Product Overview

This section provides an overview of the CGR Compute Module.

General Description

The CGR Compute Module is a modular, hardened server that can be inserted into CGR 1000 routers. The compute module functions as a fog computing node at the edge of the network.

The compute module runs Cisco IOx, a hypervisor architecture. Customers can run Internet of Things (IoT) applications on a Virtual Machine (VM) (see Table 4 on page 4) and connect legacy networking technologies through a network interface card. For example, applications hosted on the router can collect system information from Cisco IOS using APIs. By acquiring this information, the applications can use it to control and query other network devices using IoT protocols.

Hardware Overview

The x86-based multi-core compute module hardware incorporates the industry standard COM Express module, referred to in this document as COMe sub-module. The sub-module fits inside the compute module enclosure, which occupies one slot of the host CGR. The CGR1120 and CGR1240 can each host one compute module. See the "Installing the Compute Module" chapter for slot restrictions on the CGR1240.

SKU Information

Table 1 on page 1 lists the SKUs available for the compute module.

Table 1   Compute Module Product SKUs

Product ID	Bulk Memory	DDR Memory	CPU on COM-E
CGM-SRV-64	50 GB	4 GB	AMD GX-410VC. 4-Core 800Mhz
CGM-SRV-128	100 GB	4 GB	AMD GX-410VC. 4-Core 800Mhz

Hardware Features

The compute module provides these hardware features:

- IoT hardware environmental features:

    — Operational temperature range from -40C to +50C, no fan.

    — Meets IP67 standard when inserted in a CGR1240 chassis.

    — Meets IEC 61850-3 and IEEE1613 standards.

- Compliant to Field Area Network (FAN) module specifications:

    — Takes +12V power input at 6-8 Watts (Max 10 Watts).

    — Dimensions (H x W X D): 1.50" x 3.5" x 4.46" (3.81 cm x 8.89 cm x 11.32 cm).

- — Backplane/host connector is a PCIe 98-pin connector with custom pinout.

- — Backplane data-path through single USB 2.0.

- — Module control through backplane I2C bus.

- Acts as a carrier board for COM Express module:

  - — Accepts a COM Express Type 10 Mini (84mm x 55mm) module.

  - — Complies with COM Express Carrier Board specification from PICMG Open Modular Computing Standards.

  - — COMe Pinout is compliant to Rev 2.1 Type 10 specification.

- Uses the following interfaces on COMe:

  - — Two USB 2.0 ports for front-panel data communication.

  - — One copper GE port for front-panel data communication.

  - — One SATA port for connection to mSATA bulk storage.

  - — One USB 2.0 port for backplane data path.

  - — One Serial UART port for host monitoring.

  - — SPI port for alternate BIOS on the compute module—alternate BIOS Flash with Cisco custom BIOS+Bootloader code.

- COM Express (COMe) module features:

  - — Advantech SOM-9751 module.

  - — CPU = AMD GX-410VC. 4-Core at 800Mhz.

  - — Main DRAM Memory = 4Gbyte DDR3L-1066.

  - — Power consumption < 6.1 Watts (Typical), < 8.5W (Max)

  - — BIOS flash depopulates as alternate BIOS flash on carrier board is used.

  - — One GE Mac/Phy, Intel i210.

- mSATA bulk storage slot:

  - — Compliant to mSATA specifications.

  - — Interface compliant to SATA 3.0 (6.0Gbps, Data rate 4800Mbit/sec).

  - — Allows future size upgrade feature. Currently 50GB and 110GB are possible.

Note: Shielded cables are required for USB ports. The GE port does not require shielded cables.
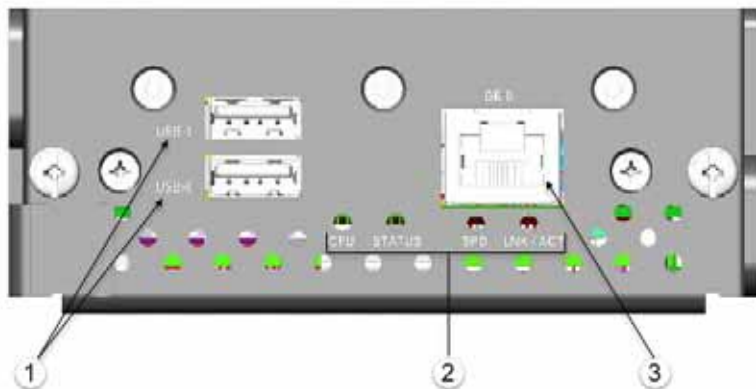
Note For slot requirements for the module, please refer to the Pre-Installation notes in the chapter in this guide.

Front Panel

The compute module has two USB 2.0 ports and one copper Gigabit Ethernet Interface. These ports go directly to the COMe sub-module as a data-path into the fog computing facility of the compute module. Packets or data needing network routing services are forwarded towards the backplane/Host through a USB 2.0 port (on COMe) via a USB-to-FE device that acts like any another network port for the FOG Software running on the COMe sub-module.

You can monitor details on the USB ports within the Host-OS and VM applications.

Figure 1   Compute Module Front Panel

1	USB 2.0 ports (USB-0 and USB-1)
2	LEDs
3	Gigabit Ethernet Copper RJ45 port

USB Ports

USB ports provide storage and support file transfer. Hot swap of USB module is supported.

Note: The compute module **does not** support USB to Ethernet traffic; and, cannot be used as a power source.

Each USB port is limited to supporting Low-Power and Self-power devices with capability to supply 100mA. Warning messages will be displayed if more than 200mA aggregate is being drawn by the two ports.

USB Cable Considerations

USB cables should be limited to use in protected areas, such as a control room. We recommend limiting USB cables to Classes 0, 1, and 2. USB cables must be at least 2 meters and are limited to be no longer than 4.3 meters (15 feet) by specification. (IEC61850-3:2013, 61000-4-5:2006).

If you connect a cable greater than 2 meters to a USB port, a ferrite clamp will need to be installed. You can order ferrite clamps from Cisco (PID: FERRITE-CLAMP=). Refer to the following Cisco document for additional details on the ferrite clamp:

Attaching Ferrite Clamp on CGR 1000 Series Alarm Cables for Noise Suppression

LEDs

Table 2 on page 4 describes the LEDs on the front panel of the compute module.

Table 2   LEDs

LED	Activity	Description
CPU (of module)	Off	No power.
	Yellow	Disabled.
	Steady green	Active.
Status (Operational status of module)	Off	No power.
	Yellow	Power available. Module not yet initialized.
	Steady green	Module is operating.
Gigabit Ethernet Port Link Speed	Off	100/10.
	Steady green	1000.
Gigabit Ethernet Link and Activity	Off	No link.
	Steady green	Link.
	Blinking green	Activity.

Memory

The compute module provides a single mSATA module for bulk storage. The mSATA module allows for configurable storage options, shown in Table 3 on page 4.

Table 3   Memory Options (Hardware)

Memory	Size
mSATA 64 GB with 14 GB reserved for wear-leveling	50 GB
mSATA 128 GB with 28 GB reserved for wear-leveling	100 GB

Software Overview

Using either the command line interface (CLI) or NMS, the user can install and run a virtual machine (VM), which is assigned CPU, memory and IO resources of the compute module (as per virtual PC model).

Table 4 on page 4 lists the supported Virtual Machines (VM) and the corresponding Operating Systems (OS) supported on those VMs.

Table 4   Supported Operating Systems and Virtual Machines

Operating System	Virtual Machine
Ubuntu versions 14.04 and 15.10	Linux
Windows 7	Windows

Two emulated Ethernet interfaces are available at the VM level: the first one is connected via backplane to router's GigabitEthernet <slot>/1 interface and provides the VM a means to access networks connected through the router. The second Ethernet interface is connected to Ethernet interface on the front panel of the module. VM can also access USB interfaces on the module's front panel.

A VM serial console can be accessed from router CLI to allow VM debugging.

A Host-OS serial console can be accessed from router CLI to allow Host-OS debugging.