

ZebOS®  
Network Platform

## GMPLS Modules

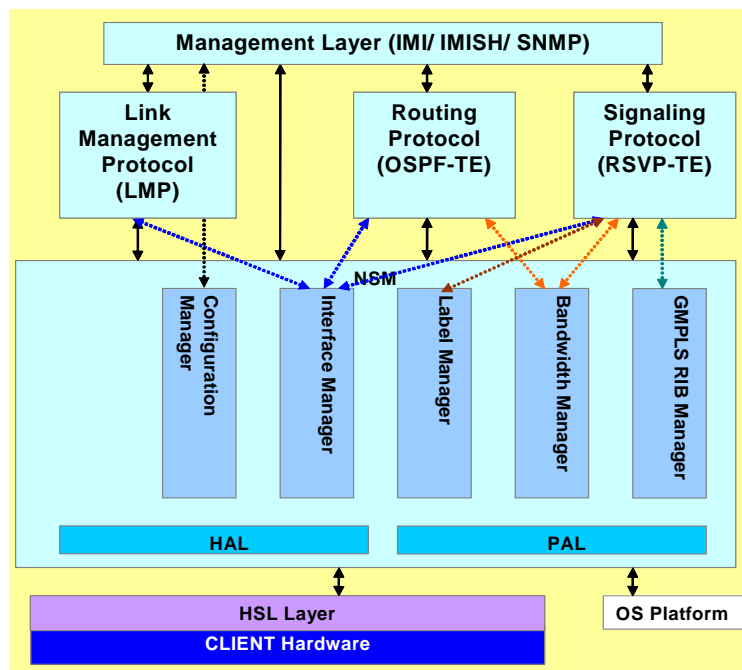
### Overview

IP Infusion's ZebOS Network Platform GMPLS (Generalized Multi-Protocol Label Switching) modules enable seamless interconnection and convergence of new and legacy networks by allowing end-to-end provisioning, control, and traffic engineering, even when the start and the end nodes belong to heterogeneous networks. GMPLS enhances MPLS architecture with complete separation of the control and data planes of various networking layers in packet-switched networks.

GMPLS comprises several protocols, including OSPF-TE for routing, RSVP-TE for signaling, OSPF-CSPF for optimal path computation, and Link Management Protocol (LMP) for link management.

### System Architecture

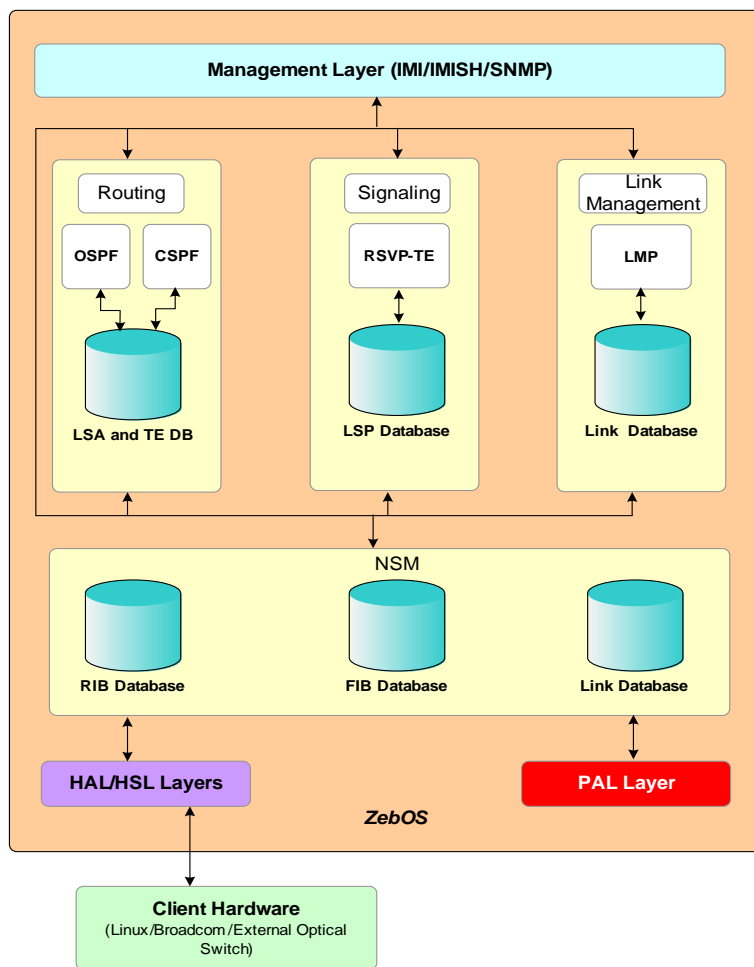
The figure depicts the interaction of GMPLS protocols with the ZebOS Network Services Manager (NSM), LMP, a routing protocol (OSPF-TE) and a signaling protocol (RSVP-TE).



**GMPLS Module Architecture**

Most functionality for GMPLS infrastructure and provisioning is in the NSM. The sub-modules use the APIs exposed by the NSM client, which in turn acts as a conduit transferring information between protocol modules and the NSM. The GMPLS sub-modules shown above have the following functions:

- **Interface Manager** The interface manager monitors physical plus various GMPLS logical interface structures, such as data links, control links, TE links, and control channels, to provide services for all logical interface types. The protocol modules subscribe to services from the interface manager for different logical interface types.
- **Configuration Manager** The configuration manager receives data from the IMI (Integrated Management Interface), and supports commands and modes for GMPLS.
- **GMPLS RIB Manager** The GMPLS RIB manager supervises GMPLS RIB entries and provisions the forwarder. It also manages the RIB for bidirectional LSPs.
- **Label Manager** The label manager interacts with the signaling protocol to manage the labels in the GMPLS system. Label manager provides services for requesting a specific label, label set, or any available label.
- **Bandwidth Manager** The bandwidth manager interacts with the signaling protocol to administer bandwidth information and operations, for example, assigning bandwidth to an LSP on a TE link, obtaining current bandwidth usage and retrieving newly-available bandwidth when and LSP goes down.



### GMPLS Module Interactions in ZebOS

GMPLS employs three major protocols working together: RSVP-TE with extensions, OSPF-TE with extensions, and the LMP. The CSPF (Constrained Shortest Path First) algorithm calculates the best path for an LSP through the network using topology information retrieved from the routing protocol TE database (TED), and then forwards it to the signaling protocol.

For more information about the RSVP-TE, OSPF-TE, LMP, and OSPF-CSPF, refer to their separate data sheets.

## Features

- Interoperable with Existing MPLS Devices
- Signals Over MPLS-established Links
- GMPLS Ethernet Link Switching (GELS), including support for PBB-TE
- Unidirectional and Bidirectional LSP Support for PSC
- Link Bandwidth Management
- Out-of-band GMPLS Signaling
- Supports Unnumbered Links (IPv4 only)
- GMPLS and MPLS can Co-exist on a Node
- PSC and PBB-TE Tunnel Support

## Standards Supported

- RFC 3471 — Generalized Multi-Protocol Label Switching (GMPLS) Signaling Functional Description
- RFC 3473 — GMPLS Resource reSerVation Protocol (RSVP-TE) Extensions
- RFC 3477 — Signaling Unnumbered Links in Resource reSerVation Protocol - Traffic Engineering
- RFC 3945 — Generalized Multi-Protocol Label Switching (GMPLS) Architecture
- RFC 4204 — Link Management Protocol; Base Implementation
- draft-ietf-ccamp-gmpls-ether-pbb-te-04 — Generalized Multi-Protocol Label Switching (GMPLS) Control of Ethernet PBB-TE

## Requirements

- ZebOS Network Services Manager
- ZebOS RSVP-TE
- ZebOS OSPFv2
- ZebOS OSPF-CSPF
- ZebOS Link Management Protocol

## Standard Deliverables

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