

ZebOS®
Advanced Integration Suite

ZebOS Advanced Integration Suite

Overview

The ZebOS Advanced Integration Suite (AIS) is a suite of software platforms, called the Hardware Integration Platform (HIP), which was created for, and pre-integrated with, industry leading merchant silicon and operating systems. These HIPs provide a comprehensive forwarding plane implementation, supporting Layer-2, Layer-3 (IPv4 and IPv6), multicast and MPLS/Traffic Engineering. A ZebOS AIS HIP, when combined with the ZebOS Advanced Routing Suite (ARS) Layer-2, Layer-3, multicast and MPLS networking protocol software for the control plane, provides a full system solution for enterprise switching, Metro Ethernet, access, edge, mobile wireless and advanced IP services applications.

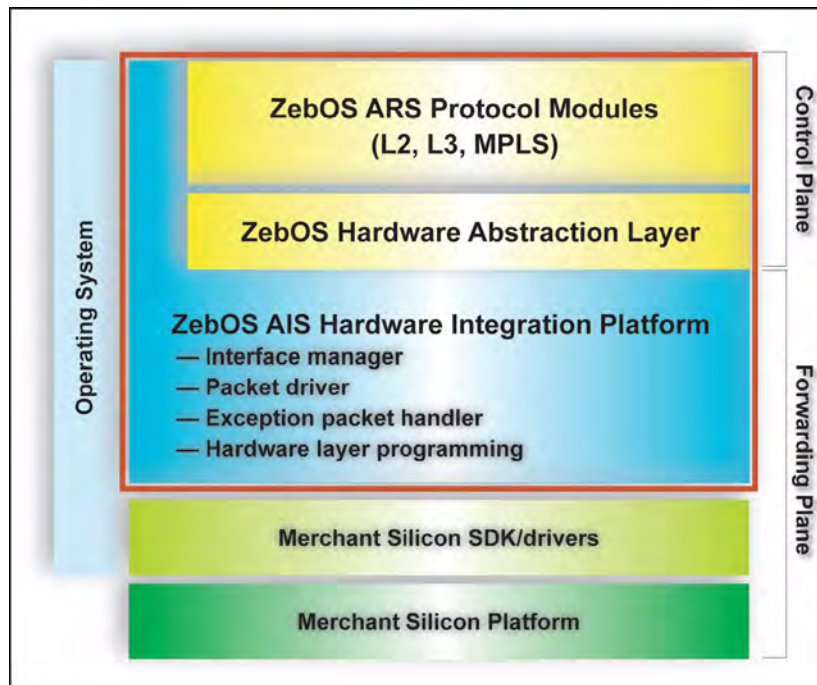
The ZebOS ARS is a complete suite of Layer 2, Layer 3, multicast and MPLS networking protocol software. The ZebOS ARS supports both IPv4 and IPv6 networks, and is well positioned not only to support core, edge, and access routing and switching platforms, but also to act as the standard routing protocol for an entire range of IPv6-enabled devices. These devices include Small Office-Home Office (SOHO) gateways, wireless, access and security devices, plus devices that support Virtual Private Network (VPN) and Voice-over-Internet Protocol (VoIP) technologies, and require Quality of Service (QoS) and superior bandwidth management.

The ZebOS AIS HIPs are fully system tested with the ZebOS ARS protocol software on leading merchant silicon reference platforms. The well-defined extensible API between the ARS (control plane) and the AIS (forwarding plane), called the Hardware Abstraction Layer (HAL), allows easy addition of custom features and applications.

Selecting from IP Infusion's full range of ZebOS AIS Hardware Integration Platforms and ZebOS ARS Layer 2, Layer 3 and MPLS protocol modules, original design manufacturers (ODMs) and original equipment manufacturers (OEMs) can rapidly bring complete solutions to market without the costly and lengthy software and hardware integration development normally associated with complex switching and routing systems.

Modular and Portable Software Architecture

The ZebOS ARS and ZebOS AIS software suites utilize an industry-leading, scalable, modular and extensible architecture for building routing and switching solutions, plus IP services and application systems, as shown in the following software architecture diagram.



ZebOS ARS and ZebOS AIS Architecture

The ZebOS Hardware Abstraction Layer (HAL) isolates all of the hardware-platform-specific interactions into a small set of well-defined function calls for the ARS (control plane). The HAL provides a unified interface for the control plane to interact with the forwarding plane for all Layer 2, Layer 3, multicast and MPLS forwarding needs. The function calls above the HAL run unmodified for any switching and routing hardware platform. The result is that customers have complete flexibility to select only the protocol modules they require in the most cost and code-space effective ways.

The ZebOS Hardware Integration Platform (HIP) provides integration and optimization of the ZebOS ARS software with both a merchant silicon hardware platform and an operating system of choice. Depending on the system application, the appropriate HIP base module and the required options can be flexibly selected. For example, for enterprise switching and Metro Ethernet applications, the available options are shown in the following table. Availability of options may depend on the merchant silicon used. Taking advantage of the feature-rich merchant silicon, the HIP base module includes support for hardware-based QoS management, rate limiting, traffic metering, and security, such as packet filtering/remarking, denial-of-service attack, CPU protection and packet tunneling.

	L2 ONLY BASE MODULE	L2, L3 & HYBRID BASE MODULE	IPv6 (UNICAST & MULTICAST) OPTION	STACKABLE & CHASSIS SYSTEM OPTION	MPLS & TRAFFIC ENGINEERING OPTION
L2 ENTERPRISE SWITCH	X		X		
STACKABLE L2 ENTERPRISE SWITCH	X		X	X	
L3 ENTERPRISE SWITCH		X	X		
STACKABLE L3 ENTERPRISE SWITCH		X	X	X	
METRO ETHERNET SWITCH (IPDSALM, EFM/xPON, RPR, ETHERNET OVER FIBER/SONET/WDM)		X	X	X	X
METRO ETHERNET MTU		X	X		X

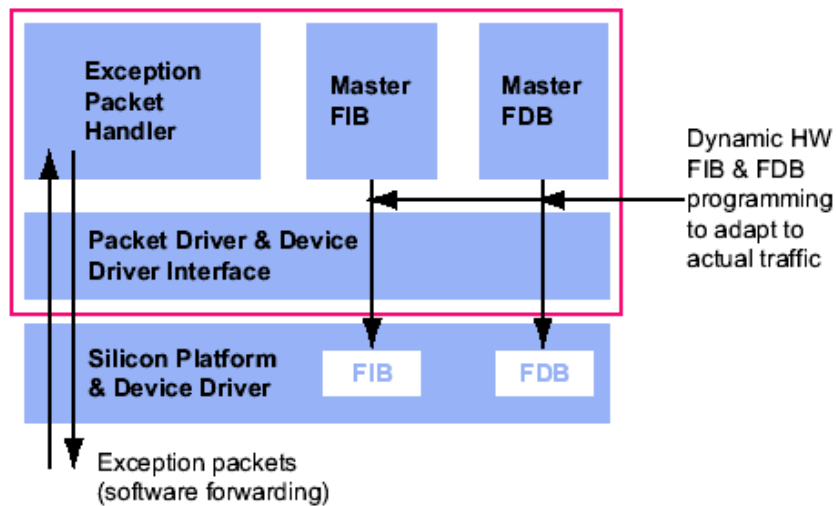
Comprehensive Forwarding Plane Implementation

The ZebOS AIS HIP includes an advanced Interface Manager that provides a logical view of hardware platform interfaces. The Interface Manager insulates interconnect topology details of merchant silicon chips within and across hardware platforms, so that hardware platform physical and logical interfaces can be easily managed and configured from the control plane through the ZebOS Integrated Management Interface (IMI). The Interface Manager implementation encompasses Layer 2 ports, Layer 3 interfaces, aggregates (Layer 2 or Layer 3), Switched-Virtual-Interface, and all possible Layer 2/Layer 3/VLAN/aggregate hierarchies. The Interface Manager simplifies systems management, and provides a uniform mechanism for all of the Layer 2, Layer 3 and MPLS protocols to view and interact with the physical and virtual interfaces.

The ZebOS AIS HIP also contains a Packet Driver that provides a logical pipe between the control and forwarding planes for all Layer 2, Layer 3, multicast and MPLS protocol control packets.

High Performance Scalable Frame/Packet Forwarding

The ZebOS AIS HIP supports master Forwarding Information Base (FIB) and Forwarding Database (FDB) in software, as an extension to the hardware/silicon-based FIB and FDB, for performance scaling. The HIP includes an Exception Packet Handler to handle exception packets received from the Packet Driver that fail to find the destination using the hardware layer's forwarding information. The Exception Packet Handler can route these packets appropriately, as it has access to the master FIB and FDB. The Exception Packet Handler can also program the hardware layer so that future packets to the same destination can be routed using a fast-path (hardware-switched path), if required.



Exception Packet Handling Mechanism

With the software-based master FIB and FDB in the HIP, customers can scale the routing performance beyond the limited size of the local forwarding database in hardware using larger RAM and a more powerful CPU.

Advanced Distributed Stacking/Chassis Support

The advanced architecture of a ZebOS HIP maintains modular, portable, Layer 2/Layer 3 hybrid, and adaptive packet handling benefits, while supporting the distributed forwarding plane for maximum performance and scalability. With the ZebOS HIP distributed forwarding plane architecture, Layer 2/Layer 3 packet forwarding and switching and routing features across the entire system, a unified management view of the stacked, or chassis system based on ports, is supported.

The ZebOS HIP is designed to support the concept of master/slave instances needed to support a distributed forwarding plane in a stackable or chassis-based system, with a single point of management. One of the stackable units, or chassis processor cards, is elected as the Master to perform system interconnection discovery, topology management, and dynamic reconfiguration in response to system change events.

Integration of Customer Features and Functions

The flexible ZebOS AIS architecture allows developers to easily expand, adapt or configure it, according to their specific needs. The well-defined HAL API allows ZebOS ARS, and custom applications to interface with the operating system and forwarding plane for routing and forwarding table updates. The ZebOS HAL API is also highly extensible, to enable expansion of the support of merchant silicon hardware platform and operating system for customer-specific applications.

Summary of ZebOS AIS HIP Benefits

- Integration and optimization of ZebOS ARS software with the hardware platform and operating system of choice

- Flexible and cost effective ZebOS ARS Layer 2, Layer 3 and MPLS protocol module selection for the control plane, independent of hardware platform and operating system
- Unified forwarding plane interface for all Layer 2, Layer 3 and MPLS forwarding needs
- Scalable hybrid hardware plus software frame and packet forwarding
- Stackable and chassis system support with single IP address management
- Advanced distributed forwarding plane architecture achieving scalable performance
- Hot-swappable stackable unit/chassis port blade insertion and removal

Supported Merchant Silicon

- Broadcom StrataXGS families
- Intel IXP2400 series

Standard Deliverables

- Source Code (written in ANSI-compliant C)
- Installation and Configuration Guide
- Command References
- Developer Guides

Requirements

ZebOS Network Services Module