Multicast Routing Table Manager (M-RTM)

EION Open IP Environment Multicast Routing Table Manager is a transparent and portable software module that provides flexible, efficient and scalable routing table support for all multicast Routing Protocol Applications (RPAs) for overall high performance networking.

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).

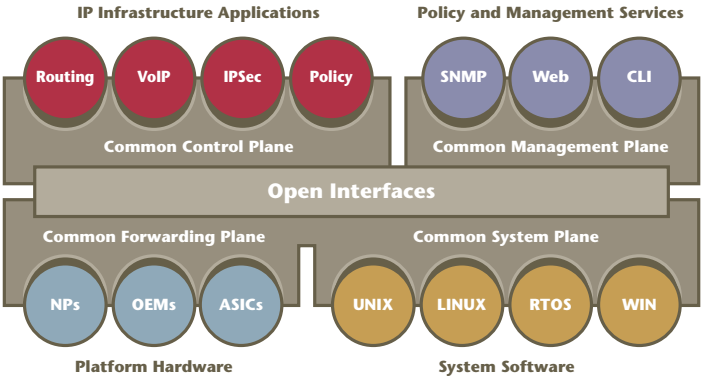
Framework Overview

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 Multicast Routing Table Manager (M-RTM) resides in the Open IP Environment Common Control Plane and provides scalable and flexible routing table support for all Open IP Environment multicast Routing Protocol Applications (RPAs). In addition, M-RTM calculates best routes for the forwarding engine through the Open IP Environment Forwarding Plane Interface (FPI). The Open IP Environment and third party forwarding engine are designed to support both unicast and multicast traffic.

M-RTM Overview

The Open IP Environment M-RTM is a software module that provides efficient, scalable and flexible routing table support for multicast RPAs such as the Open IP Environment Distance Vector Multicast Routing Protocol (DVMRP). The module enables the integration of additional multicast RPAs by using queues and messages.



M-RTM functionality comprises a routing table at its core and includes table management functionality. In addition, support for IGMP is included in the M-RTM module. This module's functionality provides services to multicast RPAs and management interfaces through the features it boasts. The M-RTM module maintains source and group routes with distribution tree information for the process of efficiently sending traffic from a source to many receivers across the network. It is designed to contain multicast routing information, specific to interfaces, for particular sources to send to specific multicast group addresses.

M-RTM allows the propagation of its own routing table, making it convenient to have separate paths for unicast versus multicast datagrams. This is suitable for service providers who may prefer to keep the unicast and multicast traffic separate for routing policy reasons as they experiment with IP multicast routing and begin to offer it as a service.

M-RTM is designed with a more complex environment in mind, to support multiple independent multicast routing domains in conformance with RFC 2715, where there are multiple independent RPAs. Each RPA creates wholly independent routes for the simple and scalable M-RTM to synchronize access to the multicast routing table.

M-RTM Interactions

EION Open IP Environment M-RTM module has been specifically designed to deliver time to market advantages through built in module to plane and module to module interactions. The Open IP Environment M-RTM module interacts with multicast RPAs as well as the Open IP Environment Common Management, Common System and Common Forwarding Plane.

M-RTM and multicast RPAs

Open IP Environment M-RTM interacts with multicast RPAs, such as the Distance Vector Multicast Routing Protocol (DVMRP), and the Protocol Independent Multicast (PIM) for the creation of wholly independent routes through the routing table with well-defined application programming interfaces (APIs).

The M-RTM module contains the industry standard implementation of Internet Group Management Protocol (IGMP) per RFC 2236. IGMP provides the multicast cache table and a set of messages that allows for integration with DVMRP.

M-RTM and Others

The population of source/group routes is sent to the Open IP Environment Forwarding Engine (FE) or a third party forwarding engine through the Open IP Environment Forwarding Plane Interface (FPI) from a multicast routing table that contains source and group routes with distribution tree information. The FE and FPI are modules that comprise the Open IP Common Forwarding Plane.

The packet forwarding function resident in a forwarding engine contains the multicast forwarding cache. When a packet arrives for which there is a valid multicast cache entry, the forwarding function forwards a packet on a list of downstream interfaces without intervention from a multicast protocol. If there is no cache entry, the forwarding function will send a request to the multicast protocol that is active on the arriving interface to create the entry and add it to the M-RTM table. An entry will contain a set of downstream interfaces.

M-RTM and Planes

Within the Open IP Environment, the M-RTM module can be configured to use the Open IP Environment's Common System Plane functions such as timers, message queues, memory manager and thread manager

libraries. This module also uses the services of the Common Management Plane by developing appropriate management code in order to integrate with management services such as SNMP, EION Command Line Interface and/or web-based management.

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

M-RTM Features

EION M-RTM module demonstrates the following key features:

- Maintains source and group routes with distribution tree information for the process of efficiently sending traffic from a source to many receivers across the network
- Allows the propagation of its own routing table, making it convenient to have separate paths for Unicast versus Multicast datagrams
- Maintains its own Reverse Path Forward unicast routing table taking input from policy, the unicast RTM and multicast RPAs such as DVMRP which compute their own Reverse Path Forward table.
- Provides support for dynamic learning of host membership information with IPv4 through its embedded IGMP.
- Interfaces with the RPAs when membership changes are implemented.
- Allows for multiprocessor usage in multiple processor architecture as messages between M-RTM and multicast RPAs will not pass pointers
- Handles Unicast Routing Table Manager (U-RTM) changes via RPA signaling
- Designed to allow efficient interoperation among multiple independent multicast routing domains in conformance with RFC 2715 via "alerts"
- Provides interfaces to the forwarding Engine via the Open IP Environment Forwarding Plane Interface for forwarding cache management and statistics

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

M-RTM SNMP Support

This module implements management via SNMP MIB support via Multicast Routing MIB and IGMP MIB drafts. These MIB objects contain Cache Tables entries of each interface on which IGMP is enabled and of IP multicast group for which there are members on a particular interface. All objects are defined in a high-level description file to allow easy integration with Open IP Environment or third party SNMP agents.

M-RTM Module Implementation

EION M-RTM is implemented in the "C" programming language. The configuration of this module periodically relinquishes control, permitting the utilization of the CPU for other activities in the system.

Open IP Environment M-RTM module is designed for portability and modularity. The design includes open and published APIs. Open IP Environment provides an architecture to allow you to implement M-RTM within the Open IP Environment framework, or alternatively to adapt this 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 M-RTM 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 M-RTM
- 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 M-RTM Feature Summary

RFC and Draft Support

- RFC 1112 Host extensions for IP Multicasting
- RFC 2236 Internet Group Management Protocol (IGMP) version 2
- RFC 2715 Compliant with "Interoperability Rules for Multicast Routing Protocols"

- IP Multicast Routing MIB as per "draft-ietf-idmr-multicast-routmib-05.txt"(97)
- IGMP MIBs as per "draft-ietf-idmr-igmp-mib-04.txt" (96)

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