Services (IntServ). These approaches are complimentary in nature and together, form a robust QoS deployment.

In the DiffServ model a packet's "class" can be marked directly in the packet. This marking is used to identify a "per hop behavior", which is applied at each device in the end to end traffic path. The QoS behavior is applied to the class of packets, rather than a particular traffic flow. This contrasts with the IntServ model, in which a signaling protocol is required to identify flows of packets requiring special QoS treatment.

The IntServ architecture model is motivated by the needs of real-time applications such as voice, video, multimedia conferencing, visualization, and virtual reality, which are sensitive to delay and jitter. IntServe provides a way to deliver the end-to-end QoS that real-time applications require by explicitly managing network resources to provide QoS to specific user packet streams (flows). It uses "resource reservation" and "admission control" mechanisms as fundamental components to establish and maintain QoS. IntServ uses RSVP to explicitly signal the QoS needs of an application's traffic along the devices in the end-to-end path through the network. Reservation of the required bandwidth is made across the media path. Upon confirmation of a successful reservation, the originating application can begin transmitting.

Signaled QoS using RSVP is uniquely suited to the needs of voice and video for the following reasons.

- RSVP delivers a strict bandwidth guarantee for traffic. Allocation of bandwidth is made in routers across the end-to-end media path.
- RSVP call admission is provided on an end-to-end basis. Congestion may occur at any point along the call path. Local admission control mechanisms are subject to failure when congestion occurs at unknown points along the call path. For this reason, a contextual awareness across the network is necessary to effectively ensure CAC. Also, note how admission control helps ensure that a burst in competing traffic is managed so as not to degrade voice and video quality. For example, instead of allowing twelve calls with poor voice quality, RSVP might ensure that at least ten high-quality calls are completed.
- Failure notification is essential for intelligent call processing. RSVP signals when bandwidth can not be allocated. This allows for a choice to either disallow connection or use alternative connection methods, such as best effort or PSTN backup.

- Every voice or video implementation needs a mechanism to handle emergency situations. During this type of occurrence, there is a high likelihood of congestion due to a spike in call volumes. Only a signaled mechanism can provide an adequate preemptive scheme that prevents a major disruption.

Hybrid IntServ over DiffServ implementations use RSVP to provide admission along the media path. After admission DiffServ marking may be applied to place the media packets into the priority queue and in this way assure delivery of guaranteed services.

It is also possible to combine the IntServ and DiffServ architectures in network designs to take advantage of the strengths of each. If an organization has an abundance of bandwidth in the core, it may choose to implement an IntServ architecture with RSVP at the edges of the network, and transport these RSVP reservations over a DiffServ core. This reduces the need to maintain reservation state in the core of the network, with only a slight danger that there will not be enough bandwidth in the network core to support the reservations.

RSVP is extensively standardized in the IETF, and Cisco continues to provide significant enhancements in Cisco IOS Software in the areas of scalability, fast response to routing changes, and aggregation of RSVP reservations over DiffServ and MPLS networks. Cisco IOS Software supports RSVP in nearly all Cisco software-forwarding platforms.

Figure 1. Cisco RSVP Agent

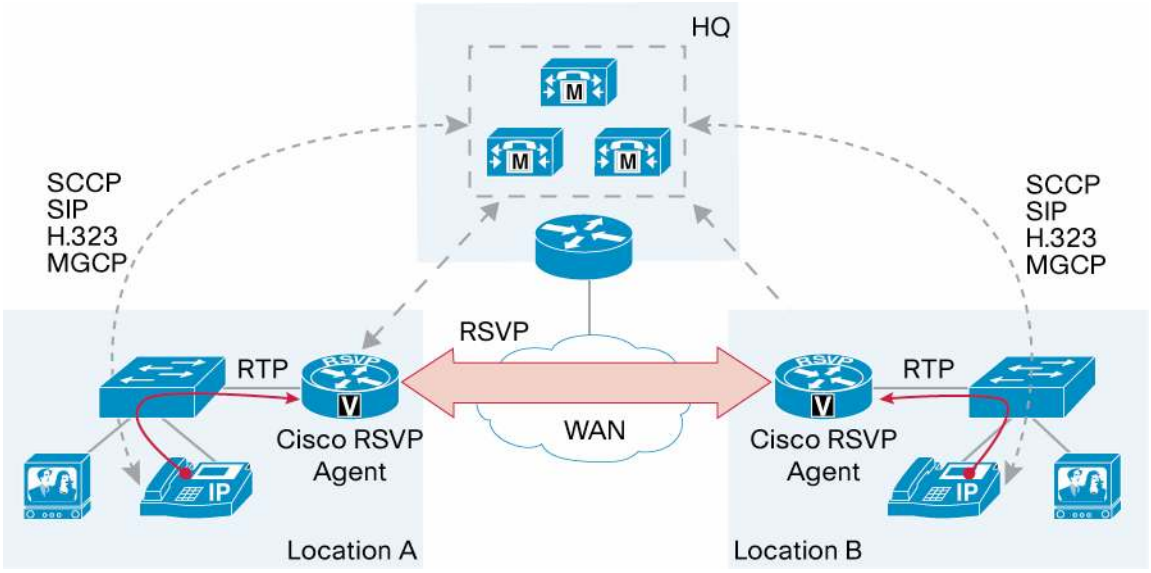
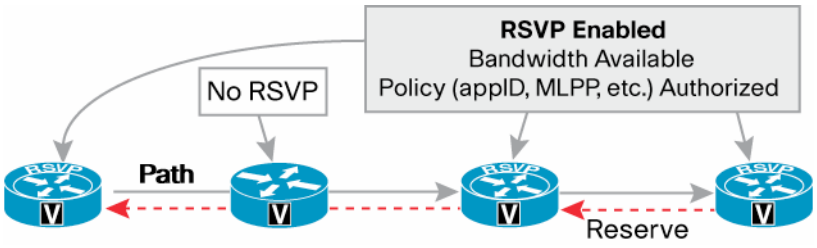


Figure 2. RSVP Call Flow



Cisco IOS Software and Cisco Unified Communications Manager Requirements

- Platforms: Cisco 2800, 2900,, 3800, and 3900 Integrated Services Routers.
- Cisco IOS Software Release Release 15.0(1)M with the Unified Communications license on the Cisco 2900 and 3900 Integrated Services Routers

- Cisco IOS Software Release 12.4(6)T with the Cisco IOS Advanced IP Services image for Cisco 2800, and 3800 Integrated Services Routers.
- Cisco Unified Communications Manager 5.0 .

Performance

Table 1. Session Capacity for Cisco RSVP Agent

Platform	Sessions
2801	60
2811	120
2821	220
2851	250
2901	110
2911	220
2921	440
2951	660
3825	440
3845	550
3925	880
3945	1050

Session capacity is based on a router dedicated to the RSVP Agent with VAD-off. Addition of concurrent applications will reduce the number of sessions supported.

Standards Support

Table 2. Cisco RSVP Agent Features

IETF RFC	Feature/Benefit
2205	Resource Reservation Protocol (RSVP)-Version 1 Functional Specification
2206	RSVP Management Information Base using SMIv2
2210	The Use of RSVP with IETF Integrated Services
2211	Specification of the Controlled-load Network Element Service
2212	Specification of the Guaranteed Quality of Service
2213	Integrated Services MIB
2214	Integrated Services MIB Guaranteed Service Extensions using SMIv2
2215	General Characterization Parameters for Integrated Service Network Elements
2379	RSVP over ATM Implementation Guidelines
2380	RSVP over ATM Implementation Requirements
2381	Interoperation of Controlled-Load Service and Guaranteed Service with ATM
2382	A Framework for Integrated Services and RSVP over ATM
2747	RSVP Cryptographic Authentication.
2748	The COPS protocol
2749	COPS usage for RSVP
2750	RSVP Extensions for Policy Control
2751	Signaled Preemption Priority Policy Element
2752	Identity Representation for RSVP
2753	Framework for Policy-Based Admission Control
2814	SBM (Subnet Bandwidth Manager): A Protocol for RSVP-based Admission Control over IEEE 802-style networks

2815	Integrated Service Mappings on IEEE 802 Networks
2816	A Framework for Integrated Services Over Shared and Switched IEEE
2872	Application and Sub-application ID
2961	RSVP Refresh Overhead Reduction Extensions
2996	Format of the RSVP DCLASS Object
2998	A Framework for Integrated Services Operation over Diffserv Networks
3097	RSVP Cryptographic Authentication-Updated Message Type Value
3181	Specification of the Controlled-load Network Element Service
3182	Identity Representation for RSVP
3209	RSVP-TE: Extensions to RSVP for LSP Tunnels
3473	Generalized Multi-Protocol Label Switching (GMPLS) Signaling Resource ReserVation Protocol-Traffic Engineering (RSVP-TE) Extensions

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Printed in USA C78-331055-02 10/09