



Virtual Router Redundancy Protocol (VRRP)

EION Open IP Environment Virtual Router Redundancy Protocol is a portable software module that manages router redundancy per RFC 2338 and achieves high performance, high availability and fault tolerance.

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).

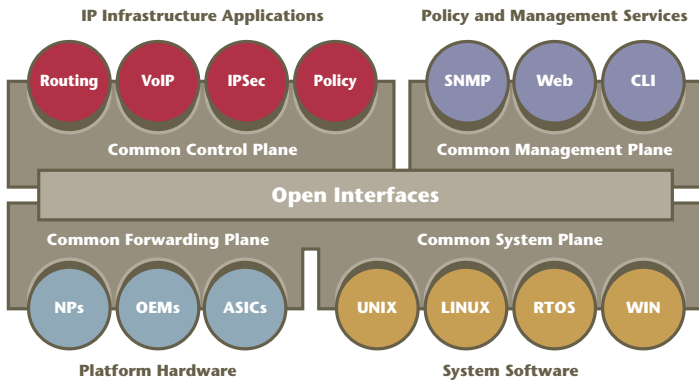
Open IP Environment VRRP module resides within the Common Control Plane. VRRP provides a way to manage router redundancy to achieve high performance, high availability and fault-tolerance. The control plane supports the Open IP Environment Internet Protocol (IP) infrastructure and enables a mix and match approach for adding support for networking protocols and/or services. Routing Protocol Applications (RPAs) interface with the control plane and deliver network functionality for providing interchangeable access to all IP-based modules such as BGP, RIP, and OSPF.

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.

VRRP Overview

EION Open IP Environment Virtual Router Redundancy Protocol (VRRP) module is a portable implementation of the Virtual Router Redundancy Protocol as specified in RFC 2338. The module provides fault tolerance using redundancy resulting in an overall maximum availability and performance of your device.



VRRP has been designed to provide fault tolerance by eliminating the single point of failure that can occur when a single, static default gateway router for an end station is lost. VRRP introduces the concept of a virtual IP address (transparent to users) shared between two or more routers connecting the common subnet to the network. With the virtual IP address as the default gateway on end hosts, the Open IP Environment VRRP provides a dynamic default gateway in the event of a failure. The Open IP Environment VRRP module has also been designed with an election mechanism that dynamically assigns responsibility for a virtual router to any one of the virtual routers on a local area network (LAN). The implementation of the Open IP Environment VRRP module enables the support of a single-master, single-backup relationship between the VRRP routers.

The VRRP router, controlling the IP addresses associated with a virtual router, is called the Master. The Master forwards packets on behalf of these IP addresses. Open IP Environment's VRRP implementation supports one IP address for each virtual router. VRRP provides redundant gateways without any changes to the host's configuration while supporting standards based routing protocols.

As a result, any of the virtual router's IP addresses on a LAN can then be used as the default first hop router by end hosts.

VRRP Interactions

EION Open IP Environment VRRP module has been specifically designed to deliver time to market advantages through built in module-plane and module-module interactions. The Open IP Environment VRRP module interacts with the IPv4 module as well as the Open IP Environment Common System and Common Forwarding Plane.

The VRRP module interacts with the IPv4 module by utilizing IP services for registering with IP functions. IP also passes circuit (physical interface) information to VRRP, and also notifies VRRP of changes in circuit information. VRRP utilizes the services of IP stack as it handles VRRP's advertising messages between the master and the backup.

Within the Open IP Environment, the VRRP 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.

Finally, VRRP seamlessly integrates with the Open IP Environment or third party forwarding engine to access it's the forwarding engine's APIs 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 on other Open IP Environment planes and modules, please refer to the relevant product briefs.

VRRP Features

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

- Provides single-master, single-backup
- Implements full-fledged router redundancy functionality.
- Delivers highly accessible networks by achieving redundancy using fault tolerance techniques by managing replications, without compromising performance
- VRRP is implemented as a separate thread within Open IP Environment.
- Provides for operation over Ethernet type of networks
- Offers specific APIs for interfacing with management, IP, and forwarding engine applications

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

VRRP Management Support

This module 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.

VRRP Module Implementation

EION Open IP Environment VRRP module is 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 APIs, the Open IP Environment VRRP module has been designed for ease of portability and modularity. Open IP Environment provides an architecture to allow you to implement VRRP within the Open IP Environment framework, or alternatively to adapt the VRRP 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 VRRP 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 VRRP
- 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 VRRP Feature Summary

RFC and Draft Support

- RFC 2338 Virtual Router Redundancy Protocol (VRRP)

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