



Unicast Routing Table Manager (U-RTM)

EION Open IP Environment Unicast Routing Table Manager is a portable software module that provides services to routing protocol and management interfaces for adding, modifying, deleting and querying route entries.

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

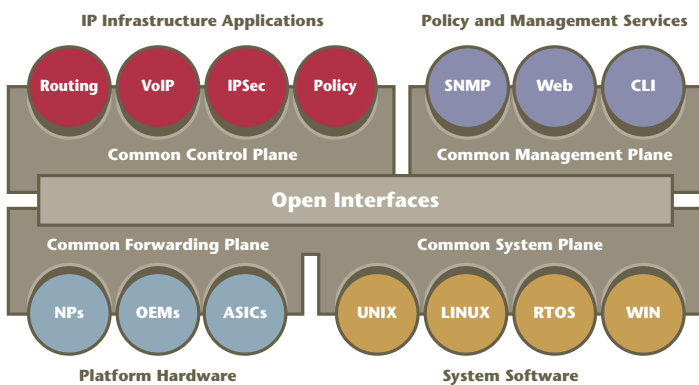
EION Open IP Environment framework consists of four planes: Common Control Plane, Common System Plane, Common Forwarding Plane and Common Management Plane. Each of these planes contains a set of components that are built to use well-defined interfaces.

Open IP Environment U-RTM module resides within the Common Control Plane to deliver high performance and interoperable services to routing protocols. 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) and delivers network functionality for providing interchangeable access for all IP-based modules such as BGP-4, RIP, IS-IS and OSPF.

The Routing Table Manager (RTM) is an Open IP Environment component that maintains the unicast routing table and is responsible for the process of redistributing routes to the various RPAs. The RTM receives information from the Open IP Environment RPAs and sends the “best” routes to the forwarding engine located within the forwarding plane.

U-RTM Overview

EION Open IP Environment U-RTM is a transparent and portable software module that provides services to routing protocol and management interfaces for adding, modifying, deleting and querying route entries. This module handles traffic from one source to one destination, with enhanced capabilities of calculating best routes for the Open IP Environment or third party forwarding engine. In addition to calculating best routes, this module is also responsible for the process of leaking routes between routing protocols.



Open IP Environment U-RTM is designed to use the services of the “PULL” mechanism. The U-RTM has the capability to send updates to the RPAs each time it learns, modifies, or deletes the newest best route. This means that the “pull” mechanism allows U-RTM to send notification signals directly to the appropriate RPA and in turn, the individual RPA decides when to pull the changes.

Open IP Environment U-RTM comprises a routing table at its core, table management and garbage collection, an exported application protocol interface (API) to add and delete routes, as well as an efficient search mechanism for lookup of routes specific to a defined criterion.

U-RTM Interactions

EION Open IP Environment U-RTM module has been specifically designed to deliver time to market advantages through the built-in module to plane and

module-to-module interactions. U-RTM module interacts with unicast RPAs as well as the Open IP Environment Common Management Plane, Common System Plane and Common Forwarding Plane.

U-RTM and RPA Interactions

U-RTM interacts with unicast RPAs such as OSPF to store changes in its routing table and sends signals to other RPAs about changes such as leaked routes. U-RTM also sends the best route updates to the forwarding plane using the Open IP Environment Forwarding Plane Interface (FPI). U-RTM also has access to the IPv4 module for interface updates and circuit management functions such as create, delete and update for circuit events, circuit configuration, etc.

U-RTM and Planes

U-RTM interacts with the Open IP Environment Common Management Plane to add and delete static routes as well as providing ‘enable’ and ‘disable’ route distribution capabilities. The Common Management Plane also provides services to the U-RTM by developing appropriate management code in order to integrate with management capabilities such as SNMP, EION Command Line Interface and/or web-based management.

In addition, the U-RTM module uses the Open IP Environment’s Common System Plane functions such as timers, message queues and thread manager libraries. U-RTM has also been designed to interact with a third party or Open IP Environment Forwarding Engine by using its APIs to forward protocol data units (PDUs) seamlessly and efficiently across any type of device.

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

U-RTM Features

EION Open IP Environment U-RTM module demonstrates the following key features:

- Ease of integration with the RPA's via well defined APIs
- Efficient design for leaking routes between routing protocol applications (RPAs) via "Pick" and "Pull" mechanisms
- Mechanisms for dynamic RPA registration with RTM
- Efficient search and storage mechanisms (e.g. Using Hash lists, balanced binary trees, and Patricia/radix tree)
- Setting route distribution preferences
- Multi-key access routing table
- Supports equal cost multipath (ECMP)

U-RTM Management Support

Well-defined application interfaces are utilized by RPAs working in unison with Open IP Environment U-RTM to implement management support via SNMP MIB as per RFC 2096.

In addition, U-RTM implements management via EION Command Line Interface (CLI). EION CLI is packaged with industry standard commands, which can be easily integrated into the customer's specific device. Please refer to the EION Command Line Interface Product Brief for more information.

This static management support demonstrates the following capabilities:

- Ability to add and delete new dynamic or static routes to and from routing tables
- Replaces routes in the routing tables
- Queries management for read access to the routing table.

U-RTM Module Implementation

EION Open IP Environment U-RTM module is implemented in the "C++" programming language. Through the publication of APIs, the Open IP Environment U-RTM module boasts a design that facilitates ease of portability and modularity by providing an architecture that allows you to implement U-RTM within the Open IP Environment framework, or alternatively to adapt the U-RTM 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 U-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 U-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 U-RTM Feature Summary

RFC and Draft Support

- RFC 2096 IP Forwarding Table MIB

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