# Cisco 5000 Series Enterprise Network Compute System

## General

**Q**

**What is the Cisco® 5000 Series Enterprise Network Compute System (ENCS)?**

**A**

The 5000 Series ENCS is an entirely new concept in network computing. Unlike traditional network hardware that performs a single function, such as routing, switching, firewall, or WAN optimization, the 5000 Series ENCS does it all. That's because it is a fully virtualized platform designed for the Cisco Software-Defined Branch (SD-Branch) and Enterprise Network Functions Virtualization (NFV) architecture. Virtual network functions, or VNFs, serve the functions previously handled by dedicated hardware. That means that a single 5000 Series ENCS unit can replace multiple pieces of hardware in the network and can also be dynamically upgraded to incorporate new or updated functions at any time. There are four models within the 5000 Series: 5100, 5406, 5408, and 5412.

**Q**

**What VNFs are supported, and what are the restrictions for new VNFs?**

**A**

The philosophy behind the Cisco SD-Branch and Enterprise NFV architecture is that there is no lock-in for any specific VNF. Any VNF from any vendor will be supported by the 5000 Series ENCS.

Of course, solution testing, including performance and configuration recommendations, along with Cisco Validated Designs, will include primarily Cisco VNFs such as the Cisco Integrated Services Virtual Router (ISRv) for virtual routing, Cisco Virtual Wide Area Application Services (vWAAS) for WAN

optimization, and Cisco Adaptive Security Virtual Appliance (ASAv) for application firewall. The 5000 Series ENCS does not restrict the VNFs that it can host.

**Q**

**What are the components of the Cisco SD-Branch and Enterprise NFV architecture?**

**A**

The Cisco Enterprise NFV architecture describes a complete solution for deploying flexible VNFs in an enterprise environment The main components are:

- **Hardware:** The physical hardware on which the Cisco SD-Branch and Enterprise NFV architecture can deploy VNFs. This includes the 5000 Series E NCS as well as the Cisco UCS® E-Series hosted in a Cisco 4000 Series ISR.

- **Operating system:** The Cisco NFV Infrastructure Software (NFVIS). This customized Linux build provides a consistent environment for hosting and managing enterprise VNFs.

- **VNFs:** The virtual machines that provide network functions can come from Cisco, Cisco partners, or any third parties, including end customers and application developers. There are no restrictions on the VNFs that can be hosted as part of the Cisco Enterprise NFV architecture.

- **Orchestration and management:** The tools that manage the Cisco SD-Branch and Enterprise NFV hardware, including deployment of NFV virtual machines. For enterprise use cases, the primary tool is Cisco DNA Centerwhich is an application hosted on the Cisco DNA Controller.

**Q**

**A**

### What is the difference between an ENCS and an ISR?

While they may look similar, the internal architecture is very different. An ISR is a flexible, dedicated network hardware platform mainly responsible for routing and forwarding. The ISR can run NFVIS on the Cisco UCS E-Series general-purpose server module to have the same VNF hosting capabilities as the 5000 Series ENCS. The ENCS is a flexible virtualization platform that can host VNFs, including a virtual router. It is the VNFs that completely define an ENCS, while they serve to augment the existing capabilities of an ISR. The two are complementary within the Cisco Enterprise Branch portfolio.

## Hardware

**Q**

**A**

### What physical interfaces are provided on a 5000 Series ENCS device?

The 5406, 5408, and 5412 ENCS platforms all include two dual-phy (RJ- 45 and SFP) 100/1000-Mbps interfaces. These can be used for either WAN or LAN connectivity. An 8-port 10/100/1000-Mbps Ethernet switch is also provided, primarily for LAN connectivity. The 5408 and 5412 models can add Power over Ethernet (PoE) to these switch ports with an optional PoE power supply. Finally, a single Network Interface Module (NIM) slot is available for adding non-Ethernet WAN connectivity.

The 5100 ENCS includes four 100/1000-Mbps interfaces. All four provide an RJ-45 copper interface. Two provide an additional dual-phy SFP for fiber or copper connectivity. An optional 4G/LTE module provides wireless WAN connectivity for either primary or backup WAN connectivity. Unlike the 5400 ENCS platform, the 5100 does not include built-in switch ports, PoE power, or a NIM slot.

The 5000 Series ENCS also provides two 10/100/1000-Mbps management interfaces. These connect to the system CPU and Cisco Integrated Management Controller lights-out management CPU to provide system management. These interfaces should not be used for normal data traffic and should be used only to manage the system. Figure 1 shows the interface side of a 5400 ENCS model, and Figure 2 shows the interface side of the 5100.

Figure 1. 5400 ENCS



Figure 2. 5100 ENCS



**Q**

**A**
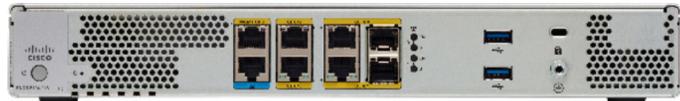
### What are the dimensions of the 5000 Series ENCS?

Table 1 lists the dimensions and weight of the 5400 ENCS, and Table 2 lists the dimensions and weight of the 5100 ENCS.

Table 1.  5400 ENCS dimensions

| Dimension | Measurement |
|-----------|-------------|
| Height | 1.73 in (4.39 cm) – 1 rack unit (RU) rack-mount |
| Width | 17.25 in (43.815 cm) – 19-in rack-mount |
| Depth | 13.8 in (35.052 cm), including card handles and power supply handles |
| Weight | 13 lb (5.9 kg) |

Table 2.  5100 ENCS dimensions

| Dimension | Measurement |
|-----------|-------------|
| Height | 1.73 in (4.39 cm) |
| Width | 12.7 in (32.3 cm) |
| Depth | 10.0 in (25.4 cm) |
| Weight | 6.6 lb (3.0 kg) |

**Q** **What are the mounting options for the 5000 Series ENCS?**

**A** The 5000 Series ENCS (both 5100 and 5400 models) is designed to be placed on a desktop or mounted in a standard 19-inch-wide rack. Mounting in a 23-inch-wide telco rack is possible with the ACS- 5400-RM-23= kit. Wall mounting is also possible with the ACS- 5400-WM= kit.

**Q** **What are the environmental requirements for the 5000 Series ENCS?**

**A** Table 3 lists the environmental requirements.

Table 3.  Environmental requirements

|  | **Minimum** | **Maximum** |
|---|---|---|
| Steady state operating | 32°F (0°C) | 104°F (40°C) at 10,000 feet (3048 m) |
| Storage | -4°F (-20°C) | 158°F (70°C) |
| Humidity operating (noncondensing) | 10% | 90% |
| Humidity nonoperating (noncondensing) | 5% | 95% |
| Altitude operating: over allowable temperature range | 500 feet (152.4 meters) | 10,000 feet (3048 meters) |
| Altitude nonoperating: over allowable temperature range | -1000 feet (304.8 meters) | 50,000 feet (15240 meters) |
| Thermal shock nonoperating with change over time of 3 minutes | -13°F (-25°C) | 158°F (70°C) |
| Thermal shock operating at 4.5°F (2.5° C) per minute | 32°F (0°C) | 122°F (50°C) |

**Q** **What hardware options are available for the 5000 Series ENCS?**

**A** The 5100 ENCS consists of a single platform, while the 5400 ENCS consists of three platforms that differ primarily in CPU size. CPUs are not upgradable, so you cannot add an 8-core CPU to a 5406 ENCS. Note also that PoE is available only on the 5408 and 5412 ENCS. Table 4 lists the part numbers and descriptions for the four 5000 Series ENCS models.

Table 4.  Part numbers and product descriptions

| **Part number** | **Description** |
|---|---|
| ENCS5104/K9 | Cisco 5104 ENCS (4-core, 3.4 GHz AMD, 16GB DRAM) |
| ENCS5412/K9 | Cisco 5412 ENCS (12-core, 1.5 GHz Intel, 8 GB DRAM) |
| ENCS5408/K9 | Cisco 5408 ENCS (8-core, 2.0 GHz Intel, 8 GB DRAM) |
| ENCS5406/K9 | Cisco 5406 ENCS (6-core, 1.9 GHz Intel, 8 GB DRAM) |

**Q** **What memory options are available for the 5000 Series ENCS?**

**A** The 5100 ENCS platform supports up to 32 GB of DRAM across two memory slots. Default memory is 16 GB in a single memory slot.

The 5400 ENCS platforms support up to 64 GB of DRAM across two memory slots. Default memory is 8 GB in a single memory slot and can be increased to 16 GB, 32 GB, or 64 GB. Memory modules do not need to be symmetrical, and different-size modules can occupy each of the two slots.

**Q** **What storage options are available for the 5000 Series ENCS?**

**A** The 5400 ENCS platforms use two different storage media, while the 5100 ENCS platform uses a single M.2 SSD. Default storage is a 64-GB Solid-State Drive (SSD) in an internal M.2 slot. This module can be upgraded to 100 GB, 200 GB, or 400 GB. Approximately 10 GB of storage on this module is required for the base NFVIS operating system, with the remainder available for VNFs.

The 5400 ENCS platforms also include two externally accessible 2.5-inch drive bays. Unlike the drive in the M.2 slot, these drives are hot-swappable and can be replaced without powering down the system, provided an appropriate RAID level is configured. By default there is no disk in these slots, but they can be upgraded to a variety of spinning disks (SATA and SAS) as well as SSD options. Specific sizes may vary and change over time. SAS drives are supported only if a hardware RAID controller is installed. The 5100 platform does not support 2.5-inch drive bays.

**Q** **Does the 5000 Series ENCS support RAID?**

**A** Yes. By default the 5400 platforms use software RAID, supporting RAID levels 0 and 1 for SATA and SSD drives in the externally accessible drive bays. An optional hardware RAID controller (ENCS-MRAID) can be installed, providing greater performance and the ability to support SAS drives. The hardware RAID controller is an internal component and requires the 5400 ENCS platform to be powered down and the top cover removed for installation. The 5100 platform does not support hardware or software RAID.

**Q** **Does the 5000 Series ENCS support dual power supplies?**

**A** No. The compact size of the 5000 Series makes dual internal power supplies impossible. If power reliability is a concern, an external uninterruptible power supply generally makes sense in a branch environment. If network reliability is a concern, many of the VNFs supported on the 5000 Series ENCS support redundancy, making dual ENCS platforms a viable option.

**Q** **Does the 5000 Series ENCS support DC power?**

**A** No. There are currently no plans for a DC power supply on the 5000 Series. Please let your account team know if there is a strong requirement for DC power.

**Q** **What Network Interface Modules (NIMs) are supported?**

**A** Initially, the 5400 ENCS platforms support the NIM-4G-LTE (all carrier versions) from the 4000 Series ISRs. Over time, additional WAN interface NIMs will be supported, based on customer demand. The 5100 ENCS platform does not support NIMs.

**Q** **What Small Form-Factor Pluggable (SFP) transceivers are supported?**

**A** The 5000 Series ENCS initially supports SX and LX/LH SFPs with Digital Optical Monitoring (DOM) from Cisco. Table 5 lists the part numbers and descriptions for the transceivers.

Table 5.   Transceiver part numbers and descriptions

| Part number | Measurement |
|---|---|
| GLC-LH-SMD(=) | 1000BASE-LX/LH SFP transceiver module, MMF/SMF, 1310nm, DOM |
| GLC-SX-MMD(=) | 1000BASE-SX SFP transceiver module, MMF, 850nm, DOM |
| SFP-GE-S(=) | 1000BASE-SX SFP (DOM) |

**Q** **Does the 5000 Series ENCS support Power over Ethernet (PoE)?**

**A** Yes, PoE is an option for the 8-core 5408 ENCS and the 12-core 5412 ENCS. The 6-core 5406 ENCS does not support PoE. The 5100 ENCS platform also does not support PoE.

## Q How much PoE is supported per port and for all ports?

A With an optional PoE power supply installed in an 5408 or 5412 ENCS, a total of 250W of PoE is available across all eight switch ports. Each port supports a maximum of 60W of Cisco Universal PoE (Cisco UPOE™). In the future, NIM modules with PoE ports might also be supported. Neither the 5406 ENCS nor the 5100 ENCS support PoE.

## Q What is the behavior of the power button?

A The 5000 Series ENCS is intended to be an always-on, critical piece of network hardware. Because of this, the default state for the system is powered on. A short (3-second) press of the power button can be used to initiate a system shutdown for routine maintenance of non-hot-swappable components. Another short press will restart the system. A longer press (5+ seconds) will force an immediate power off without waiting for NFVIS to properly shut down.

## Q What do the icons on the bezel indicate?

A Because of recent requirements to provide universal language indications around the world, Cisco devices are adopting indication icons instead of English language indicators. The 5000 Series ENCS are some of the first devices to use this new model, so these icons might be unfamiliar. The Status and Power indicators are also mirrored on the I/O side of the ENCS for convenience. Figure 4 shows the indication icons and their meanings.

**Figure 4.** Indication icons and their meanings

| | | | | | |
|---|---|---|---|---|---|
| 🗄 | [PCIe] | 🌡 | ✓ | ⏻ | RAID \| Internal Services Processor \| Temperature \| Status \| Power |
| ⚡🔌 | [M.2] | ✹ | [F] | ⏻ | PoE \| SSD \| Fan \| Flash \| Boot |

## Q What is the Internal Services Processor (ISP)?

A The ISP is an internal PCIe module that can accept a variety of accessory modules. The first available module that would use this slot is the hardware RAID controller. In the future, additional accessory modules might be available. The ISP is available only on the 5400 ENCS platforms.

## Q What is SR-IOV?

A Single-root I/O virtualization (SR-IOV) is a technology that allows virtual machines to share PCI resources such as network interface cards. In the 5400 ENCS platforms, SR-IOV is used to present a virtual Ethernet interface to hosted VNFs. Traffic in and out of that interface can be handled by physical switching hardware in the ENCS. Traditionally, traffic between virtual machines would be handled by a virtual switch, which consumes valuable CPU resources and limits performance. This technology in a 5400 ENCS offloads that intra-VM traffic to hardware, freeing up CPU resources for additional VNF hosting.

## Q What is the Cisco Integrated Management Controller (IMC)?

A The IMC is the lights-out management processor used in Cisco UCS servers and now the Cisco ENCS. It provides industry-standard server management capabilities, including the ability to power the system on and off and remotely manage and upgrade the system software, as well as perform environmental monitoring for critical system functions. Cisco IMC also provides remote KVM (keyboard, video, mouse) management capability with a virtual desktop, allowing administrators to configure the ENCS as if they were directly connected to the system with a monitor and keyboard.

The 5100 ENCS platform does not support a Cisco IMC for lights-out management.

ılıılı
**CISCO**

## Software

**Q** **What is the operating system for the 5000 Series ENCS?**

**A** The 5000 Series ENCS supports the Cisco NFVIS. This customized Linux build provides a consistent environment for hosting and managing enterprise VNFs and includes API interfaces to orchestration and management tools. NFVIS also manages the physical ENCS hardware, including specialized hardware such as SR-IOV, RAID controller, and the NIM.

**Q** **What is the default username and password for NFVIS and IMC?**

**A** The IMC default username is **admin**, with a password of **password**.

The NFVIS default username is **admin**, with a password of **admin**.

**Q** **Is the Data Plane Development Kit (DPDK) supported?**

**A** The 5400 ENCS hardware and NFVIS operating system do support DPDK. However, each virtual service will need to support DPDK in order to take full advantage of it. The 5100 ENCS platform does not support DPDK.

## SD-WAN Support

**Q** **Does the ENCS 5000 support SD-WAN?**

**A** Yes Cisco SD-WAN capability can be enabled on the Cisco ENCS 5000 series platforms with IOS-XE. Cisco SD-WAN offers an entirely new way to manage and operate your WAN infrastructure. Cisco SD-WAN is a cloud delivered architecture that offers secure, flexible and rich services with the following key benefits:

- **Better user experience:** The ability to deploy applications in minutes, on any platform, with a consistent user experience. Deliver predictable performance for applications residing in the data center or in the cloud.

- **Greater agility:** Faster, easier deployment and operation of your WAN, and get faster performance using less bandwidth. Add new revenue generating services in minutes not months.

- **Advanced threat protection:** Securely connect your users to applications in minutes and protect your data from the WAN edge to the cloud. Secure segmentation for critical assets and multi-layer, robust security that encrypts all data.

**Q** **What SD-WAN advanced security features are supported with the ENCS 5000 series?**

**A** Cisco delivers the most hardened solution for multi-cloud connectivity with integrated SD-WAN + security offering with the following key capabilities:

SD-WAN with:

- Enterprise firewall with application aware access control, intrusion prevention, and stateful inspection

- Advanced malware protection, DNS-layer enforcement, URL filtering, anti-virus, and SSL decryption proxy

- End to end segmentation, encryption and centralized policies to isolate and protect critical enterprise assets

**Q** **Does the ENCS 5000 series support optimization for Microsoft Office 365?**

**A** Yes Optimization for Microsoft Office 365 using Cisco onramp is supported for SD-WAN deployments and the ENCS 5000 series. Distance can play a role in user experience , however if link performance is not good then users will continue to have a bad experience. Cisco onramp can now enables local or regional breakout for Microsoft Office 365 based on dynamic performance measurements to improve the experience for users at remote locations without compromising on security.

**Q** **Does the ENCS 5000 support unified access security and multi-factor authentication?**

**A** Yes the ENCS 5000 series supports unified access security and multi-factor authentication. A zero-trust security model, allows secure connections to all applications (whether on premises or in the cloud) based on the trustworthiness of users and devices.

## Virtual network functions

**Q** **What Cisco VNFs are supported?**

**A** Initially the 5000 Series ENCS will be tested with Cisco VNFs including ISRv, vWAAS, Virtual Wireless LAN Controller (vWLC), and ASAv. These VNFs will be included in the initial Cisco Validated Design Guides, but they are not the only VNFs supported. There are no restrictions on the VNFs supported on the 5000 Series ENCS, from either Cisco or other developers. Additional Cisco and third-party VNFs will likely be included in future Cisco Validated Designs.

**Q** **What operating systems are supported?**

**A** NFVIS is the only operating system supported on the 5000 Series ENCS.

**Q** **Is code signing used to ensure authenticity?**

**A** Because of the open nature of the 5000 Series ENCS, software is not restricted through digital signatures. However, because the 5000 Series does include custom hardware for services such as SR-IOV, Ethernet switching, and NIMs, it is unlikely that other off-the-shelf operating systems would work fully.

**Q** **What is the Cisco ISRv?**

**A** ISRv is a completely virtual version of the Cisco IOS® XE operating system used on the 4000 Series ISRs and ASR 1000 Series. It is very similar to the Cisco Cloud Services Router (CSR) 1000v.

However, ISRv is customized for branch deployments and is well suited to providing routing and forwarding for an 5000 Series ENCS unit. ISRv is a required VNF for the 5400 Series to be fully functional, as it provides management and control for the NIM.

**Q** **What VNFs are required?**

**A** Because of the specialized hardware in the 5400 ENCS platforms, such as NIMs, integrated switching, and SR-IOV, the 5400 platforms require an ISRv for full functionality. However, users can choose to deploy an additional virtual router from any vendor if they have specific requirements. Because it is a required component for full hardware support, there is no additional charge for the ISRv on the 5000 Series ENCS. There are no required VNFs for the 5100 ENCS platform.

**Q** **What third-party VNFs are supported?**

**A** There are no restrictions on VNF support on the 5000 Series ENCS. Third parties, Cisco partners, and customers themselves can create their own VNFs that can be hosted on an ENCS unit.

**Q** **Can a VNF access interfaces on a NIM?**

**A** Not directly. Because they use a Cisco proprietary configuration protocol, NIMs are accessible only through the ISRv VNF.

**Q** **How can multiple virtual functions be connected into a service chain?**

**A** Initially the 5000 Series ENCS supports chaining of VNFs through internal VLANs that can be configured with the Cisco ESA orchestration tool. In the future, ENCS and other VNFs will support network service headers for dynamic service chaining.

# Orchestration and management

**Q** **What tools are available to manage VNFs on the 5000 Series ENCS?**

**A** The 5000 Series ENCS is intended primarily for enterprise deployments. Because no two enterprise environments are alike, there are several orchestration and management options.

- **Cisco DNA Center(DNA_C):** This DNA Controller based application is the preferred tool for managing large deployments of ENCS units across an enterprise environment. DNA-C provides basic platform management as well as VNF orchestration and management.

- **Cisco Network Services Orchestrator (NSO):** Primarily a tool for large service provider deployments, NSO is also an option for very large enterprise deployments. With a highly customizable API-driven interface, NSO can integrate seamlessly with existing management infrastructures. Check the ENCS data sheet for NSO availability.

- **Local Portal:** This web-based application provides a powerful tool for managing a single ENCS system. Hosted directly from the NFVIS operating system, the portal gives an administrator access to configure the ENCS platform as well as orchestrate individual VNFs and set up service chains.

**Q** **Is there a traditional Command-Line Interface (CLI) (console, SSH, or Telnet) for managing the 5000 Series ENCS?**

**A** Because ENCS is not your traditional network appliance, it does not provide a traditional CLI. The primary interface for managing an ENCS unit is through an API-driven tool such as the DNA Center application or a local web interface.

# Ordering

**Q** **How is the 5000 Series ENCS licensed?**

**A** The 5000 Series ENCS is available exclusively through Cisco ONE™ Software term-based licensing. Cisco ONE provides a flexible licensing model that includes ongoing support for the 5000 Series ENCS, NFVIS, and ISRv, all in one. Additional details can be found in the 5000 Series ENCS data sheet.

**Q** **Can the 5000 Series ENCS be ordered without NFVIS or ISRv?**

**A** No. NFVIS is the only operating system supported for the 5000 Series ENCS. An ISRv VNF is a required component for full functionality, so it is included with every 5000 Series ENCS system.