Resource ReSerVation Protocol (RSVP)

EION Open IP Environment Resource ReSerVation Protocol (RSVP) module is a portable implementation of the RSVP signaling protocol as specified in RFC 2205 for the support of admission control to RSVP-enabled Differentiated Services (DiffServ) Networks.

Overview

EION Open IP Environment is a portable real-time software suite that IP-enables new and traditional network elements providing high performance interoperability across multiple platforms and products. Open IP Environment is based on a single, open, modular and scalable framework that allows system integrators and developers to incorporate services such as routing, Quality of Service (QoS), security, IP accounting and policy management into any type of device. Open IP Environment is platform and real-time operating system (RTOS) independent and can work on any type of device ranging from high end optical core switches to personal digital assistants (PDAs).

Framework Overview

EION Open IP Environment framework consists of four planes: Common Control Plane, Common System Plane, Common Forwarding Plane and Common Management Plane. Each of these planes contains a set of components that are built to use well-defined interfaces.

Open IP Environment RSVP module resides within the Common Control Plane to deliver high performance resource reservation functionality. The Common Control Plane supports the Open IP Environment Internet Protocol (IP) infrastructure protocols and enables a mix and match approach for adding support for networking protocols and/or services. The control plane holds together the Routing Protocol Applications (RPAs) that interface with the Common Control Plane and deliver network functionality for providing interchangeable access for all IP-based modules such as BGP, RIP and OSPF.

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RSVP Overview

EION Open IP Environment RSVP module is a portable implementation of the RSVP protocol as specified in RFC 2205. The module provides a RSVP aware node/router. This implementation supports RSVP signaling for admission control to RSVP-enabled DiffServ Networks. The Open IP Environment RSVP engine is also supported by COPS-RSVP (RFC 2749) features which enable the outsourcing of policy control decisions from the RSVP engine to the external Policy Server.

IP Infrastructure Applications — Policy and Management Services
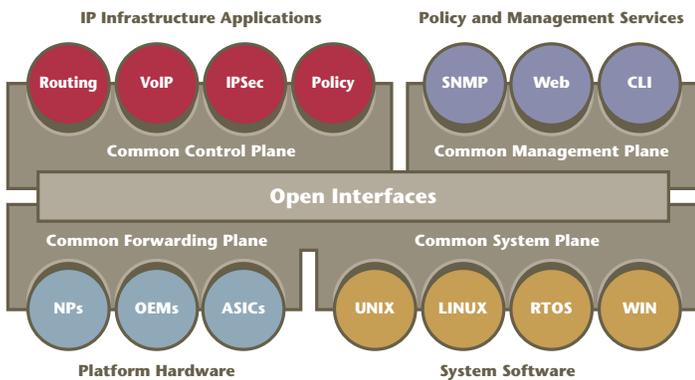
RSVP was introduced to allow an application to signal the network to dynamically request resources. For example, in an RSVP-enabled DiffServ network a Host using RSVP would signal a DiffServ network requesting admission to the network. If sufficient bandwidth were available, the DiffServ edge nodes (ingress and egress) would make a bandwidth reservation for the particular flow. Dynamically signaled QoS requests require dynamic admission control decisions that involves communication between routers/network devices and the PDP i.e. Policy Server - COPS-RSVP is the protocol used for this communication.

RSVP Interactions

EION Open IP Environment RSVP module has been specifically designed to deliver time to market advantages through built in module-plane and module-module interactions. The Open IP Environment RSVP

module interacts with COPS-RSVP client, the IPv4 module, the Routing Table Manager (RTM) as well as the Open IP Environment Common System and Common Forwarding Plane.

The RSVP module interacts with the IPv4 module by utilizing IP services for registering with IP functions. The IPv4 module is responsible for any packet "fragmentation" or "re-assembly" that is required. In addition IP passes circuit (physical interface) information to RSVP, and also notifies RSVP engine of changes in circuit information.

RSVP also interacts with the Routing Table Manager (RTM) to determine the next-hop(s) of the outgoing RSVP packets. RSVP interacts through the Policy Manager APIs to access the COPS-RSVP protocol for the exchange of Policy request and decisions.

Within the Open IP Environment, the RSVP module uses the Open IP Environment's Common System Plane functions such as timers, message queues and thread manager libraries.

Finally, RSVP seamlessly integrates with the Open IP Environment Forwarding Engine (FE) or third party forwarding engine to forward Protocol Data Units (PDUs). The PDUs are forwarded through a network interface based on a forwarding table that provides the best route to the packet destination.

For more details about other Open IP Environment modules and planes, please refer to the relevant product briefs.

RSVP Features

EION Open IP Environment RSVP module demonstrates the following key features:

- Support for Unicast and Multicast Resource Reservation. Multicast support in the Forwarding Engine is dependent on the future integration of RSVP with the Open IP Environment M-RTM
- Integrates with the Open IP Environment IPv4 stack to receive and transmit protocol data units (PDUs). The IPv4 stack performs RSVP packet fragmentation and re-assembly.
- Support POLICY_DATA Objects for policy control mechanisms. The INTEGRITY Object for authentication is not currently implemented.
- Maintains RSVP "soft state" in routers to manage the dynamic reservation state in routers.
- Support of RSVP message types (PATH, RESV, PATHTEAR, REVTEAR, RESV-ERR, PATHERR, REVCONF) as defined in RFC 2205
- Use of data objects such as FLOW_SPEC, ADSPEC and SENDER_TSPEC that are opaque to RSVP (as per RFC 2210). These Objects are required to perform bandwidth admission control using RSVP in a Differentiated Services network.
- Support of RSVP Extensions for Policy Control (RFC 2750) and RSVP Policy Data Object (as per RFC 2752)
- Support of TCLASS object (as per RFC2814)
- Support of RSVP DCLASS object format, used to represent and carry DSCPs within RSVP messages.
- Support of COPS (RFC 2748) and COPS-RSVP (RFC 2749) for communication with External Policy Servers
- The RSVP-Handling Task in a router will typically execute in the control plane much like routing protocols

For a complete list of Open IP Environment RSVP RFC support, please refer to the last page of this product brief.

RSVP Module Implementation

EION Open IP Environment RSVP module has been implemented in the "C" programming language and runs as a single thread. The configuration of this module periodically relinquishes control, permitting the utilization of the CPU for other activities in the system.

Through the publication of application programming interfaces (APIs), the Open IP Environment RSVP module has been designed for ease of portability and modularity. Open IP Environment provides an architecture to allow you to implement RSVP within the Open IP Environment framework, or alternatively to adapt the RSVP module to your specific environment.

Ease of Portability

EION Open IP Environment provides a set of interoperable modules that are available for use in both established and "greenfield" products. The customer has the choice to pick and choose Open IP Environment modules to incorporate into the customer's established products, preserving the investment in prior development. The customer also has the option to use modules within the Open IP Environment framework to develop a new software base to address going-forward opportunities. It is also possible to compile the software for a variety of target processors. Therefore, protocol composition can be statically changed by modifying the configuration to suit your needs.

Established products typically have a well-developed architecture and an existing suite of applications, and these products will be looking to Open IP Environment for additional capabilities. The portable and modular Open IP Environment components can be integrated into an existing execution environment to work within an existing code base, with minimal modifications to the customer's environment.

Greenfield products typically require a full suite of applications plus the Open IP Environment framework to provide an appropriate execution environment. The Open IP Environment framework and modules are well-positioned to address such greenfield opportunities.

Benefits

In a market that demands ever-increasing IP support, it is difficult to maintain sufficient in-house expertise in every area. EION Open IP Environment framework and RSVP module solve this problem by:

• Allowing OEMs to focus on their real value added solutions, not underlying infrastructure
• Reducing the length of time to market via ease of integration of key components such as RSVP
• Enabling the freedom to choose among different software and hardware platforms
• Enabling ease of portability to traditional and new network enabled devices
• Enabling accelerated development of highly customized IP-enabled products via well documented APIs
• Enabling a pick and choose approach to Open IP Environment modules via a flexible open framework addressing various devices and applications from PDAs to carrier grade optical switches
• Delivering components of the framework that are scalable, modular, and portable that consistently demonstrate high performance attributes
• Delivering standards-based interfaces and common programming languages such as C, C++ and Java to developers, enhancing overall productivity with a small learning curve.
• Delivering configured and managed modules that use one or several of the following management capabilities:
    – EION Command Line Interface
    – Simple Network Management Protocol (SNMP)
    – Web-based management.

EION Open IP Environment RSVP Feature Summary

RFC and Draft Support

• RFC 2205   Resource ReSerVation Protocol (RSVP) – Version 1 Functional Specification - UDP encapsulation, INTEGRITY Object and Multicast support are NOT implemented
• RFC 2210   The Use of RSVP with IETF Integrated Services. No support for Integrated Services (IntServ) style traffic control to be performed
• RFC 2748   The COPS (Common Open Policy Service) Protocol
• RFC 2749   COPS-RSVP "COPS usage for RSVP"
• RFC 2750   RSVP Extensions for Policy Control
• RFC 2752   RSVP Policy Data Object
• RFC 2753   A Framework for Policy-based Admission Control (Informational)

• RFC 2814   TCLASS object format
• RFC 2872   RSVP Application Identity Policy Element in Policy Data Object

• <draft-ietf-rap-pr-04.txt> "COPS Usage for Policy Provisioning"
• <draft-mfine-cops-pib-02.txt> "An Initial Quality of Service Policy Information Base for COPS-PR Clients and Servers"
• <draft-ietf-issll-dclass-01.txt>   "RSVP DCLASS object"
• <draft-santitoro-rap-policy-appids-00.txt> "RSVP Application IDs for IP Telephony"
• <drafts/draft-santitoro-rap-policy-errorcodes-00.txt> "Error code extensions to RSVP Policy Error Object"

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