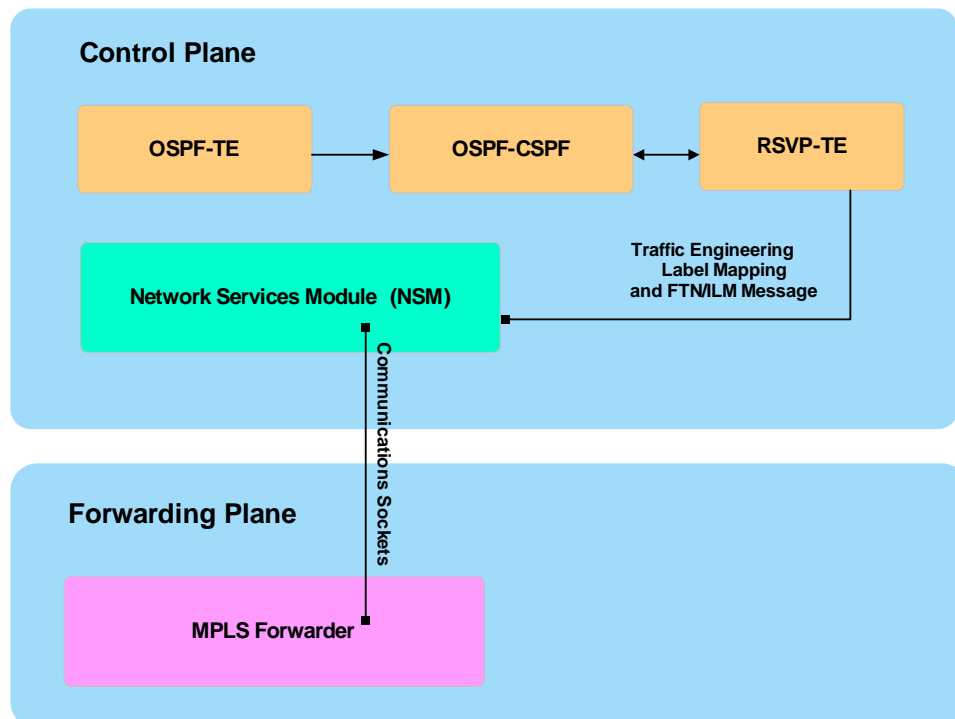


RSVP-TE Module

Overview

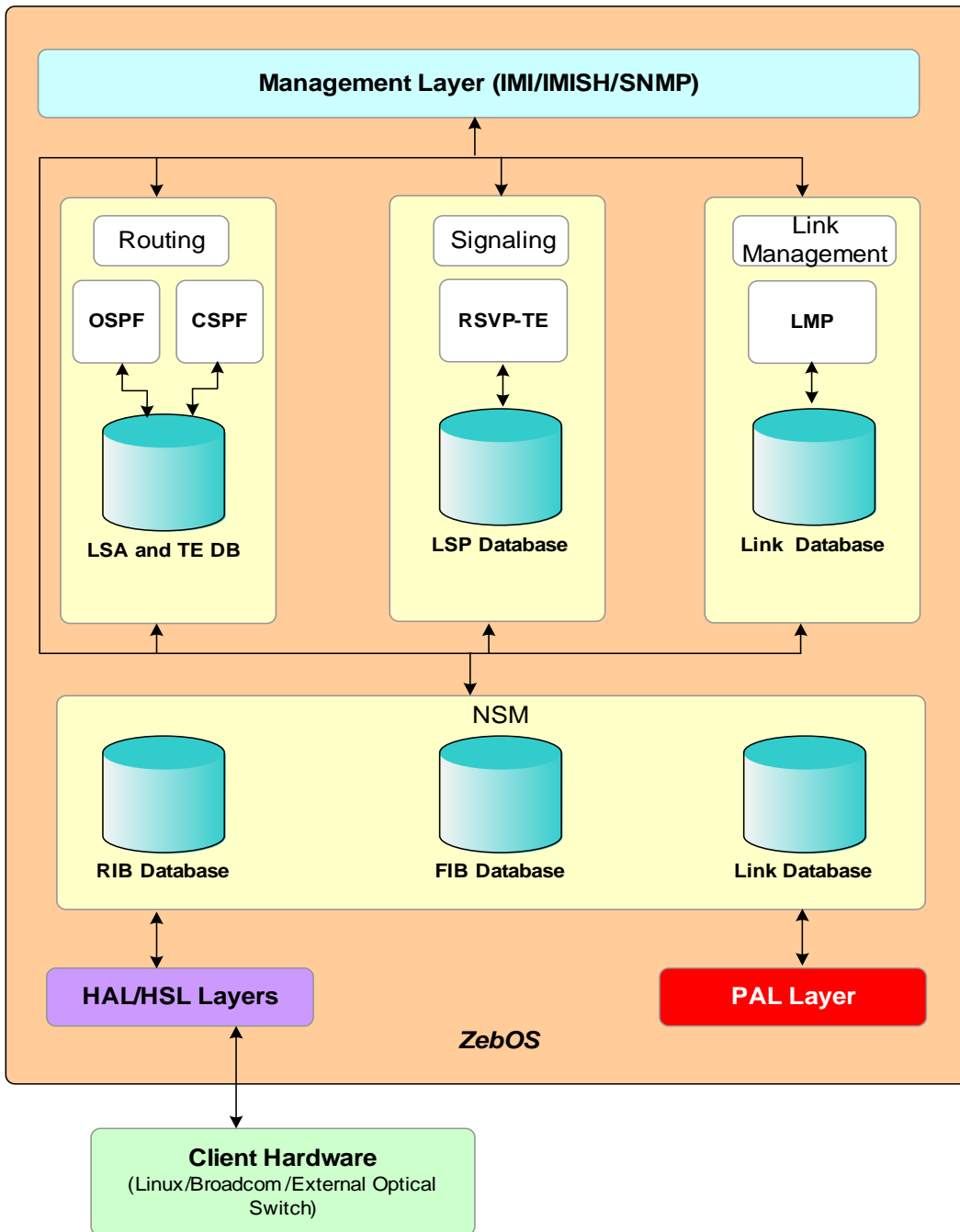
IP Infusion's ZebOS® Network Platform Resource Reservation Protocol-Traffic Engineering (RSVP-TE) Module is portable software that provides signaling information for traffic engineering to an MPLS (Multi-protocol Label Switching) or a Generalized MPLS (GMPLS) network. RSVP-TE is implemented in the ZebOS Network Services Manager (NSM) to take advantage of services provided by the NSM. A router that supports MPLS or GMPLS as either an LER or an LSR utilizes RSVP-TE to request quality of service (QoS) tasks from the network for a flow that a network operator has provisioned.



RSVP Model

GMPLS Extensions

GMPLS enhances MPLS architecture by separating the control planes and data planes of various networking layers. The GMPLS control plane supports IPv4 addresses at this time, and IP Infusion's implementation of GMPLS also supports unnumbered data-plane links.



GMPLS Module Interaction with RSVP-TE

GMPLS enables seamless interconnection and convergence of new and legacy networks by allowing end-to-end provisioning, control, and traffic engineering, even when the start and end nodes belong to heterogeneous networks. RSVP-TE is the signaling protocol required to establish GMPLS LSPs. GMPLS can interoperate with MPLS at the same time, and some interfaces may use MPLS for signaling while others may use GMPLS.

ZebOS RSVP-TE relies on NSM for most of the services necessary to support GMPLS. It receives information about data links, control links, TE links, control channels, and control adjacencies from NSM. RSVP-TE also depends on NSM for Label, RIB (FTN/ILM), and QoS. The following list defines the major components of the ZebOS RSVP-TE enhancement to support GMPLS.

- **GMPLS LSP** GMPLS supports Unidirectional and Bidirectional LSP (Label Switched Paths). For Bidirectional LSP, both a forward LSP and a reverse LSP are established with a single set of messages: a single initiator and a single terminator.
- **Explicit Label Control** Explicit Label Control supports the ability to designate label Explicit Route Objects (ERO), and further supports this functionality in the forward and reverse directions for bidirectional LSPs. Explicit label control also extends the label Record Route Object (RRO) in the reverse direction for bidirectional LSPs.
- **Control Channel Separation** Control Channel Separation handles data links and control adjacencies from the RSVP-TE perspective. Control channel separation also manages registration with NSM for these services.
- **NSM Interface** The NSM Interface addresses the RSVP-TE interface with an NSM client. Major functions include label, RIB (for FTN and ILM), and QoS management.
- **CSPF Interface** The CSPF Interface conveys constraints, priority, metrics, and received ERO paths to RSVP-TE.
- **Configuration Manager** The Configuration Manager is used to configure properties of the RSVP-TE module. It receives configuration information from the ZebOS IMI (Integrated Management Interface), and contains enhancements to MPLS commands that extend RSVP-TE functionality to GMPLS.

MPLS

ZebOS RSVP-TE communicates with the MPLS Forwarder via the ZebOS NSM using client APIs to set up LSP across a network. RSVP-TE supports explicit routing by incorporating a simple EXPLICIT_ROUTE object into RSVP PATH messages. An explicitly-routed path can be set up administratively, or may be “learned of” by querying the Constrained Shortest Path First (CSPF) extension.

DiffServ and DiffServ TE

ZebOS RSVP-TE supports optional DiffServ and DiffServ TE extensions. IP Infusion has implemented RFC 3270 as an extension to the ZebOS RSVP-TE module to provide a flexible DiffServ-over-MPLS solution that enables RSVP-TE to set up a DiffServ LSP using RSVP signaling. By combining DiffServ with MPLS TE, routing devices can simultaneously classify and prioritize traffic, and achieve fine-grained optimization of transmission resources.

Fast Reroute

ZebOS RSVP-TE supports optional Fast Reroute. Fast Reroute (FRR) is a mechanism that facilitates fast local repair of LSPs in the event of link or node failures. It extends RSVP to request link or node protection by appending an FRR object to the Path message, which indicates to downstream LSRs that a locally-generated backup LSP should be set up to back up this Protected LSP, in the event the downstream link or node fails. RSVP-TE uses refresh reduction to optimize RSVP-TE refresh updates.

Features

- GMPLS Signaling Support (IPv4 addresses only)
- RSVP-TE Hellos —The RSVP Hello extension enables RSVP nodes to detect when a neighboring node is not reachable, thus providing node-to-node failure detection.
- Explicit Route and Record Route Objects
- Loop detection
- Nexthop Caching

- Make-before-break
- Fast Reroute (FRR) and Traffic Engineering for LSP Tunnels
- Path Preemption and Priorities (MPLS only)
- Ability to map IP flows to LSPs based on destination address using the “map-route” command
- Graceful restart (IPv4 and MPLS only)

Requirements

- ZebOS Network Services Manager
- ZebOS MPLS Forwarder (optional; for Linux only)
- ZebOS OSPFv2 Module (optional for Fast Reroute functionality)
- ZebOS OSPF-CSPF Module (optional for GMPLS functionality)

Standards Support

- RFC 2205 — Resource reSerVation Protocol (RSVP) - Version 1 Specification
- RFC 2206 — RSVP Management Information Base Using SMIv2
- RFC 2210 — Use of RSVP with IETF Integrated Services
- RFC 2211 — Specification of the Controlled-Load Network Element Service
- RFC 2212 — Specification of Guaranteed Quality of Service
- RFC 2961 — RSVP Refresh Overhead Reduction Extensions
- RFC 3209 — RSVP-TE: Extensions to RSVP for LSP Tunnels
- RFC 3473 — Generalized Multi-Protocol Label Switching (GMPLS) Signaling RSVP-TE Extensions
- RFC 3477 — Signaling Unnumbered Links in Resource reSerVation Protocol - Traffic Engineering (RSVP-TE)
- RFC 3812 — Multi-Protocol Label Switching (MPLS) Traffic Engineering (TE) Management Information Base (MIB)
- RFC 4090 — Fast Reroute Extensions for RSVP-TE for LSP Tunnels

Standard Deliverables

- Source Code (written in ANSI-compliant C)
- Installation Guide
- Configuration Guide
- Command Reference Guide
- Developer Guide