

## Cisco 7304 NSE-150 Network Services Engine

### Cisco 7304 Route Processor

The Cisco® 7304 Router is designed for the network edge where high-performance IP services are required to enable profitability, service differentiation, and business agility. It is widely positioned as a WAN aggregation router in enterprise and high-end customer-premises-equipment (CPE) deployments or as a low-end provider-edge router in service provider deployments.

The NSE-150 is the forwarding engine or route processor for the Cisco 7304; it uses Parallel Express Forwarding (PXF) technology to deliver hardware-accelerated network services with up to 3.5-Mpps forwarding rate; it also has an 800-MHz microprocessor CPU to support a rich feature set in Cisco IOS® Software with high performance and scalability. With four onboard Gigabit Ethernet ports, the NSE-150 also increases the overall port density of the platform and maximizes the value of customers' investments (Figure 1).

**Figure 1.** Cisco 7304 NSE-150 Network Services Engine



### Feature Summary

#### Features and Benefits

Table 1 provides an overview of the features and benefits of the Cisco 7304 NSE-150.

**Table 1.**

Features	Benefits
<b>Hardware-Accelerated Features</b>	Cisco Express Forwarding, Turbo ACL, NetFlow v8, Multiprotocol Label Switching (MPLS), MPLS VPN, Network Address Translation (NAT), generic routing encapsulation (GRE), quality of service (QoS), IP Multicast, etc.
<b>Support for Cisco IOS Software</b>	Supports a wide range of software features through a route processor, such as Multi-link Point-to-Point Protocol (MLPPP), IPv6, etc.
<b>High Availability</b>	Provides optional redundant-processor support for the industry's most compact, fully redundant, high-availability solution, improving network resiliency, management, and costs
<b>Performance</b>	<ul style="list-style-type: none"> <li>Supports 4-Gbps bidirectional throughput through NSE-150 for line cards</li> <li>800-Mhz microprocessor allows non-PXF accelerated features to run at 800 kpps</li> <li>Provides 3.5-Mpps Cisco Express Forwarding forwarding performance for PXF-accelerated services</li> </ul>
<b>Four fixed onboard Gigabit Ethernet ports</b>	Maximizes LAN connectivity and performance without taking up slot capacity

Features	Benefits
<b>2 GB of Synchronous Dynamic (SDRAM)</b>	Offers more scalability on features: routing table, Forwarding Information Base (FIB) table, IPv6 features, etc.
<b>2 USB ports</b>	Provides two USB ports for general storage and security token storage
<b>Modularity</b>	Enables maximum investment protection and flexibility by allowing customers to upgrade to the NSE-150 network services engine or future Cisco 7304 processors
<b>Mean Time Between Failure (MTBF)</b>	89,718 hours

### Minimum Recommended Software Release

- The minimum software release recommended is Cisco IOS Software Release 12.2(31)SB2.

### Cisco 7304 Processor Options

The Cisco 7304 Router offers two types of processor options: general-purpose network processing engine (NPE) and hardware-accelerated network services engine (NSE).

Table 2 provides a quick overview of the primary differences between the three Cisco 7304 processing engines.

**Table 2.** Comparison of the Cisco 7304 NPE-G100, NSE-100, and NSE-150

Feature	NPE-G100	NSE-100	NSE-150
<b>Engine Type</b>	General-purpose processor	PXF-based processor plus general-purpose route-processor support	PXF-based processor plus general-purpose route-processor support
<b>Performance</b>	More than 1-Mpps route processor	3.5 Mpps (PXF); 450 kpps (route processor)	3.5 Mpps (PXF); 800 kpps (route processor)
<b>LAN Ports</b>	Three fixed 10-/100-/1000-Mbps ports (RJ-45) or Small Form-Factor Pluggable (SFP) optics	Two (Gigabit Ethernet)	Four (Gigabit Ethernet; SFP)
<b>Gigabit Ethernet Optics</b>	SFPs	Gigabit interface converters (GBICs)	SFPs
<b>SDRAM</b>	1 GB	512 MB	2 GB
<b>Compact Flash Memory</b>	256 MB	256 MB	256 MB
<b>USB Port</b>	No	No	Yes **

Please note that USB port support will not be available at first customer shipment (FCS) time of the Cisco NSE-150 Network Services Engine (part number 7300-NSE-150), and it will be supported in a later software release.

### Selecting a Processor

All three processor options on the Cisco 7304 offer unique benefits. The high-performance NSE-100 and NSE-150 provide up to 3.5-Mpps performance for application-specific features. The list of features that are hardware-accelerated continues to evolve, but currently includes numerous QoS, MPLS, and MPLS VPN services. Features that are not in the PXF path are still supported on the route processor on the NSE-100, but at a lower throughput. In addition, the NSE-100 and NSE-150 can support line-rate interfaces of up to OC-48/STM-16 speeds.

The Cisco 7304 NSE-150 has the same route processor as the NPE-G100, so it offers up to 800,000-pps performance on Cisco IOS Software. The Cisco 7304 NSE-100 has a 350-MHz RM7000 MIPS microprocessor offering approximately 450,000-pps performance on software features, which is less than the performance of the control-plane feature on the NPE-G100 and NSE-150.

Compared to the Cisco 7304 NSE-100, the Cisco 7304 NSE-150 has the following major improvements:

- Offers improved processing power for the control-plane functions (for example, routing protocols and statistics collection)
- Offers improved processing power for route processor-processed data traffic (for example, traditional protocol traffic such as X.25)
- Provides increased route-processor and PXF memory to enable more scalability (routing table, FIB table, etc.)
- Adds port density through onboard Gigabit Ethernet ports (two more onboard Gigabit Ethernet ports)
- Introduces USB interfaces to the Cisco 7304 Router
- Supports up to 16,000 interface descriptor blocks (IDBs), whereas the NSE-100 supports 4,000 IDBs and the NPE-G100 supports 8,000 IDBs; With scalability improvement of IDB, more interfaces can be supported in a system: Cisco 7304 with NSE-150 can support up to 16,000 VLANs, 8,000 Frame Relay DLCIs and 4,000 ATM VCs per system.

The Cisco 7304 NPE-G100 comes with 1 GB of SDRAM and 256 MB of Compact Flash memory by default, and it can achieve better than 1-Mpps switching performance with full support for Cisco IOS Software. In addition, it has three onboard Gigabit Ethernet ports providing high-density LAN connectivity (three fixed 10-/100-/1000-Mbps ports copper or fiber). The network processing engine can deliver all Cisco IOS Software-based services at high performance, thus providing maximum versatility. The NPE-G100 supports the same interfaces as the NSE-100 and NSE-150, but there will be a performance difference between it and the NSE-100 or NSE-150 when deploying higher-speed interfaces such as OC-48/STM-16.

When selecting which processor to deploy, customers should consider the following:

- What features does the deployment require and at what performance level?
- What interfaces does the deployment require and at what performance level?
- Which processor best meets these requirements in the desired timeframe?

### **High Availability**

The Cisco 7304 NSE-150 supports a redundant-processor option that allows the Cisco 7304 Router to be deployed as a fully redundant, high-availability solution. It is recommended that the same hardware configuration be deployed for both the active and standby processors to ensure consistent and predictable route-processor operations after switchover.

Note that the primary engine occupies slots 0 and 1 in a Cisco 7304 chassis, and the redundant NSE-150 occupies slots 2 and 3.

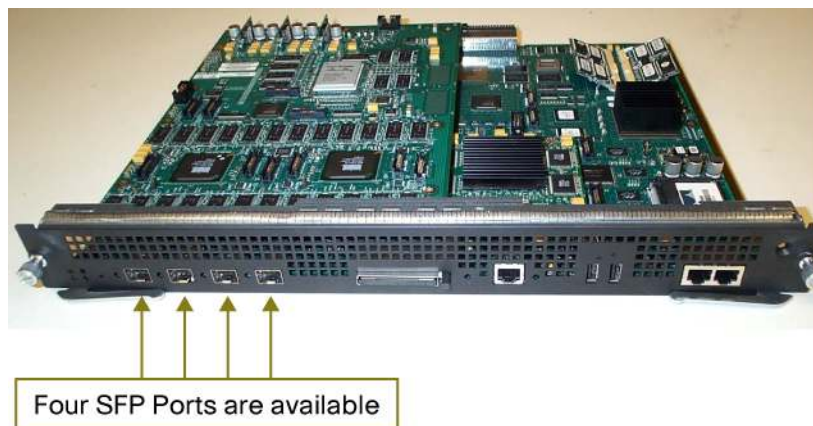
## LAN Ports

Four LAN ports are available on the NSE-150, supporting SFP connectors. Figure 2 illustrates these ports.

Gigabit Ethernet specifications follow:

- IEEE 802.3z compliance
- Support for Jumbo Frames with a maximum transmission unit (MTU) of 9192 bytes
- SFP-based Gigabit Ethernet interfaces with SC connectors (refer to Table 6)

**Figure 2.** Cisco 7304 NSE-150 LAN Ports (Currently the NSE-150 supports coarse wavelength-division multiplexing [CWDM] SFPs, 1000BASE-T SFP, 1000BASE-BX SFP, and 1000BASE Fiber SFPs with short-reach [SX], long-reach/long-haul [LX/LH], and longer-reach [ZX] options.



## SFPs

The Cisco 7304 NSE-150 supports three variations of Gigabit Ethernet SFPs: SX, LX/LH, and ZX. These Gigabit Ethernet SFPs are a small-form-factor version of the more commonly known GBICs. SFPs are sold separately. Table 6 lists the Gigabit Ethernet SFPs supported on the Cisco 7304 NSE-150 service engine. The SFPs are sold separately.

## Memory

### SDRAM Memory

The Cisco 7304 NSE-150 supports 2 GB of SDRAM. There are two SDRAM slots, so the 2 GB consists of two 1-GB memory small-outline dual in-line memory modules (DIMMs).

The type of SDRAM memory on the NSE-150 is DDR memory, providing high-performance memory access rates.

### Compact Flash Memory

The Cisco 7304 NSE-150 supports 256-MB Compact Flash memory. Table 5 provides product numbers for the Compact Flash memory used with the NSE-150.

### Console and Auxiliary Ports

As with the Cisco 7304 NSE-100, the NSE-150 has built-in console and auxiliary ports.

### USB Flash

The USB Flash feature provides an optional secondary storage capability. Images, configurations, or other files can be copied to or from the Cisco USB Flash memory with the same reliability as storing and retrieving files using the Compact Flash card. Cisco USB Flash memory will be supported with 64-, 128-, and 256-MB sizes in future software releases.

## Product Specifications: Compatibility

### Chassis

The NSE-150 is supported on the Cisco 7304 chassis.

### Native Line Cards

The NSE-150 is supported with all native line cards currently orderable with the Cisco 7304 chassis.

### Port Adapters (PAs) and Shared Port Adapters (SPAs)

The NSE-150 is supported with the carrier card (part numbers 7300-CC-PA and 7304-MSC-100), and all port adapters and shared port adapters are currently orderable with the Cisco 7304 chassis.

### Software

The NSE-150 is supported in Cisco IOS Software Release 12.2(31)SB2 and later. Please consult your Cisco representative for additional details.

### Network Management

The NSE-150 comes with the following Network Management support

- Local loopback
- Network loopback
- NetFlow data export
- Simple Network Management Protocol (SNMP) management support
  - SNMPv1, SNMPv2, and SNMPv3
  - ENTITY-MIB (RFC 2737) based inventory and asset management

- MIB-II (RFC 1213) compliance
- Standard RFCs support for physical layer interfaces

Refer to following link for full details about MIBs support on the Cisco 7304 platform:  
<http://www.cisco.com/univercd/cc/td/doc/product/core/cis7300/7304mibs/index.htm>

## Features of Cisco 7304 NSE-150

### Hardware and Software Features

- 800-MHz processor
- Cisco patented PXF IP services processor
- 2-MB NVRAM
- 2-MB upgradable boot ROM flash memory
- 2-GB SDRAM default memory
- 256-MB Compact Flash memory
- 32-MB packet memory
- ECC support
- 2 USB ports

### Product Specifications

#### Physical

- Weight: 6.25 lb
- Dimensions (W x D): 12.5 x 16 in. (PCB); 13.5 x 17 in. (including tray)

#### Environmental

- Operating temperature: 32 to 104°F (0 to 40°C)
- Storage temperature: -4 to 149°F (-20 to 65°C)
- Relative humidity: 5 to 90%, noncondensing
- Operating altitude: -500 to 6500 ft

#### Regulatory Compliance

- CE Marking

#### Safety

- IEC 60950-1
- AS/NZS 60950.1
- CAN/CSA-C22.2 No. 60950-1-03
- EN 60950-1
- UL 60950-1

**EMC**

- EN 55022, 1998, class A
- CISPR22, 1997, class A
- AS/NZS CISPR 22 class A
- CFR47, Part 15, class A
- ICES 003 Class A
- VCCI Class A
- EN61000-3-2 Harmonic Current Emission
- EN61000-3-3 Voltage Fluctuation and Flicker

**Immunity**

- CISPR24, ITE-Immunity characteristics, Limits and methods of measurement
- EN 55024, ITE-Immunity characteristics, Limits and methods of measurement
- EN50082-1, Electromagnetic compatibility—Generic immunity standard
- EN 300 386 Telecommunications Network Equipment (EMC)
- EN61000-6-1 Generic Immunity Standard
- EN 61000-4-2 Immunity to Electrostatic Discharges
- EN 61000-4-3 Immunity to Radio Frequency Electromagnetic Fields
- EN 61000-4-4 Immunity to Electrical Fast Transients
- EN 61000-4-5 Immunity to Transients (Surges)
- EN 61000-4-6 Immunity to Radio Frequency Induced Conducted Disturbances
- EN 6100-4-8 Immunity to Power-Frequency Magnetic Fields (N/A for most of Cisco equipment)
- EN 61000-4-11 Immunity to Voltage Dips, Voltage Variations, and Short Voltage Interruptions

**ETSI Compliance**

- ETS-300386-2 Switching Equipment

**Product Ordering Details**

Refer to Tables 3, 4, 5, and 6 for specific product ordering information. To place an order, visit:

[http://www.cisco.com/public/ordering\\_info.shtml](http://www.cisco.com/public/ordering_info.shtml)

**Table 3.** Processor Ordering Information

Product Number	Product Description
<b>7300-NSE-150</b>	Cisco 7304 NSE-150 with 2 GB SDRAM, 256MB Flash, (4)GE (offered through system bundle only)
<b>7300-NSE-150=</b>	Cisco 7304 NSE-150 with 2 GB SDRAM, 256MB Flash, (4)GE, spare
<b>7300-NSE-150/2</b>	Redundant Cisco 7304 NSE-150 w/2 GB SDRAM, 256MB Flash, (4)GE

**Table 4.** Chassis Bundle Ordering Information

Product Number	Product Description
<b>CISCO7304-NSE-150</b>	4-slot chassis, Cisco 7304 NSE-150, 1 Power Supply, 2GB Memory
<b>CISCO7304CH-NSE150</b>	Channel bundle: chassis, NSE-150,PWR-AC, IOS IP PLUS, FAN

**Table 5.** Compact Flash Memory Ordering Information

Product Number	Product Description
<b>7304-I/O-CFM-256M</b>	Cisco 7304 Compact Flash Memory, 256MB
<b>7304-I/O-CFM-256M=</b>	Cisco 7304 Compact Flash Memory, 256MB, SPARE

**Table 6.** SFP Optic Ordering Information

Product Number	Product Description
<b>GLC-SX-MM</b>	Gigabit Ethernet SFP, LC connector SX transceiver
<b>GLC-SX-MM=</b>	Gigabit Ethernet SFP, LC connector SX transceiver, spare
<b>GLC-LH-SM</b>	Gigabit Ethernet SFP, LC connector LH transceiver
<b>GLC-LH-SM=</b>	Gigabit Ethernet SFP, LC connector LH transceiver, spare
<b>GLC-ZX-SM</b>	Gigabit Ethernet SFP, 1000BASE-ZX
<b>GLC-ZX-SM=</b>	Gigabit Ethernet SFP, 1000BASE-ZX, spare
<b>CWDM-SFP-1470=</b>	1000BASE-CWDM 1470 nm SFP (single mode only), spare
<b>CWDM-SFP-1490=</b>	1000BASE-CWDM 1490 nm SFP (single mode only), spare
<b>CWDM-SFP-1510=</b>	1000BASE-CWDM 1510 nm SFP (single mode only), spare
<b>CWDM-SFP-1530=</b>	1000BASE-CWDM 1530 nm SFP (single mode only), spare
<b>CWDM-SFP-1550=</b>	1000BASE-CWDM 1550 nm SFP (single mode only), spare
<b>CWDM-SFP-1570=</b>	1000BASE-CWDM 1570 nm SFP (single mode only), spare
<b>CWDM-SFP-1590=</b>	1000BASE-CWDM 1590 nm SFP (single mode only), spare
<b>CWDM-SFP-1610=</b>	1000BASE-CWDM 1610 nm SFP (single mode only), spare
<b>GLC-BX-D</b>	1000BASE-BX SFP, 1490NM
<b>GLC-BX-D=</b>	1000BASE-BX SFP, 1490NM, spare
<b>GLC-BX-U</b>	1000BASE-BX SFP, 1310NM
<b>GLC-BX-U=</b>	1000BASE-BX SFP, 1310NM, spare
<b>SFP-GE-S</b>	Cisco 1000BASE-SX SFP (with DOM)
<b>SFP-GE-S=</b>	Cisco 1000BASE-SX SFP (with DOM), spare
<b>SFP-GE-L</b>	Cisco 1000BASE-LX/LH SFP (with DOM)
<b>SFP-GE-L=</b>	Cisco 1000BASE-LX/LH SFP (with DOM), spare
<b>SFP-GE-Z</b>	Extended Temperature ZX SFP
<b>SFP-GE-Z=</b>	Extended Temperature ZX SFP, spare
<b>GLC-T</b>	1000BASE-T SFP
<b>GLC-T=</b>	1000BASE-T SFP, spare

## Service and Support

Cisco offers numerous service and support options for its customers. For more information about Cisco service and support programs and benefits, visit:

[http://www.cisco.com/public/Support\\_root.shtml](http://www.cisco.com/public/Support_root.shtml)





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