



### **Common Open Policy Server (COPS)**

EION COPS is a protocol for distributing policy information and decisions across a network. COPS provides common functionality that can be used by an extensible number of client types. EION COPS-PR is a protocol that deals with policy provisioning in the case of configuring differentiated services (DiffServ) network elements. EION COPS-RSVP is a protocol that deals with outsourcing of policy decisions for Resource ReSerVation Protocol (RSVP) clients to policy servers over requests for network resources.

#### **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).

Open IP Environment currently provides support for COPS Common Client to set policies including filters and traffic profiles for Policy-Based DiffServ QoS Management.

Open IP Environment COPS Common Client, COPS-PR and COPS-RSVP modules reside within the Common Control Plane. In the Open IP Environment framework, COPS is implemented as a COPS Common Client module and a series of client type modules e.g. COPS-PR and COPS-RSVP.

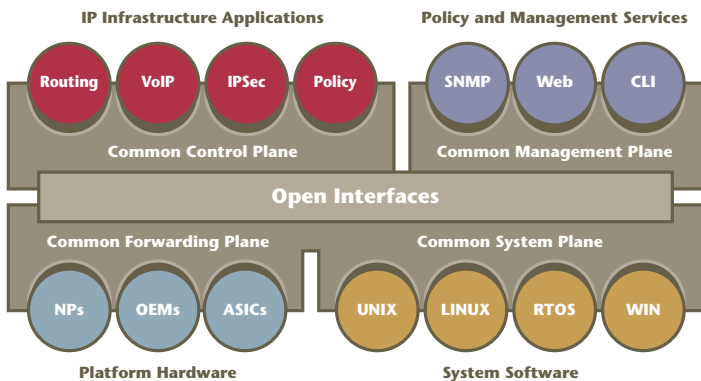
#### **Framework Overview**

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.

## Policy-Based COPS Clients Overview

### COPS Common Client

The COPS Common Client module provides the underlying infrastructure for policy provisioning. It has been adopted by most major hardware and network software vendors as their protocol of choice for their policy-enabled products. COPS protocol was created for the general administration, configuration, and enforcement of policies. It is a simple query and response protocol for distributing policy information and decisions across a network between a policy server (Policy Decision Point or PDP) and its clients (Policy Enforcement Points or PEPs). The PEP enforces the policy decisions made by the PDP.



The COPS protocol RFC supports two common COPS policy models. The first model is outsourcing, in which every PEP event triggers a PDP decision. This scheme applies to RSVP, for example, because every RSVP reservation request that arrives at PEP requires a PDP decision. The second model, provisioning, is not designed around a one-to-one mapping between PEP events and PDP decisions. Provisioning applies, for example, with DiffServ, because a DiffServ edge router (e.g. PEP) does not need to respond to new traffic by querying a policy server.

### COPS-PR Client

COPS-PR is the COPS client-type created for policy provisioning. It applies to DiffServ QoS networks, although its scope is not limited to DiffServ.

DiffServ policies are chiefly captured in Service Level Agreements (SLAs), which are relatively static. Thus, when COPS is used to distribute DiffServ policy, a PDP generally needs to issue Decision messages only when SLAs or policies are updated. The Open IP Environment COPS-PR module is designed for such a model.

### COPS-RSVP

Open IP Environment DiffServ architecture also allows end-hosts or applications to explicitly signal their requests to the network. At the moment, there is no particular signaling protocol standardized for DiffServ. However, clearly one of the leading candidates for a host-to-network signaling protocol is RSVP (RFC 2205) in case of “RSVP Signaling for Admission Control to Differentiated Services Networks”.

Dynamically signaled Quality of Service requests requires Dynamic Admission Control decisions. This involves communication between routers and the PDP where COPS-RSVP is the protocol used for this communication. Both RSVP “RESV” and “PATH” messages are encapsulated in COPS-RSVP message to the Policy Server.

### COPS-PR & COPS-RSVP Client Interactions

#### COPS Common Client and Planes

EION Open IP Environment COPS Common Client, COPS-PR and COPS-RSVP client modules interact with the Open IP Environment Common System Plane. These modules use the Open IP Environment Common System Plane components such as message queues, timer, etc...

Well-defined COPS Common Client APIs are used to allow the interaction between the COPS Common Client and the COPS Clients (i.e. COPS-PR and COPS-RSVP)

#### COPS-PR and Forwarding Plane

EION Open IP Environment COPS-PR module interacts with the Common Forwarding Plane through a Policy Agent module that resides in the Control Plane. The Policy Agent is responsible for accepting all policy information and communicating with the Open IP Forwarding Plane Interface. The Policy Agent also handles the role-to-interface assignment and execution intelligence.

#### COPS and RSVP

EION Open IP Environment COPS-RSVP client interacts with the Open IP Environment RSVP protocol engine through a Policy Manager API. It connects to the external Policy Server via the COPS Common Client to communicate exchanges of Policy decisions to the Open IP Environment “RSVP Engine”.

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

### COPS, COPS-PR, and COPS-RSVP Features

EION Open IP Environment COPS, COPS-PR, and COPS-RSVP module demonstrates the following key features:

- COPS-PR and COPS-RSVP protocol implementations communicate with the Open IP Environment COPS Common Client through an API library provided by the COPS Common Client
- COPS-PR allows to pass Policy Information Base (PIB) information inside the COPS defined “Request message”
- COPS-PR interacts with the Forwarding Plane through a Policy Agent (PA). The PA allows for any “stateful” interaction between PIB and the Forwarding plane and shields the Open IP Environment FPI APIs independent from the PIB standard evolution.
- COPS-PR allows provisioning of the Open IP Environment QoS filters
- The COPS-RSVP allows the implementation of dynamic admission control to DiffServ works using RSVP Signaling (RFC 2205)
- The COPS-RSVP client interacts with the RSVP protocol engine through a Policy Manager APIs
- Support for POLICY\_DATA objects for policy control mechanisms
- COPS-RSVP client implements the COPS-RSVP protocol as defined in RFC 2749
- COPS-RSVP allows the following RSVP objects as Replacement Data in decisions: DCLASS, TCLASS, POLICY\_DATA and ERROR\_SPEC. FLOWSPEC or other RSVP objects are not supported
- The current COPS-RSVP implementation supports the following Context Object requests: “Resource-Allocation” and “Outgoing-Message” but ignores decisions regarding the “Incoming-Message” request context

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

### COPS, COPS-PR and COPS-RSVP Module Implementation

EION Open IP Environment COPS Common Client, COPS-PR and COPS-RSVP modules are implemented in the “C” programming language.

Through the publication of APIs, the Open IP Environment COPS Common Client, COPS-PR, and COPS-RSVP module have been designed for ease of portability and modularity. Open IP Environment provides an architecture to allow you to implement COPS and its COPS Clients within the Open IP Environment framework, or alternatively to adapt it 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 COPS and its clients 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 COPS and its clients
- 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 COPS Feature Summary

### RFC and Draft Support

- RFC 2205 Resource ReSerVation Protocol (RSVP), with the exception of the “INTEGRITY” object for authentication/message integrity between PDP and PEP
- RFC 2748 The COPS (Common Open Policy Service) Protocol, with the exception of the “INTEGRITY” object handling mechanisms for message level security
- RFC 2749 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)
  
- draft-ietf-rap-pr-04.txt “COPS Usage for Policy Provisioning”,
- draft-mfine-rap-frameworkpib-00.txt “Framework Policy Information Base”
- draft-mfine-cops-pib-02.txt “An Initial Quality of Service Policy Information Base for COPS-PR Clients and Servers”

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