Cisco 7500 Series

Cisco's New Premier High-end Router

Much has been said in the industry over the last 12 months about the continuing role that routers will play as ATM and LAN switching technologies continue to emerge. Perhaps the Gartner Group[1] exposed the prevailing misconception best in a recent research note: "'Switch where you can, route only when necessary' is a thinly veiled attempt to bring about the death of routing. Although there are a number of marketing and political reasons forcing these switch vendors to take such a stand, the compelling technical evidence proves this battle cry is shortsighted, hollow, and misleading."

While ATM and LAN switching both have important roles to play, routing continues to be essential in building highly available and scalable networks. Routers provide the security, stability, and control needed for mission-critical enterprise networks. Moreover, an emerging set of applications and environments are expanding the boundaries of high-end routing.

These include such applications as:
- Switched virtual LANs (VLANs), where the requirement for routing is shifting from routing between physical segments to routing between logical virtual LANs.
- Networked multimedia with its requirement for quality of service and high-performance advanced queuing techniques
- IBM networking and the continued integration of SNA and NetBIOS with TCP/IP and the functional offload of mainframes and front-end processors (FEPs)
- Bandwidth-hungry client/server applications and high-speed WAN services
- Internet access and its requirement for density and security
- Internet core requirements where the explosive growth of the world's Internet continues to drive high-performance routing

1. Gartner Group Research Note dated March 1, 1995. "Challenging the Flat-Earth Networking Theory."

In addition, routers will increasingly perform value-add functions such as compression and encryption, again increasing the routing power needed to solve these emerging and growing application areas.

Figure 1   The Cisco 7500 Series—Setting New Standards for High-End Internetworking

CISCO SYSTEMS

Cisco Systems has been providing solutions to this diverse set of applications environments for over two-and-a-half years with its award-winning Cisco 7000 series. Today, the Cisco 7000 series is the undisputed leader in the industry with over 76 percent market share[2]. However, the requirements for high-end routing continue to grow.

Cisco frequently meets with the IS professionals who design, build, and manage diverse sets of application environments. What has emerged from these discussions is a common theme; that the requirement for high-end routing technology remains a critical, fundamental element of success as customers conduct daily business over their strategic internetworking assets. For high-end routing, there continues to be a critical need to provide the stability, security, and control that only a layer 3 device can provide. And since technology changes can occur faster than assets can be depreciated, there must be a focus on meeting these emerging requirements in a way that can maximize the investments that customers have already made in their internetworking infrastructures.

The Cisco 7500 series, Cisco's new premier high-end internetworking platform, is the result of these ongoing customer discussions.

Cisco 7500

The Cisco 7500 was designed to extend Cisco's high-end router product line, the Cisco 7000 family, to meet these emerging high-end application environments while maximizing the investments that customers have already made in the Cisco 7000 series. The result is an architecture that extends the capabilities of the Cisco 7000 in terms of density, performance, and system availability, while supporting complete forward compatibility of the existing set of interface processors.

Cisco 7500 Architecture

The Cisco 7500 architecture (see Figure 2) is based on a new system processor called the Route Switch Processor (RSP). Based on the MIPS R4000 series RISC processor and custom ASICs, the RSP is responsible for performing several tasks associated with system maintenance, routing, and switching. System maintenance tasks including environmental monitoring and maintaining configuration registers and packet memory. The route server functionality of the RSP includes tasks such as determining internetwork topology, creating and maintaining routing tables,

responding to routing update requests, controlling configuration, maintaining network interface statistics, and processing and responding to SNMP requests.

The RSP switching function has one task: to decide the destination of a packet and switch it based on that decision.

Figure 2   Cisco 7500 Architecture

Route Switch Processors

VIP

IP
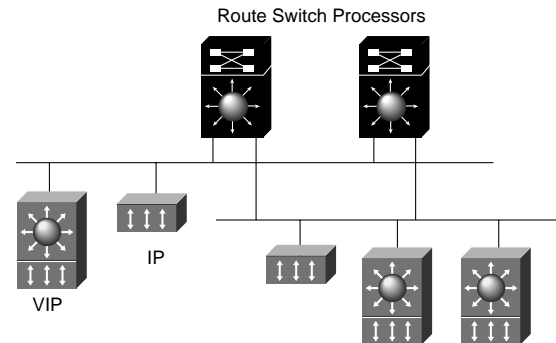
While the RSP represents a physical integration of the Route Processor and Switch Processor functions in the Cisco 7000 series, these processes remain independent in the RSP. Routing provides security, stability, and control, and switching provides scalable performance.

The Cisco 7500 supports the same redundancy in power supplies, power access, and OIR of system components as the Cisco 7000. In addition, the Cisco 7507 and Cisco 7513 provide a dual RSP architecture which will be supported by a phased implementation of High System Availability (HSA) software.

In the first phase of HSA, the primary RSP will be able to utilize the packet memory of the secondary RSP during normal operation, and the secondary RSP will monitor the performance of the primary RSP. Upon detection of a failure condition, the secondary RSP will automatically take-over control and reboot the system without user intervention, thus minimizing network interruption. Phase 1 of HSA software is expected to be part of IOS release 11.1. In subsequent phases, the process by which the secondary RSP takes control of the system will be improved to reduce the initialization time and minimize traffic disruption and session loss.

In a dual RSP configuration, the Cisco 7500 will give the user the ability to double packet memory and increase aggregate switching performance. Each RSP ships with 2 MB of packet memory. In a dual RSP configuration, users will be able to take advantage of the 2 MB of memory on the slave RSP for a system total of 4 MB of packet memory. In addition, when load-sharing capabilities are available, the switching engine of the second or slave RSP can be utilized to increase performance. Load- sharing will be supported first for IP, and over time other protocols and features will be added.

2. IN-STAT SERVICES. March 1995. "1994 Router Market Shares."

Incorporated into the passive backplane design of the Cisco 7500 are two 1-Gbps data buses providing an aggregate system bandwidth of over 2 Gbps.

Versatile Interface Processor

The Cisco 7000 family Versatile Interface Processor (VIP) is based on a RISC engine optimized for I/O functions (see Figure 3). To this engine are attached one or two port adapters or daughter boards. These port adapters provide the media- specific interfaces to the network. A key feature of the VIP technology is its ability to receive route information from the master RSP. Based on route data received from the RSP, a VIP is able to make its own autonomous, multilayer switching decisions, providing, in effect, the CiscoFusion™ architecture in a box. In much the same way that CiscoFusion relies on a central "route server" function distributing information through the network to multilayer switches in wiring closets, the RSP in the Cisco 7500 distributes information to multilayer "switches" (the VIP) within the chassis. This feature, called distributed switching, is just one of many features supported by the VIP technology. The VIP supports:

- *High port densities.* This feature enables users to continue to grow their networks without necessarily adding additional systems. As higher densities of the VIP technology become available, users will be able to cost-effectively add additional ports to either the Cisco 7000 or Cisco 7500 platforms.
- *Mixed Media.* The port adapter design enables different media types to be deployed on the same VIP. This capability enables users to maximize chassis slot utilization.
- *Packet memory.* Each VIP contains its own packet memory, thus distributing and greatly increasing the amount of packet memory available in the system. This is a particularly important feature in environments where there are large round-trip propagation delays (trans-Atlantic or trans-Pacific for example), bursty traffic conditions, or where there may be many high-speed media pointing to a small number of slower-speed media.
- *Feature Offload.* Each VIP can run a subset of the Cisco IOS software. With Feature Offload, it will be possible to distribute some of the more processor-intensive functions from the RSP throughout the rest of the system. Examples of features that will be off-loaded over time include compression, encryption, and priority queuing.
- *Distributed switching.* This is the "CiscoFusion in a box" feature that enables scalable switching performance.

The Cisco 7500 series offers a rich set of capabilities addressing issues of high reliability, availability, serviceability, and performance (see Table 1).

Figure 3   Versatile Interface Processor—Setting New Standards for Port Density Flexibility, and Functionality

Features and Benefits

Table 1 Cisco 7500 Features and Benefits

FEATURE	BENEFIT
Dual RSPs	• Allows the system to automatically recover without user intervention (Q1 '96) in the unlikely event that an RSP fails. Minimizes downtime and increases applications availability • Allows system to double available buffers through sharing of packet memory
Environmental Monitoring	• Alerts operator of fluctuations before critical conditions occur, allowing proactive resolution while the system stays on line
Self-Diagnostics and Tools	• Ensures that modules are operational before going on line, eliminating potential network problems
Dual Power Supply Systems (Cisco 7507 and 7513)	• Extends individual power supply life through load sharing • Allows users to implement dual sources of prime power. Each supply has its own power cord, eliminating risks associated with the failure of uninterruptible power supply systems (UPS) or building power
Intelligent Environmental Design	• Ensures component longevity through strict adherence to environmental limits • Provides investment protection because design margins are sufficient to handle future network interface processor requirements, avoiding costly upgrades to chassis components
Passive Backplanes	• Virtually eliminates backplane failures and downtime associated with repair or replacement of active backplane or midplane designs
Mean Time Between Failure	• High MTBF values help to reduce total cost of ownership by reducing the amount of on-site spares needed and helping ensure that systems remain online
Online Software Reconfiguration	• Enables software configuration changes to occur without rebooting or interrupting network applications and services
Online Insertion and Removal	• Allows seamless upgrades to higher density and new interface processors without rebooting or taking the system off line • Reduces operator intervention, because like interface processors are automatically reconfigured
Fast Boot	• Enables the system to come on line quickly after software upgrades, minimizing the impact on network availability
Easy Access to all Processor Modules and Power Supplies	• Enables servicing to be performed within seconds, minimizing downtime and impact to the network
Universal Power Systems	• Simplifies servicing and spares provisioning for multinational internetworks, reducing total cost of network ownership
Status and Health LEDs	• Provides at-a-glance determination of system and processor status
System Flash Memory	• Enables fast, reliable software and microcode upgrades • Allows single centralized point of administration, obviating the need to visit each router site when upgrading software or microcode
Software-Readable Identification and Serial Numbers	• Enables asset management of all interface processors, system processors, and chassis, reducing administrative overhead
User-Configurable FLASH and RAM options	• Allows users to easily change RSP configuration to deal with growth in network size and system software
Flexible Rack-Mounting Configurations	• Allows users to optimize installations through front or rear mounting
Cable Management (Cisco 7505 and 7513)	• Provides convenient strain relief and anchor points, simplifying installation and preventing accidental dislodging or damaging of cables

Positioning

The Cisco 7500 series represents an extension to the Cisco 7000 series. Together these two series represent a family of high-end routing platforms that are unmatched in the industry (see Figure 4).

Both the Cisco 7000 and 7500 are designed for environments requiring high performance, high availability routing. The decision to deploy a Cisco 7000 or a 7500 is dependent upon the requirements for price/performance, density, and system availability. The Cisco 7000 series provides cost-effective performance, supports moderate port densities and has field-proven reliability. The Cisco 7500 series offers customers higher performance, higher port densities, and will provide greater levels of system availability with support for the dual RSP configurations.

The five models of the Cisco 7000 family allow users to choose the exact configuration needed to optimize installations and network designs for cost and functionality.

Investment protection, spares provisioning, and simplified maintenance logistics are just a few of the benefits that this broad product line offers. These factors reduce overall maintenance and inventory costs, lowering the total cost of network ownership while leveraging investment in Cisco's high-end routing technology.

The introduction of the Cisco 7500 series, an extension to the Cisco 7000 family and the new Virtual Interface Processors, enhance the capabilities of the Cisco 7000 series. The new VIPs enable increased port density and offer increased packet memory for the existing Cisco 7000 models. Each of the Cisco 7000 and Cisco 7500 platforms play an important role, meeting different customer requirements for price/performance and density. And as part of the introduction of the Cisco 7500 systems, we are also offering customers even better price/performance with price reductions of the Cisco 7000 and 7010 chassis.

The new VIP represents a significant enhancement to the Cisco 7000 family. While some advanced VIP features are designed to take advantage of the Cisco 7500 RSP, the Cisco 7000 benefits through the VIP's ability to support much higher port densities, mixed media, and packet memory, further strengthening the Cisco 7000 series within the high-end product line.

Figure 4   The Cisco 7000 Family Enables Customers to Optimize Network Installations for Cost and Functionality.

Figure 5   Cisco 7000 Family Price/Performance
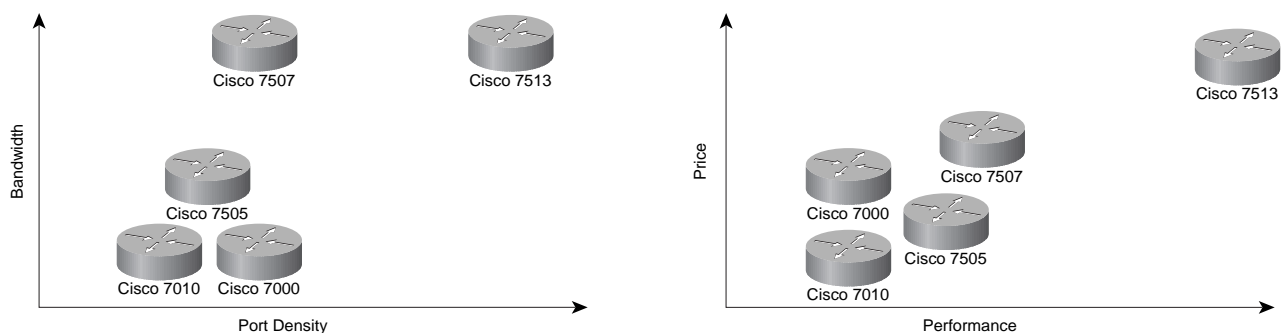
The Cisco 7500 series is the ideal candidate for applications that require the highest possible levels of performance, density, and system availability. Price/ performance and bandwidth/density comparisons of the Cisco 7000 family are shown in Figure 5.

**Configurations and Product Descriptions**

The Cisco 7500 series offers all of the reliability and serviceability features of the Cisco 7000 series and provides higher levels of performance, offering over 2 Gbps of system bandwidth. Built on Cisco's new distributed switching architecture, the Cisco 7500 series integrates switching and routing functions in the RSP to deliver fast, multilayer switching, increased peak performance, and scalability to very large networks. Cisco's new VIP provides increased port

densities, better slot utilization and increased functionality. The Cisco 7500 series is available in three models: the Cisco 7505, the Cisco 7507, and the Cisco 7513.

Cisco 7513

The Cisco 7513 (see Figures 6 and 7) with dual RSPs and distributed switching offers the highest levels of performance and system availability in the product family. And with its 11 interface processor slots, it also offers the highest levels of port densities, making it an ideal candidate for large collapsed backbone environments or as an aggregation router supporting a huge number of remote users.
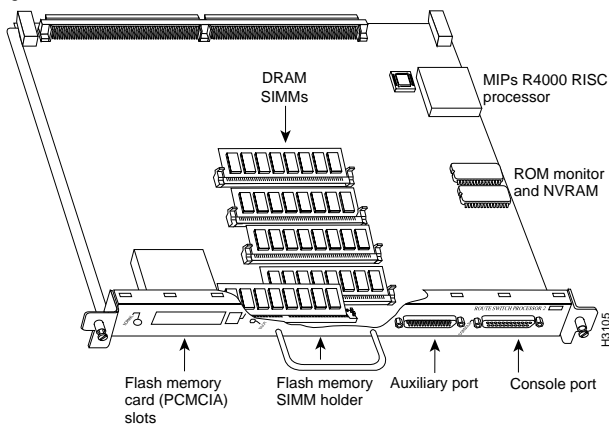
Figure 6   The Cisco 7513 Router, Processor End
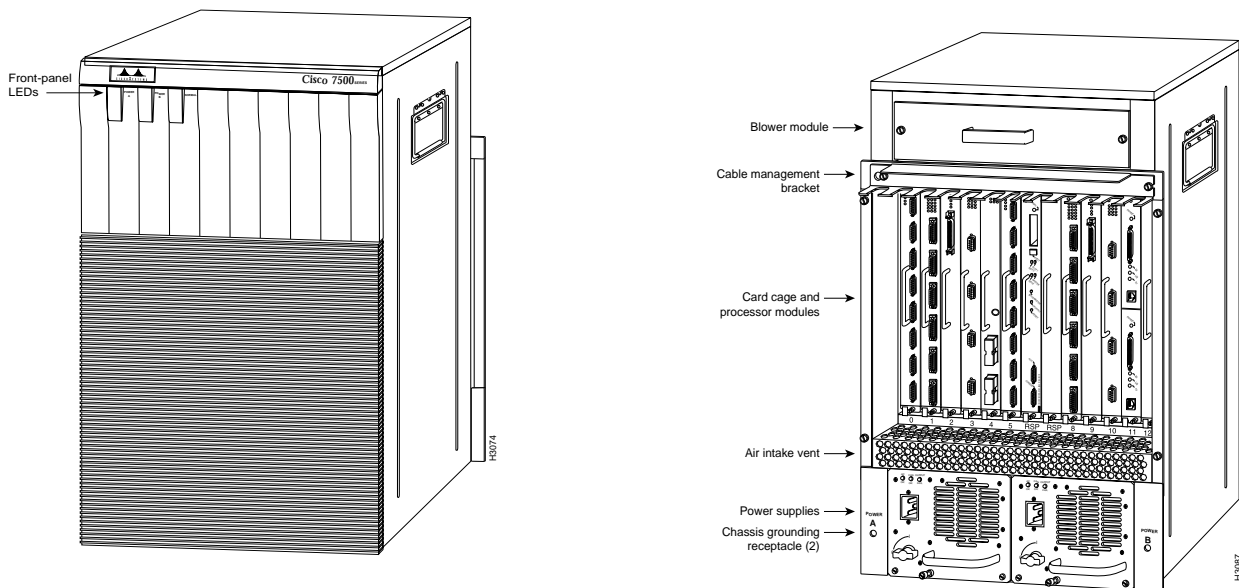
Each Cisco 7513 ships with one RSP, one power supply, one rack-mount kit, one cable management kit, and one fan tray. A second RSP and power supply are optional. Two slots of the 13-slot chassis are always reserved for RSPs (called RSP2 for the Cisco 7507 and 7513 to indicate the number of CyBus interfaces supported). The Cisco 7513 supports two 1.066-Gbps CyBus backplanes for a total system bandwidth of 2.132 Gbps. When viewing the Cisco 7513 from the interface processor end, slots 6 and 7 are reserved for RSPs. The two CyBuses are physically laid out across the chassis card cage. The slots to the left of the RSPs have access to one CyBus, and the slots to the right of the RSPs have access to the second CyBus.

The RSP (see Figure 7) supports in several different memory configurations, and can be easily upgraded in the field.

Figure 7   Route Switch Processor

DRAM SIMMs

MIPs R4000 RISC processor

ROM monitor and NVRAM

ROUTE SWITCH PROCESSOR 2

Flash memory card (PCMCIA) slots

Flash memory SIMM holder

Auxiliary port

Console port

The RSP contains two different types of memory configuration options and user configurable memory:
- *DRAM.* DRAM stores data such as routing tables, protocols, and network accounting applications. The default DRAM configuration for the RSP2 is 16 MB. This memory is configurable. Options for 32, 64, and 128 MB are available.
- *Flash Memory.* The RSP supports 8 MB of onboard Flash and up to two Personal Computer Memory Card International Association (PCMCIA) Flash memory cards (Intel Series 2+). The onboard flash is not configurable; however, the RSP is shipped with 8 MB of user-configurable Flash memory via the PCMCIA Flash memory card. Flash memory allows users to remotely load and store multiple Cisco Internetwork Operating System (Cisco IOS™) software and microcode images. With its two PCMCIA interfaces and support for up to 20 MB of Flash per interface, the RSP can be configured with up to 40 MB of Flash memory.

In addition to the Flash and DRAM, the RSP ships with 2 MB of packet memory.

Cisco 7507

The Cisco 7507 (see Figure 8) and Cisco 7513 both offer the same high levels of system availability and differ only in the number of interface processor, that can be supported.

Figure 8   Cisco 7507

Slot 0   1   2   3   4   5   6
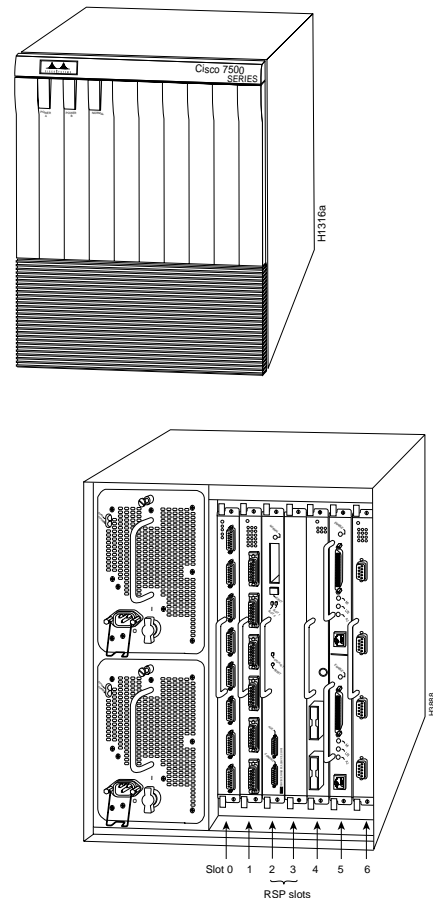
RSP slots

Each Cisco 7507 ships with one RSP, one power supply, and one rack-mount kit. A second RSP and power supply are optional. Two slots of the seven-slot chassis are always reserved for RSPs. The Cisco 7507 supports two 1.066-Gbps CyBus backplanes for a total system bandwidth of 2.132 Gbps. When viewing the Cisco 7507 from the interface processor end, slots 3 and 4 are reserved for RSPs. The two CyBuses are physically laid out across the chassis card cage. The slots to the left of the RSPs have access to one CyBus, and the slots to the right of the RSPs have access to the second CyBus.

Since the Cisco 7507 is mechanically similar to the Cisco 7000 design, system-level accessories are common. This commonality applies to the AC and DC power supplies, blower assemblies, and rack-mount kits and greatly simplifies spares provisioning and maintenance logistics.

Cisco 7505

The Cisco 7505 (see Figure 9), with support for one RSP, one CyBus, and one power supply, enables the cost-effective deployment of Cisco Systems' high-end routing technology in a compact package. With support for up to four interface processors, the Cisco 7505 is an ideal candidate to solve complex internetworking problems in the data center, the workgroup, and the core of the network.
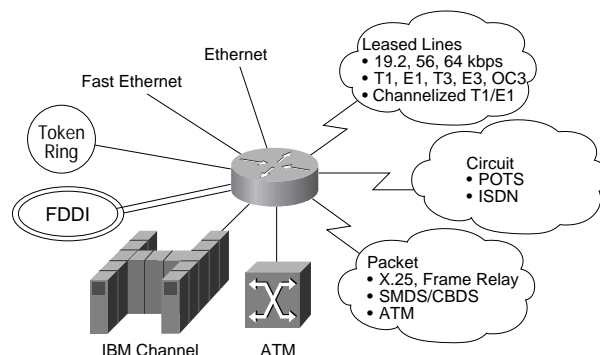
Figure 9   Cisco 7505 Interface Processor
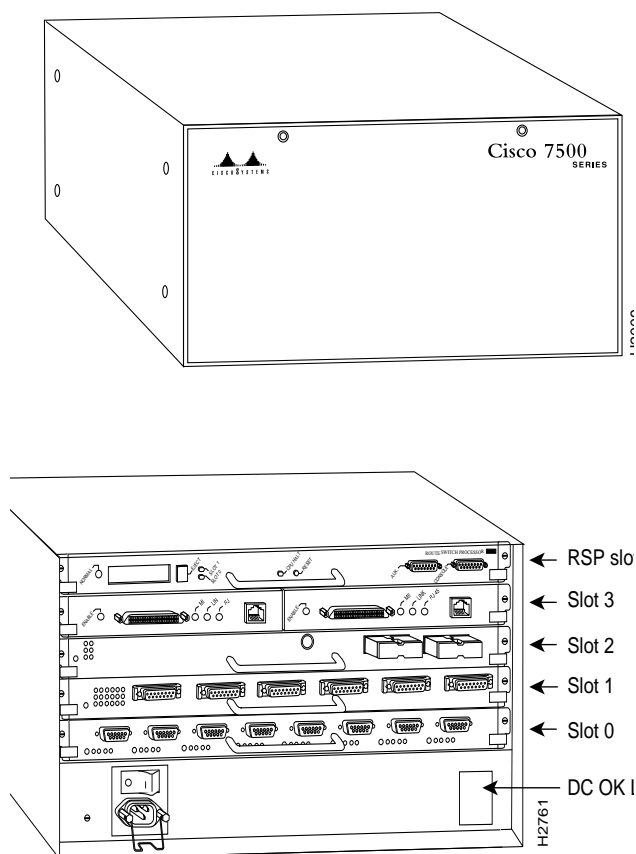
Network Interface Processors

Today the Cisco 7000 family supports the broadest set of media technologies, and transport mechanisms in the industry (see Figure 10). All interface processors are compatible with both the Cisco 7000 and the Cisco 7500.

Figure 10   The Cisco 7000 Family of Network Interface Processors

Ethernet Interface Processor

The Ethernet Interface Processor is available in either two-, four-, or six-port configurations. The six-port card offers the highest density in the industry for cost-effective connectivity to a large number of Ethernet users.

Fast Ethernet Interface Processor

The Fast Ethernet Interface Processor (FEIP) is available in either one- or two- port configurations. Each port provides an RJ-45 port for connection to 100BaseTX and an alternate 40-pin Media Independent Interface (MII) port for use with customer provided transceivers. Each port is configurable for either full- or half-duplex operation and when available in the IOS will support VLAN transport protocols (s/w based) using InterSwitch Link (ISL) and IEEE 802.10 TB-VLAN.

When an application requires full duplex operation, or direct connectivity to a device likely to heavily load the link, it is recommended that the single port versions be used.

Token Ring Interface Processor

The Token Ring Interface Processor is available in either two- or four-port configurations. This interface processor is based on the IBM 4- or 16-Mbps Token Ring chipset and an

enhanced interface driver co-developed by Cisco Systems and IBM. The interface processor delivers the highest Token Ring throughput and lowest latency on the market.

FDDI Interface Processor

The FDDI Interface Processor is available for multimode fiber, single-mode fiber, or combinations of both. Today, Cisco supports more routed protocols on FDDI than any other vendor and supports multiple bridging technologies, including encapsulation bridging, remote source-route bridging (RSRB), translational bridging, and transparent bridging. Cisco Systems has shipped more than 10,000 FDDI router interfaces, more than all other router vendors combined.

Fast Serial Interface Processor

The Fast Serial Interface Processor is available in four- or eight-port configurations. The eight-port configuration is the highest-density serial card on the market and supports eight T1 or E1 serial ports at full wire speed. A number of serial interface types are supported by this interface processor and are determined automatically by the type of cable connected to each port. The Fast Serial Interface Processor makes the Cisco 7000 family the ideal choice for critical WAN distribution points.

HSSI Interface Processor

The HSSI Interface Processor supports the High-Speed Serial Interface (HSSI) specification developed by Cisco Systems and its business partners. Standardized as EIA/TIA-612/613, HSSI supports serial communication at speed up to 52 Mbps. The HSSI Interface Processor is ideal for access to DS3 or E3 dedicated lines, or to SMDS/CBDS and ATM at rates of 45 Mbps and beyond.

ATM Interface Processor

The ATM Interface Processor (AIP) provides a native ATM interface for the Cisco 7000 family. Supporting both AAL3/4 and AAL5, the ATM interface processor enables high-speed communications between Cisco 7000 family routers and standards-based ATM networks. The first processor of its type, the ATM interface processor includes interchangeable Physical Layer Interface Modules (PLIMs) that can be swapped to support ATM over different physical layers, such as TAXI 4B/5B, SONET/SDH, and DS3/E3.

Multichannel Interface Processor/ISDN PRI

The Multichannel Interface Processor supports up to two channelized T1 or E1connections, allowing network designers to provide connectivity cost-effectively to a large number of remote sites. With this capability, a single Cisco 7000 or Cisco 7500 can support up to 256 remote sites in North America and the rest of the world. The Multichannel Interface Processor also supports primary rate ISDN.

Channel Interface Processor

The Channel Interface Processor (CIP) enables network administrators to implement direct channel connection to IBM mainframes. Today, the Channel Interface Processor supports both Bus-and-Tag and ESCON channel interfaces and can emulate an IBM 3172 Interconnect Controller for TCP/IP and SNA mainframe access. The TCP/IP support includes a high-performance TCP/IP offload capability compatible with the IBM 3172-3, providing a cost-effective, scalable solution for customers implementing TCP/IP on their mainframes. The CIP also supports SNA, thereby offering an alternative to costly FEPs for accessing VTAM applications on mainframes.

Versatile Interface Processor

With support for up to two port adapters, the Versatile Interface Processor (VIP) supports the following:

High port density. Provides a higher level of network consolidation, reduces overall inventory, logistics, and maintenance costs.

Mixed media. Allows users to obtain better utilization of the slots available in the Cisco 7000 and 7500. Mixed-media boards (Ethernet and serial for example), enable users to tailor the interface processors to specific media and density requirements

Packet memory. Each VIP ships with 512 MB of onboard packet memory, augmenting the total available system memory. This is particularly useful for applications where a large amount of buffering is required, such as in the presence of bursty traffic conditions, long round-trip propagation delays, or where there might be many high-bandwidth media trying to vie for access to a smaller number of slower media (FDDI to Ethernet for example).

Offload processing. By operating a subset of the Cisco IOS, a VIP in a Cisco 7500 can offload some of the interface-specific functions that run in the central processor today. Features such as compression and encryption can be off-loaded from the central processor, increasing overall system performance.

Offload processing functionality will be enhanced over time to include many more features. The first feature to be "off-loaded" will occur in Q1 '95 with LAPB compression.

Distributed switching. This is another feature enabled by the architecture of the RSP. Routing information is distributed from the RSP in the Cisco 7500 to one or more interfaces, enabling the VIP to make its own multilayer switching decisions. This "Cisco Fusion in a box" enables an architecture that can gracefully scale to meet increasingly higher levels of system performance. Distributed switching will become available in H1 '96 and will initially support IP. Other protocols and features will be added throughout calendar 1996.

Initially, four fixed-configuration versions of the VIP will be available for support on both the Cisco 7000 and Cisco 7500 platforms.

VIP-1FE and VIP-2FE

The Fast Ethernet (FE) ports on a VIP support the same basic levels of functionality as the Fast Ethernet ports on the FEIP. Each FE port is configurable for half- or full-duplex operation. And with support in the Cisco IOS software, the VIP can perform routing between bridge groups using ISL or 802.10. The FE ports on a VIP can support much higher levels of performance.

When an application requires full duplex operation, or direct connectivity to a device likely to heavily load the link, it is recommended that a single Fast Ethernet port be used.

VIP-4E/4T

This version of the VIP contains four Ethernet (10BT) ports and four serial ports. Each media type supports the same set of capabilities as the existing set of Ethernet and serial interface processors.

VIP-1FE/4E

This version of the VIP contains one Fast Ethernet port and four ethernet ports.

Applications

Today, the implementation of switched LANs and switched VLANs is exploding. Switches can offer higher performance at a lower total cost of ownership than the hubs that have traditionally been used in the past. And switched virtual LANs can provide high- performance, low-latency connectivity between geographically dispersed locations within a campus (see Figure 11).

Figure 11   Switched LAN Networks Alternative Designs
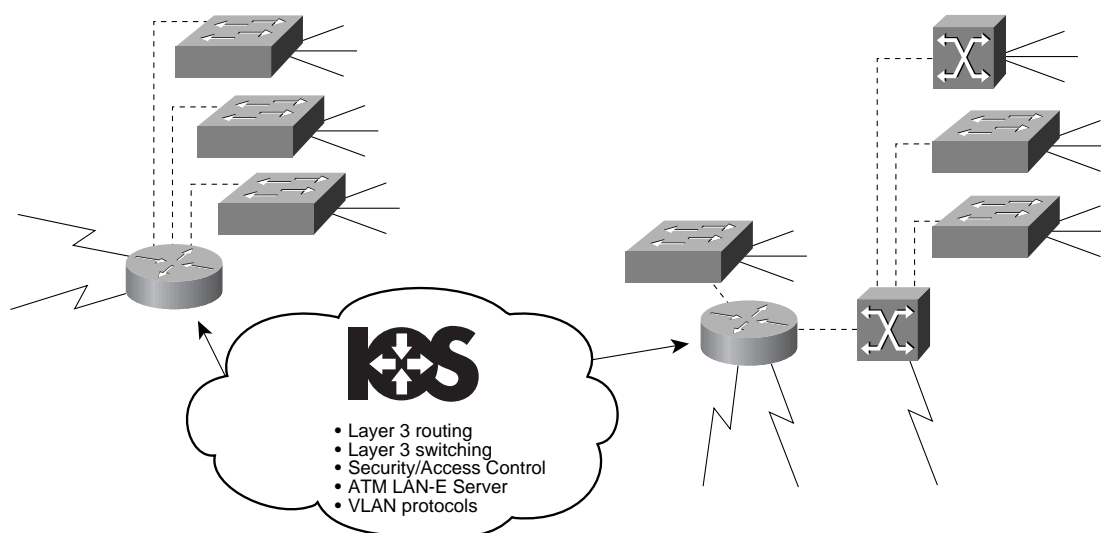
For switched LANs and VLANs, routing remains critical to provide broadcast control, network security, and VLAN services. The Cisco 7500 delivers the performance needed to handle aggregate traffic at over 100 Mbps and supports increased port densities that handle multiple high-speed interfaces. Cisco routers offer the network-wide layer 3 access and broadcast control necessary for building scalable and manageable switched internetworks.

IBM Networking Environments

Typically, IBM networking environments contain multiple protocol-specific networks. If these can be integrated into a single multiprotocol network, companies can achieve better WAN utilization, reduce the cost of redundancy, and provide physical connectivity among all locations (see Figure 12).

Figure 12   IBM Networking Environments
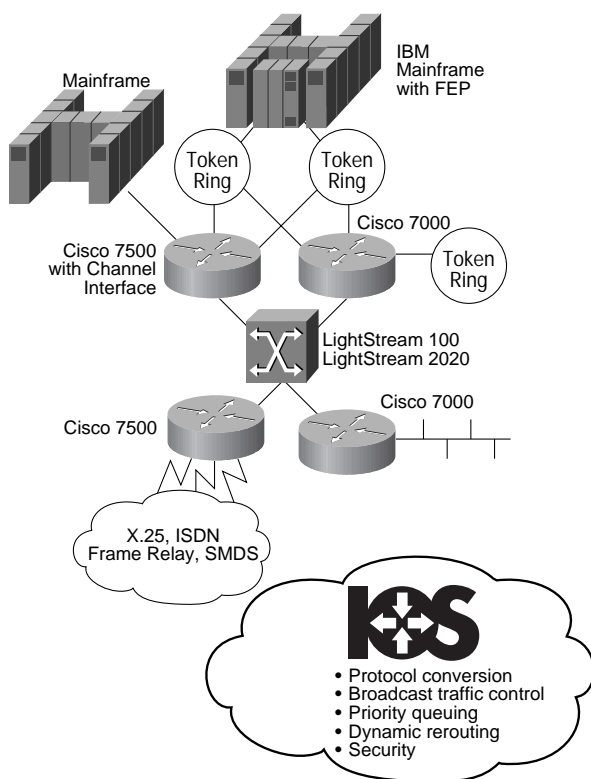
The Cisco 7500 series is the platform of choice in high performance environments such as data processing and data center networking. By providing direct attachment to the mainframe channel, the Cisco 7500 can increase performance and simplify integration. Cisco high performance routers can also offload functions such as SDLC conversion and consolidate traffic via "virtual multidrop," thus maximizing utilization of expensive mainframes and front-end processors. And with Cisco's advanced queuing techniques, users can assure specific quality-of-service levels, by allocating priorities to specific protocols, applications, or devices.

A Cisco router infrastructure can aid in protocol migration, including NetBios to TCP/IP and SNA to APPN. By utilizing the rich capabilities of Cisco IOS software, users can migrate their networks to achieve performance and manageability improvements while minimizing upgrade disruptions and expenses.

WAN Network Environments

Data center consolidation, client/server architectures using centralized servers, and growth in remote sites all drive the rapidly growing need for WAN bandwidth (see Figure 13). High performance routing provides critical functionality in the high-speed WAN environment.

Figure 13   High Speed WAN Applications
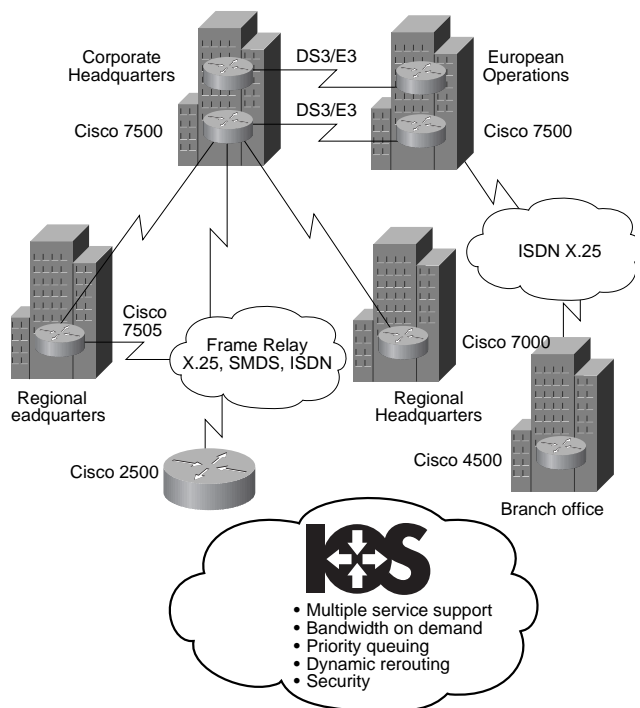
Cisco's IOS software adaptive rerouting increases network availability, while its flexible interfaces provide support for multiple services and a migration path to ATM. The higher port densities supported by the Cisco 7500 series easily handle the large number of interfaces that result from more remote site connectivity. Cisco high-performance routers also provide network security while minimizing the loss of transparency. Finally, the Cisco IOS software provides tools for network configuration, fault detection, and minimizing unnecessary traffic across expensive wide area links.

Internet Service Providers

Operating in one of today's fastest growing businesses, Internet service providers face the challenges of a constantly expanding user base, increasing traffic, and supporting a growing number of multimedia applications (see Figure 14). The increased port density of the Cisco 7500 enables Internet service providers to support more customers on a router while the Cisco 7500's scalability makes it easy to handle rapidly increasing traffic. The Cisco 7500's online adapter insertion and removal capabilities eliminate maintenance down-time and increase system availability. Most important, the high throughput of the Cisco 7500 series provides the performance needed for multimedia traffic.

Figure 14   Internet Providers
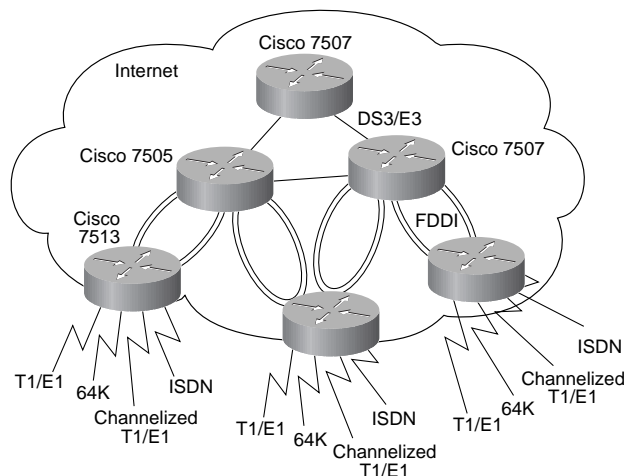
Cisco 7000 Series Pricing

Effective September 5, 1995, Cisco has reduced the prices of the Cisco 7000 and Cisco 7010; including all options of the Silicon Switch Processor (SSP). Coupled with this price reduction is the introduction of software subsets similar to those that exist today for the Access products. Definitions of the software subsets, including software options, are included later in this Product Announcement. For more details, please refer to the *Cisco Systems' Product Catalogue.*

Investment Protection Program

Cisco is committed to protecting the investments its customers have made and will continue to make in the Cisco 7000. To that end, the existing set of interface processors shipping today for the Cisco 7000 series are forward compatible and will operate in the Cisco 7500.

However, to ensure forward compatibility with the Cisco 7500 series, some interface processors may need to be upgraded to a current revision level. Cisco's Investment Protection Program is being offered to provide our customers with a no-cost or minimal-cost migration path, if necessary, to upgrade interface processors for operation in the Cisco 7500 series. This program is intended for:

• Customers who have invested in the Cisco 7500 and want to maintain common sparing between their Cisco 7000 and Cisco 7500 platforms
• Customers who have invested in the Cisco 7500 and want to install their existing base of interface processors in the Cisco 7500 platforms.

For more details on the Investment Protection Program, including procedures to upgrade interface processors if necessary, please refer to:

• Product Bulletin #349 for U.S. direct customers
• Product Bulletin #350 for European and international partners
• Product Bulletin #351 for U.S. partners

Orderability

Product Name	Orderable	Available
Cisco 7505	Today	Today
Cisco 7507	Today	October 1995
Cisco 7513	Today	Today
VIP	November 1995	Dec – Jan '96
Dual RSPs	Q1 '96	Q1 '96 (IOS 11.1)
Dual AC/DC power (7513)	November 1995	November 1995

Both the Cisco 7505 and 7513 models will ship initially on a maintenance release of 10.3 and support Cisco IOS Release 11.0 immediately upon its availability.

Dual power (AC and DC) for the Cisco 7513 will not be orderable until November 1995. Customers that require dual AC or DC power must order a second Cisco 7513 power supply as a spare. This is the result of stronger-than-expected demand for the 7513 systems. To ensure that product lead times are maintained, the first several months of Cisco 7513 shipments will include one power supply only. This will enable prompt delivery of Cisco 7513 systems and will allow customers to begin immediate deployment. Since the power supplies support hot swap, spare power supplies, when received, can be installed without service interruption. We expect to be able to ship spare power supplies in November 1995.

Availability

Table 3 outlines country-specific availability. Note that the Cisco 7505 and Cisco 7513 both require Cisco IOS Release 10.3(572) or higher (Release 11.0.1 is supported on both platforms). The Cisco 7507 will require Cisco IOS Release 10.3(7) or higher.

Country	Cisco 7505	Cisco 7507	Cisco 7513-AC	Cisco 7513-DC
United States	Today	October 1995	Today	September 1995
Canada	Today	October 1995	Today	September 1995
Japan	November 1995	November 1995	November 1995	November 1995
United Kingdom	Today	October 1995	October 1995	November 1995
Germany	Today	October 1995	September 1995	October 1995
France	Today	October 1995	September 1995	October 1995
Australia	Today	October 1995	November 1995	December 1995
Austria	Today	October 1995	September 1995	October 1995
Belgium	Today	October 1995	September 1995	October 1995
Denmark	Today	October 1995	September 1995	October 1995
Finland	Today	October 1995	September 1995	October 1995
Iceland	Today	October 1995	September 1995	October 1995
Ireland	Today	October 1995	September 1995	October 1995
Luxemburg	Today	October 1995	September 1995	October 1995
Mexico	February 1996	February 1996	February 1996	February 1996
Netherlands	Today	October 1995	September 1995	October 1995
New Zealand	Today	October 1995	September 1995	October 1995
Norway	Today	October 1995	September 1995	October 1995
Portugal	Today	October 1995	September 1995	October 1995
Sweden	Today	October 1995	September 1995	October 1995
Switzerland	Today	October 1995	September 1995	October 1995
Italy	Today	October 1995	September 1995	October 1995
Spain	Today	October 1995	September 1995	October 1995

Technical Specifications

The Cisco 7500 product series provides the highest density and broadest media support available in the industry today. Both the Cisco 7000 and Cisco 7500 series allows users to choose the exact configurations required to optimize installations and network designs for cost and functionality. Investment protection, spares provisioning, and simplified maintenance logistics are just a few of the benefits provided by the Cisco 7000 family. These factors reduce overall maintenance and inventory costs, lowering the total cost of network ownership while leveraging investments in Cisco's high-end technology.

Table 4 summarizes each member of the Cisco 7000 family.

Feature	Cisco 7010	Cisco 7000	Cisco 7505	Cisco 7507	Cisco 7513
Processor Type	25-MHz 68040 CPU	25-MHz 68040 CPU	100-MHz R4600	100-MHz R4600	100-MHz R4600
System Processors	RP, RP64, SP, SSP, SSP-2MB	RP, RP64, SP, SSP, SSP-2MB	RSP1	RSP2 and dual RSP2	RSP2 and dual RSP2
Memory	RP; 16 MB expandable to 64 MB	RP; 16 MB expandable to 64 MB	RSP1; 16 MB expandable to 128 MB	RSP2; 16 MB expandable to 128 MB	RSP2; 16 MB expandable to 128 MB
Flash Memory	RP; 4 MB expandable to 16 MB	RP; 4 MB expandable to 16 MB	RSP1; 8 MB expandable to 40 MB	RSP2; 8 MB expandable to 40 MB	RSP2; 8 MB expandable to 40 MB
System Bandwidth	533 Mbps	533 Mbps	1.066 Gbps	2.132 Gbps	2.132 Gbps
Chassis Slots	5	7	5	7	13
Configurable Interface Slots	3	5	4	5	11
Maximum Network Interfaces[1]					
Ethernet (10 MB)	18	30	24	30	66
Fast Ethernet (100 MB)	6	10	8	10	22
Token Ring	12	20	16	20	44
FDDI	3	5	4	5	11
Serial	24	40	32	40	88
HSSI	3	5	4	5	11
ATM	3	5	4	5	11
Channelized T1/E1 and PRI	144/180 channels	256/256 channels	256/256 channels	256/256 channels	256/256 channels
IBM channel	6	10	8	10	22
IP Interfaces	Yes	Yes	Yes	Yes	Yes
VIP	Yes	Yes	Yes	Yes	Yes
Distributed Switching			Yes	Yes	Yes
Online Insertion and Removal	Yes	Yes	Yes	Yes	Yes
Power Systems	Single AC Single DC	Single AC, Dual AC Single DC, Dual DC	Single AC Single DC	Single AC, Dual AC Single DC, Dual DC	Single AC, Dual AC Single DC, Dual DC

1. Other configurations and operational considerations may reduce the number of interface processors of a given type which can be supported to below these maximums.

Cisco 7000 Family Software Subsets and Options

With the introduction of the Cisco 7500 series, Cisco has introduced software subsets. One software subset must accompany each system purchase. Table 5 defines software subsets for both the Cisco 7000 and Cisco 7500 series.

Table 2 Cisco 7000 Family Subset Features

Feature	IP Routing	IP/IPX and IBM	IP/IPX, IBM, and APPN[1]	Desktop and IBM	Enterprise and APPN[(1)]	Enterprise
LAN Support	IP, transparent and translational bridging[2], multiring, LAN extension host	IP, Novell IPX, transparent and translational bridging[(2)], multiring, LAN extension host	IP, Novell IPX, transparent and translational bridging[(2)], multiring, LAN extension host	IP, Novell IPX, AppleTalk 1 & 2, DECnet IV, transparent and translational bridging[(2)], multiring, LAN extension host	IP, Novell IPX, AppleTalk 1 & 2, DECnet IV, DECnet V, OSI, XNS, Banyan VINES, Apollo Domain, transparent and translational bridging[(2)], multiring, LAN extension host	IP, Novell IPX, AppleTalk 1 & 2, DECnet IV, DECnet V, OSI, XNS, Banyan VINES, Apollo Domain, transparent and translational bridging[(2)], multiring, LAN extension host
WAN Services	HDLC, PPP[3], ISDN[4]	HDLC, PPP[(3)], ISDN[(4)], IPXWAN 2.0	HDLC, PPP[(3)], ISDN[(4)], IPXWAN 2.0	HDLC, PPP[(3)], ISDN[(4)], IPXWAN 2.0	HDLC, PPP[(3)], ISDN[(4)], IPXWAN 2.0	HDLC, PPP[(3)], ISDN[(4)], IPXWAN 2.0
WAN Optimization	Header and link compression, dial-on-demand, dial backup, bandwidth-on-demand, custom and priority queuing, access lists, access security, snapshot routing	Header and link compression, dial-on-demand, dial backup, bandwidth-on-demand, custom and priority queuing, access lists, access security, snapshot routing	Header and link compression, dial-on-demand, dial backup, bandwidth-on-demand, custom and priority queuing, access lists, access security, snapshot routing	Header and link compression, dial-on-demand, dial backup, bandwidth-on-demand, custom and priority queuing, access lists, access security, snapshot routing	Header and link compression, dial-on-demand, dial backup, bandwidth-on-demand, custom and priority queuing, access lists, access security, snapshot routing	Header and link compression, dial-on-demand, dial backup, bandwidth-on-demand, custom and priority queuing, access lists, access security, snapshot routing
IP Routing	RIP, IGRP[®], Enhanced IGRP, OSPF, PIM, NHRP	RIP, IGRP, Enhanced IGRP, OSPF, PIM, NHRP	RIP, IGRP, Enhanced IGRP, OSPF, PIM, NHRP	RIP, IGRP, Enhanced IGRP, OSPF, PIM, NHRP	RIP, IGRP, Enhanced IGRP, OSPF, PIM, NHRP	RIP, IGRP, Enhanced IGRP, OSPF, PIM, NHRP, ES-IS, IS-IS
Other Routing	—	IPX RIP, NLSP	IPX RIP, NLSP	IPX RIP, NLSP, RTMP, AURP	IPX RIP, NLSP, RTMP, AURP, SRTP	IPX RIP, NLSP, RTMP, AURP, SRTP
Management	SNMP, Telnet	SNMP, Telnet	SNMP, Telnet	SNMP, Telnet	SNMP, Telnet	SNMP, Telnet
Remote Node	SLIP, PPP, CSLIP, CPPP, DHCP	SLIP, PPP, CSLIP, CPPP, DHCP	SLIP, PPP, CSLIP, CPPP, DHCP	SLIP, PPP, CSLIP, CPPP, IPX CP, MacIP, ATCP, DHCP	SLIP, PPP, CSLIP, CPPP, IPX CP, MacIP, ATCP, DHCP	SLIP, PPP, CSLIP, CPPP, IPX CP, MacIP, ATCP, DHCP
Terminal Services	Telnet, rlogin, X.25 PAD	Telnet, rlogin, X.25 PAD	Telnet, rlogin, X.25 PAD	Telnet, rlogin, X.25 PAD	Telnet, rlogin, X.25 PAD, XRemote, TN3270	Telnet, rlogin, X.25 PAD, XRemote, TN3270
IBM Support	—	SRB/RSRP, SRT, DLSw+[5], SNA & NetBIOS WAN optimization via local acknowledgment, caching and filtering, SDLC integration, SDLC-to-LAN conversion (SDLLC), SDLC transport (STUN), Frame Relay SNA Support (RFC 1490)	SRB/RSRP, SRT, DLSw+[(5)], SNA & NetBIOS WAN optimization via local acknowledgment, caching and filtering, SDLC integration, SDLC-to-LAN conversion (SDLLC), SDLC transport (STUN), Frame Relay SNA Support (RFC 1490)	SRB/RSRP, SRT, DLSw+[(5)], SNA & NetBIOS WAN optimization via local acknowledgment, caching and filtering, SDLC integration, SDLC-to-LAN conversion (SDLLC), SDLC transport (STUN), Frame Relay SNA Support (RFC 1490)	SRB/RSRP, SRT, DLSw+[(5)], SNA & NetBIOS WAN optimization via local acknowledgment, caching and filtering, SDLC integration, SDLC-to-LAN conversion (SDLLC), SDLC transport (STUN), Frame Relay SNA Support (RFC 1490), TG/COS, QLLC, Downstream PU Concentration (DSPU)	SRB/RSRP, SRT, DLSw+[(5)], SNA & NetBIOS WAN optimization via local acknowledgment, caching and filtering, SDLC integration, SDLC-to-LAN conversion (SDLLC), SDLC transport (STUN), Frame Relay SNA Support (RFC 1490), TG/COS, QLLC, Downstream PU Concentration (DSPU)

1. APPN is available with Cisco IOS Release 11.0

2. See the category "IBM Support" in this table for information about source-route bridging (SRB)
3. PPP includes support for LAN protocols supported be the feature set, PAP and CHAP subaddressing, and applicable WAN optimization features
4. ISDN support includes calling line identification (ANI), X.25 over the B channel, ISDN subaddressing, and applicable WAN optimization features
5. DLSW+ will first be supported in Q1 '96

As mentioned, one of the six software subsets identified above is required for each system. Optional licenses are also available for WAN packet protocols and interdomain routing. Customers can choose to order no options or one or more from those shown in Table 6.

Category[1]	Feature Set
WAN Packet Protocols	X.25, X.25 switching, Frame Relay, SMDS, Frame Relay switching, ATM DXI, SMDS over ATM
Inter-Domain Routing[2]	BGP, EGP for internet scale routing

1. Purchased in addition to the software subsets
2. Not required for the 16-MB version of the Cisco 7000/7010 Route Processor

IOS Release 11.0

The Cisco 7500 will support 11.0 functionality. However, the following features will not be supported until IOS 11.1:
• ATM LAN Emulation (LANE)
• DLSW+
• SRB over FDDI

Maintenance Operation Protocol (MOP) will be supported in a future release.

Dimensions and Weight

Table 3 Cisco 7000 Family Dimensions and Weight Specifications

Feature	Cisco 7000	Cisco 7010	Cisco 7505	Cisco 7507	Cisco 7513
Height	19.3 in (48.9 cm)	10.5 in (26.67 cm)	10.5 in (26.67cm)	19.3 in (48.9 cm)	33.75 in (85.73 cm)
Width	17.5 in (44.6 cm)	17.5 in. (44.45 cm)	17.5 in. (44.45 cm)	17.5 in (44.6 cm)	17.5 in (44.45 cm)
Depth	25.1 in (63.8 cm)	17.0 in (43.18 cm)	17.0 in (43.18 cm)	25.1 in (63.8 cm)	22.0 in (55.88 cm)
Weight (max)	145 lb (65.90 kg)	70 lb (31.75 kg)	70 lb (31.75 kg)	145 lb (65.90 kg)	160 lb (72.58 kg)
Weight (installation/minimum)	76 lb (34.60 kg)	46 lb (20.87 kg)	46 lb (20.87 kg)	76 lb (34.60 kg)	62 lb (28.13 kg)

Power Requirements

Table 4 Cisco 7000 Family Power Requirements

Feature	Cisco 7000	Cisco 7010	Cisco 7505	Cisco 7507	Cisco 7513[1]
Input VA **Output watts** **Output watts**	945 max 700 max 650 typ	780 max 600 max 540 typ	780 max 600 max 540 typ	945 max 700 max 650 typ	1600 max 1200 max 1050 typ
Heat Dissipation	945W (3224 Btus/hr)	780W (2661 Btus/hr)	780W (2661 Btus/hr)	945W (3224 Btus/hr)	1600W (5461 Btus/hr)
AC Input Voltage	100 to 240 VAC	100 to 240 VAC	100 to 240 VAC	100 to 240 VAC	100 to 240 VAC
Frequency	50-60 Hz	50-60 Hz	50-60 Hz	50-60 Hz	50-60 Hz
AC Input Current	12A max @ 100 VAC 6A max @ 240 VAC	9A max @ 100 VAC 4A max @ 240 VAC	9A max @ 100 VAC 4A max @ 240 VAC	12A max @ 100 VAC 6A max @ 240 VAC	16A max @ 100VAC 7A max @ 240VAC
DC Input Voltage	−48 to −60 VDC	−48 to −60 VDC	−48 to −60 VDC	−48 to −60 VDC	−48 to −60 VDC
DC Input Current		20A max @ −48 VDC 16A max @ −60 VDC	20A max @ −48 VDC 16A max @ −60 VDC		35A max @ −48 VDC 28A max @ −60 VDC

1. Note: 7513 requires 20 Amp circuit @ 120 VAC

Environmental

Table 5 Cisco 7000 Family Environmental Specifications

Feature	Cisco 7000	Cisco 7010	Cisco 7505	Cisco 7507	Cisco 7513
Operating Temperature	32 to 104°F (0 to 40°C)	32 to 104°F (0 to 40°C)	32 to 104°F (0 to 40°C)	32 to 104°F (0 to 40°C)	32 to 104°F (0 to 40°C)
Nonoperating Temperature	−4 to 149°F (−20 to 65°C)	−4 to 149°F (−20 to 65°C)	−4 to 149°F (−20 to 65°C)	−4 to 149°F (−20 to 65°C)	−4 to 149°F (−20 to 65°C)
Relative Humidity	10 to 90% noncondensing	10 to 90% noncondensing	10 to 90% noncondensing	10 to 90% noncondensing	10 to 90% noncondensing

Regulatory Compliance

The Cisco 7000 family conforms to the following set of safety and regulatory standards:

Table 6. Cisco 7000 family safety and regulatory standards compliance

Standard	Compliance Met
Safety	• UL 1950 • CSA 22.2-No. 950 • EN60950 • EN41003 • AUSTEL TS001 • AS/NZS 3260 • IEC 801-2, 3, 4, 5, and 6

Table 6. Cisco 7000 family safety and regulatory standards compliance

Standard	Compliance Met
EMI	• FCC Class A • EN60555-2 • EN55022 Class B • VDE 0878 Part 3, 30 Class B
Immunity	• EN55101/2 (ESD) • EN55101/3 (RFI) • EN55101/4 (Burst) • EN55101/5 (Surge) • EN55101/6 (Conducted) • IEC77B (AC Disturbance)

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