CISCO SYSTEMS

Versatile Interface Processor 4
for Cisco **7500** Series Routers

The Versatile Interface Processor 4 (VIP4) for the high-end Cisco 7500 router series enables high-performance switching, and scalable LAN and WAN intelligent network services to meet the needs of high-performance WAN applications. It provides over twice the distributed switching performance and twice the aggregate bandwidth of previous model VIPs, employs higher-capacity memory modules for rich IP services, and utilizes Error Correction Code (ECC) for increased system availability. The VIP4 serves as an ideal platform for enterprise and service-provider networks that require high performance and processing power to support service-enabled edge and core applications.

The VIP4 is a highly configurable, RISC-based, intelligent interface processor. Up to two separate port adapters (PAs) can be configured on each VIP4. PAs provide the media-specific interfaces for the VIPs, enabling the VIP4 configuration to be optimized in terms of price, performance, and density. More than 50 media-specific LAN and WAN PAs are supported, including Fast Ethernet, T1/E1, High-Speed Serial Interface (HSSI), T3/E3, T3/E3 ATM, multichannel T1/E1, multichannel T3/E3, OC-3 ATM, packet over SONET (POS), and OC-12 ATM.

The VIP4 greatly increases the switching performance of the Cisco 7500 series and serves as an ideal platform for new,

higher-speed, higher-density LAN and WAN interfaces. On the Cisco 7500 series, VIP4 distributed switching scales system performance to over two million packets per second (pps). In addition, the VIP4 features Single-Error-Correction, Double-Error-Detection Code (SECDED) logic, detecting and correcting single event upsets within a data word. This enables greater system resiliency and continued system availability in the presence of a single-event parity upset.

A key VIP4 feature is its ability to receive and execute on route information provided by the master Route Switch Processor (RSP). Based on this route data, a VIP4 can make its own Layer 3 switching decisions, providing a scalable, distributed switching architecture, called distributed switching (DSW). Further, DSW scales packet-processing throughput of a VIP4-equipped router, and resources for route policy and administration are increased by off-loading the central processor of packet-handling tasks.

Figure 1
Versatile Interface
Processor 4
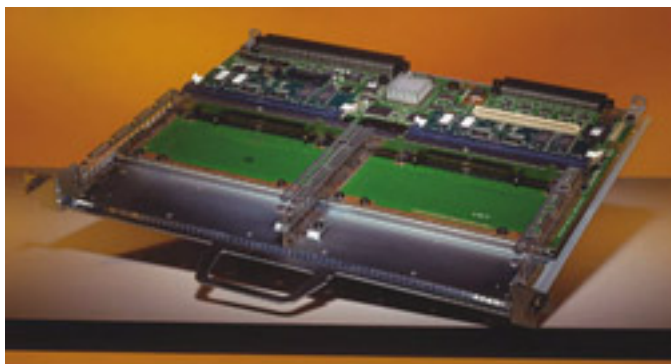
The VIP4 also supports the following features:

- *High performance*—The VIP4 (Model 80) provides the highest distributed switching services available, delivering over twice the switching performance of earlier-generation VIPs. On average, the VIP4-80 provides between 150 and 210 kpps of switching throughput in each direction for most port adapters. This new benchmark for high-performance switching is well suited for multiple high-speed connections such as quad DS3, dual OC-3, and OC-12. Coupled with its high-performance RISC-based processor and Cisco developed system controller ASIC, the VIP4 ensures high throughput, even while applying the broad set of intelligent Layer 3 through Layer 7 services available with the Cisco 7500 series router.

- *High bandwidth*—The VIP4 modules deliver nearly double the PA bandwidth when compared to the earlier VIP2 series. Each VIP4 provides a total aggregate of 750+ MB of bandwidth to its two PAs. Additionally, the new advanced architecture of the VIP4 ensures available bandwidth is allocated based on traffic requirements both between the two port adapters as well as in the direction of traffic flow.

- *Increased availability*—ECC is a standard VIP4 feature. The VIP4 uses (SECDED), which detects and corrects single-event upsets within a data word. This enables continued system availability in the presence of a single-event parity upset.

- *Mixed media*—The modular VIP4 design enables the selection of more than 50 LAN and WAN PA types for customization to any networking environment. With two PA bays, the VIP4 enables mixing different media types (Ethernet and serial, for example) on a single VIP4, maximizing chassis slot utilization. The VIP4 is fully compatible with most Cisco 7500/7200 PAs.

- *Packet memory*—Each VIP4 contains 64 MB of high-speed packet memory for buffering packets and advanced quality-of-service (QoS) packet queues, thus distributing and greatly increasing the amount of packet memory available in the system. This feature is particularly important in environments with large round-trip propagation delays, bursty traffic conditions, or where extensive use of advanced queueing systems (such as the Cisco Distributed Weighted Random Early Detection (D-WRED), Weighted Fair Queuing (WFQ), and Class-Based Queuing) is being utilized.

- *Distributed switching*—An advanced software feature, distributed switching (DSW) provides the scalable, multilayer switching function that enables the aggregate performance of the Cisco 7513 to scale to over two million packets per second. A unique property of VIP-equipped Cisco 7500 systems provides incremental system switching capacity with the insertion of every VIP module. In the case of the VIP4, between 150 and 210 kpps (300–420-kpps aggregate) of switching capacity is added with each VIP4-80 model introduced into existing Cisco 7500 series routers. The Distributed Switching services available on VIP4 include:

  - *Distributed Cisco Express Forwarding (CEF)*—Route table information and changes are proactively distributed to CEF-enabled VIP4s. VIPs never need to query the RSP for route information on new packet destinations, improving overall performance in networks whose topologies are dynamic and in constant change or are characterized by short-lived packet flows—such as the Internet. Distributed CEF effectively separates the control function (the RSP) from the data function (IP packet switching within and among VIPs), improving system-wide performance of all services provided.

  - *Distributed optimum/fast switching*—Each VIP4 provides incremental packet processing engines for optimum and fast-switching methods—improving overall system IP switching performance.

- *Distributed IP NetFlow Switching CEF-based NetFlow and data export*—Facilities implemented via NetFlow, such as analysis of all traffic flows transiting the router and improved access-list processing, scale to high system aggregate performance levels when implemented across multiple VIP4 engines.
- *Distributed services*—Each VIP4 runs, in effect, a subset of the Cisco IOS® software. This powerful feature enables the VIP4 to execute complex and processor-intensive IP services, scaling the application and performance of these features while offloading the main router processor. Distributed services delivers enhanced, network-layer IP services such as distributed QoS and security services such as encryption and link-level compression.

VIP4 Models

There are two different versions of the VIP4: the VIP4-80 and the VIP4-50, providing two levels of distributed switching and services performance, matching system performance requirements to overall deployment costs. Both VIP4 versions support two modular PAs and identical ECC-protected memory expansion options. Table 1 outlines the three VIP4 models.

Table 1 VIP4 Base Configurations

Product No.	Description	Distributed Switching/Services	DSW Performance	Usage
VIP4-50	VIP4; Model 50	Yes	Moderate to high	Distributed switching Moderate link utilization Cisco Express Forwarding
VIP4-80	VIP4; Model 80	Yes	Very high	Demanding applications with • High distributed switching performance • Multiple high-speed PAs with high link utilization • Extensive use of distributed IP services • Cisco Content Networking

The VIP4-50

The VIP4-50 offers support for distributed switching and distributed services. Powered by a 250-MHz RM5000, it provides large program memory to accommodate Layer 3 route information from the RSP for autonomous switching decisions, and large packet memory capacity necessary for distributed IP services. In addition, the VIP4-50 runs a subset of Cisco IOS software to provide support for enhanced network services such as distributed queuing and software-based encryption and compression.

The VIP4-80

The VIP4-80 is designed for the most demanding environments with increased processor performance and very large memory options. It offers 80 percent greater distributed switching performance over VIP4-50 from its 250-MHz MIPS RM7000 processor. In addition, the enhanced memory architecture of the VIP4 series provides substantially greater packet memory than previous VIPs. This feature supports environments with long round-trip propagation

delays for wide-area network links and environments that use distributed IP services such as D-WRED and distributed committed access rate (D-CAR) queuing systems. Large program memory options enable support for switching methodologies such as CEF that eliminate performance bottlenecks caused by random destination addressing typically found in the Internet and large enterprise networks.

VIP4 Base Configurations

Table 2 Processor, Switching, and Services Support

Product No.	Description	Processor	Distributed Services/Services
VIP4-50	VIP4; Model 50	250-MHz MIPS RM5000	Yes
VIP4-80	VIP4; Model 80	250-MHz MIPS RM7000	Yes

Table 3

Product No.	Packet Memory	Program Memory (default)	Program Memory (optional)
VIP4-50	64-MB SDRAM	64-MB DRAM	128, 256-MB DRAM
VIP4-80	64-MB SDRAM	64-MB DRAM	128, 256-MB DRAM

Specifications

Hardware

Physical Dimensions
- The VIP4 occupies one chassis slot and can only be operated in a Cisco 7500 series or RSP7000-equipped Cisco 7000 series router
- Shipping weight: 5 lb (2.25 kg)

Environmental Ranges
- Operating temperature: 32 to 104 F (0 to 40 C)
- Relative humidity: 10 to 90 percent, noncondensing
- Storage temperature: –4 to 149 F (–20 to 65 C)

Port Adapters
- The VIP4 supports multiple LAN and WAN PA types, including Ethernet, Fast Ethernet, Gigabit Ethernet, serial, Channelized serial, multichannel, HSSI, ATM, and POS.

Software

- VIP4-50 and VIP4-80 require Cisco IOS Release 12.0(11)ST. 12.1(6), 12.2(1), 12.0(13)S, 12.1(5)E, 12.1(5)T. Note that Release 12.1 is a continuation of Cisco IOS Release 12.0T, focused on stability and general deployment (GD) certification.

Management

- Simple Network Management Protocol (SNMP) agent V1 (RFCs 1155–1157)
- Management Information Base (MIB) II (RFC 1213)

Host Platform Requirements

Hardware

- The VIP4 requires the RSP of the Cisco 7500 series, or the RSP7000 of the Cisco 7000 series to operate.

Regulatory Approvals

- Electromagnetic Emissions Certifications
- FCC Class A
- CISPR-22 Class B
- EN55022A Class B
- VCCI Class 2

Safety

- UL 950
- IEC 950
- EN60950
- CSA C22.2 No. 950-M29

CE Mark

- IEC 801-2, 3, 4, 5, 6, 11

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