Intel® Visual Compute Accelerator 2 (Intel® VCA 2)

Product Specification and Hardware Guide

A reference document for server OEMs providing an overview of product features, integration requirements, and validation guidelines.

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Intel® Server Products and Solutions

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Document Revision History

Date	Revision	Changes
July 2017	1.0	Initial release.
October 2017	1.1	Edited for clarity. Removed sections on validation and operating systems.
November 2017	1.2	Updated supported memory to include non-ECC memory.

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Table of Contents

List of Figures

List of Tables

1. Introduction

This document provides a high-level overview of the product features, functions, and support requirements of the Intel® Visual Compute Accelerator 2 (Intel® VCA 2) (VCA1585LMV).

1.1 Document Outline

This document is divided into the following chapters:

- Chapter 1 – Introduction
- Chapter 2 – Product Overview
- Chapter 3 – Board Specifications and Support Requirements
- Chapter 4 – Host Server Validation Guidelines
- Chapter 5 – Memory Support
- Chapter 6 – Operating System Support

2.   Product Overview

The Intel® Visual Compute Accelerator 2 (Intel® VCA 2) equips Intel® Xeon® Scalable processor and Intel® Xeon® processor E5-based platforms with Iris® Pro Graphics and Intel® Quick Sync Video media transcode capabilities. Comprised of three Intel Xeon processors E3 1585L v5, this PCIe* add-in card delivers outstanding total cost of ownership and is supported by a rich ecosystem of server OEMs, ISVs, and solutions. Applications include:

- Broadcast – Ultra-high channel density with high visual quality.
- Remotely rendered graphics – High video quality, low latency graphics for enterprise productivity and anytime anywhere gaming.
- Multi-party communication – Video-enabled B2B, B2C, and C2C communication with massive scaling

2.1   Order Information

Table 1. Order information

Product Image	Details	Description

	Intel® Visual Compute Accelerator 2 (Intel® VCA 2) VCA1585LMV
	
	iPC VCA1585LMV
	MM# 954907
	UPC 7 35858 33453 2
	EAN 5 0320370 99127
	MOQ 1
	
	Product type PCIe* Add-in Card
		Includes:
		(1) – PCIe* add-in-card with
		     (3) Intel® Xeon® processor E3-1500 v5 product family
		     (6) DIMM slots – (2) DIMMs/CPU
		(1) – Quick Start Guide

2.2   Feature Set

Table 2. Board feature set

Feature	Description
Form factor	Full-length, full-height, double-width PCIe* card
CPU	(3) Intel® Xeon® processor E3-1585L v5
Max TDP	235 W
Memory	DDR4 ECC SODIMMs, 2 channels per CPU, up to 64 GB per CPU, up to 192 GB per card
PCIe* configuration	Gen3, x16, 8 lanes per CPU
BIOS	(1) 16 MB SPI flash per CPU
Operating system support	CentOS* 7.2 , Windows Server* 2016, Windows* 10, Xen or KVM support if using hypervisor

Table 3. Processor feature set

Feature	Description
Processor Type	Intel® Xeon® processor E3-1585L v5
Cache	8 MB
Instruction set	64-bit
Instruction set extensions	SSE4.1/4.2 AVX 2.0
# of cores	4
# of threads	8
Processor base frequency	3.0 GHz

Feature	Description
Max turbo frequency	3.7 GHz
TDP	45 W
Max memory size (dependent on memory type)	64 GB
Max # of memory channels	2
ECC memory supported	Yes
Processor graphics	Iris® Pro graphics P580
Graphics base frequency	350 MHz
Graphics max dynamic frequency	1.0 GHz (capped in BIOS)
Graphics video max memory	32 GB
Execution units	72
Intel® Quick Sync Video	Yes

2.3 Host System Required BIOS Features

The host system BIOS must be configured to enable large memory-mapped input/output (MMIO), and allow for large per-device base address register (BAR) allocations. BAR must have 64-bit address enabled.

The minimum requirements for BAR and MMIO are:

- MMIO mapping above 4 GB is enabled
- Minimum MMIO size is 4 GB/CPU (node)

For example, on Intel® Server Board S2600WT based systems, this can be enabled in BIOS setup by configuring the following two options on the PCI Configuration screen.

- Set **Memory Mapped Above 4 GB** to **Enabled**
- Set **Memory Mapped IO size** to **256 GB**

2.4 Host System Minimum Memory Requirements

The host system must have sufficient free RAM (after accounting for operating system, running services, and applications) to load the bootable image for each node to be simultaneously booted. (For example, if a 2 GB bootable image would be booted simultaneously on four cards (12 nodes), there must be at least 24 GB (2 GB x 12 nodes) of free RAM when the boot command is issued.)

2.5   Architecture Block Diagram

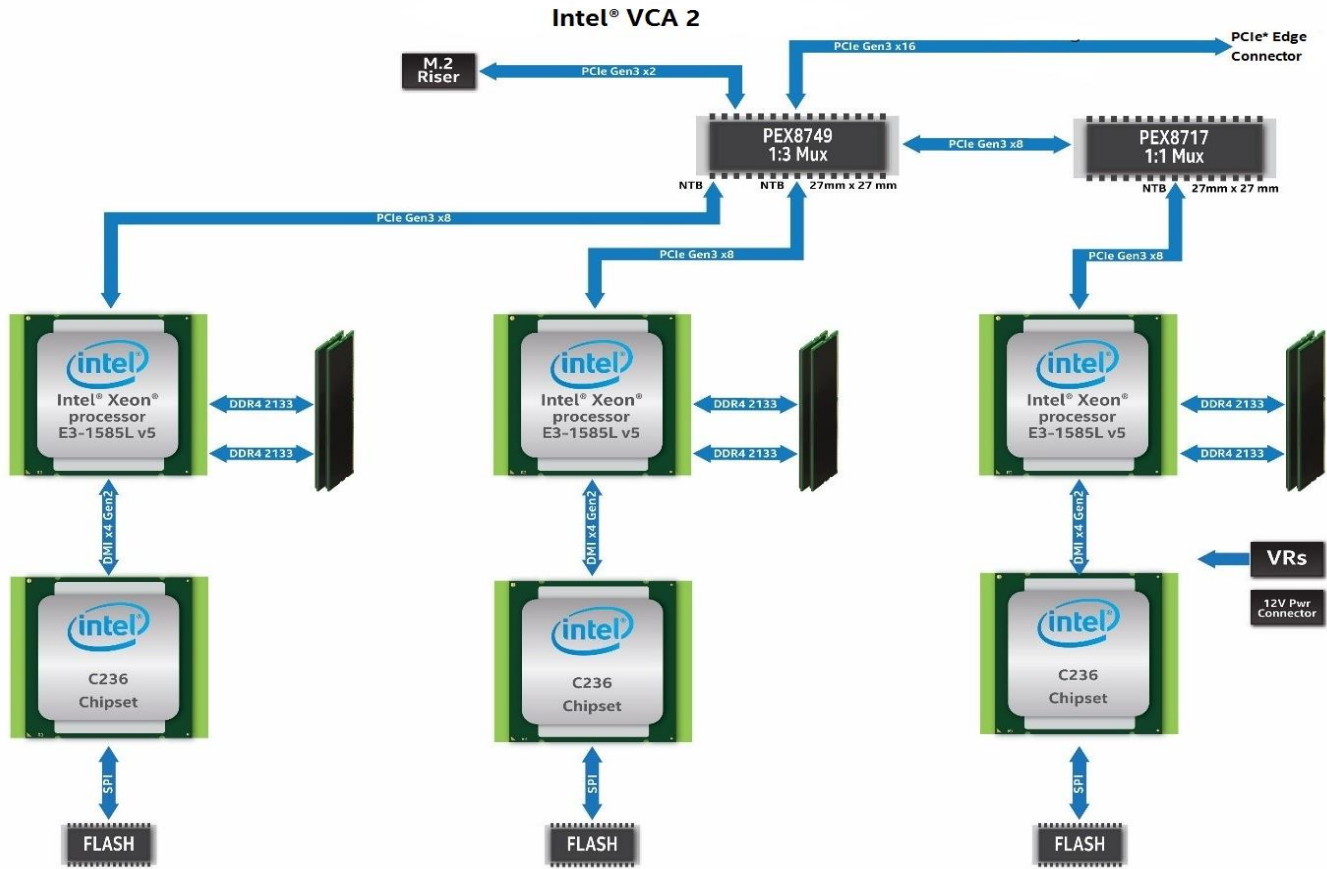**Figure 1. Product architectural block diagram**

3.   Board Specifications and Support Requirements

3.1   Mechanical Specification

Intel® VCA 2 is a "near" full-length, full-height, double-width PCIe* 3.0 x16 add-in card. It includes a bracket that extends the card to full length for systems that fully support the PCIe specification.
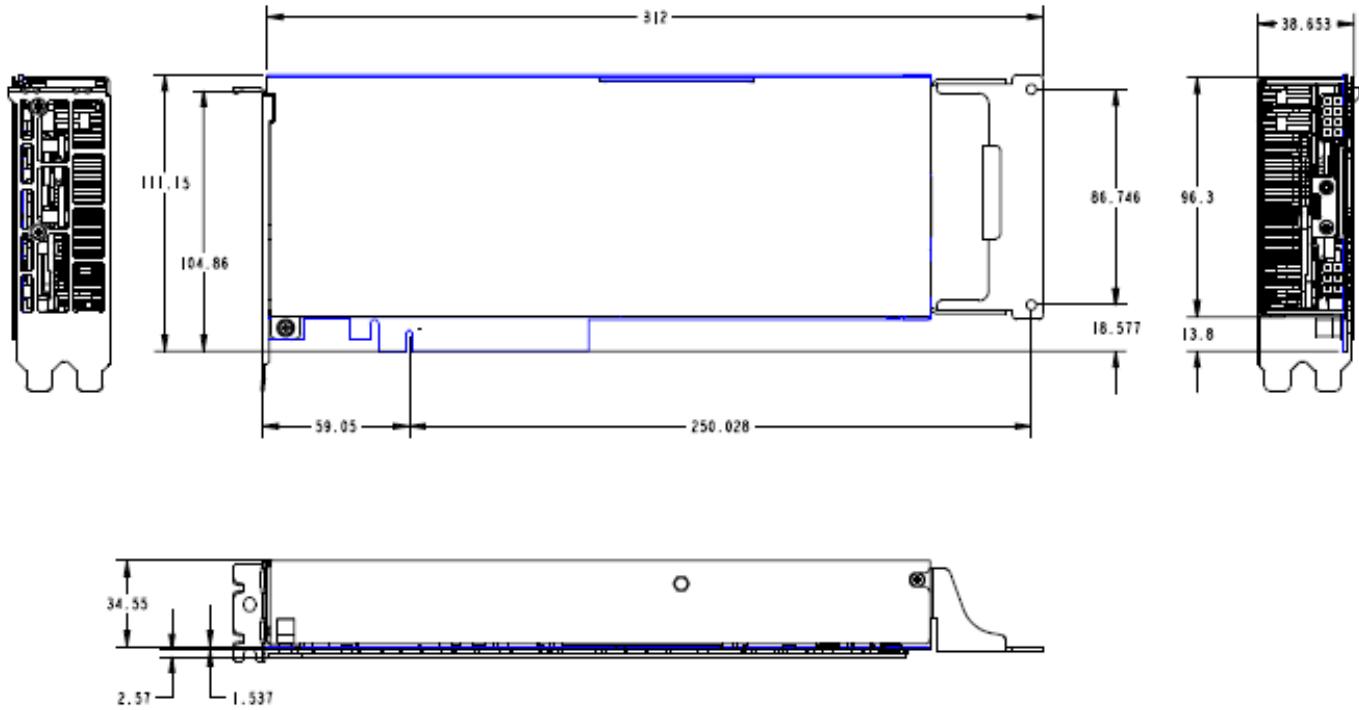
Figure 2. Intel® VCA 2 dimensions

3.2   Card Assembly

The Intel VCA 2 assembly consists of several detachable components to allow for card configuration and serviceability. Figure 3 displays the full card assembly.

Cosmetic cover

PCIe* extender bracket

Thermal module and duct

Main board

I/O bracket

Backplate and insulator
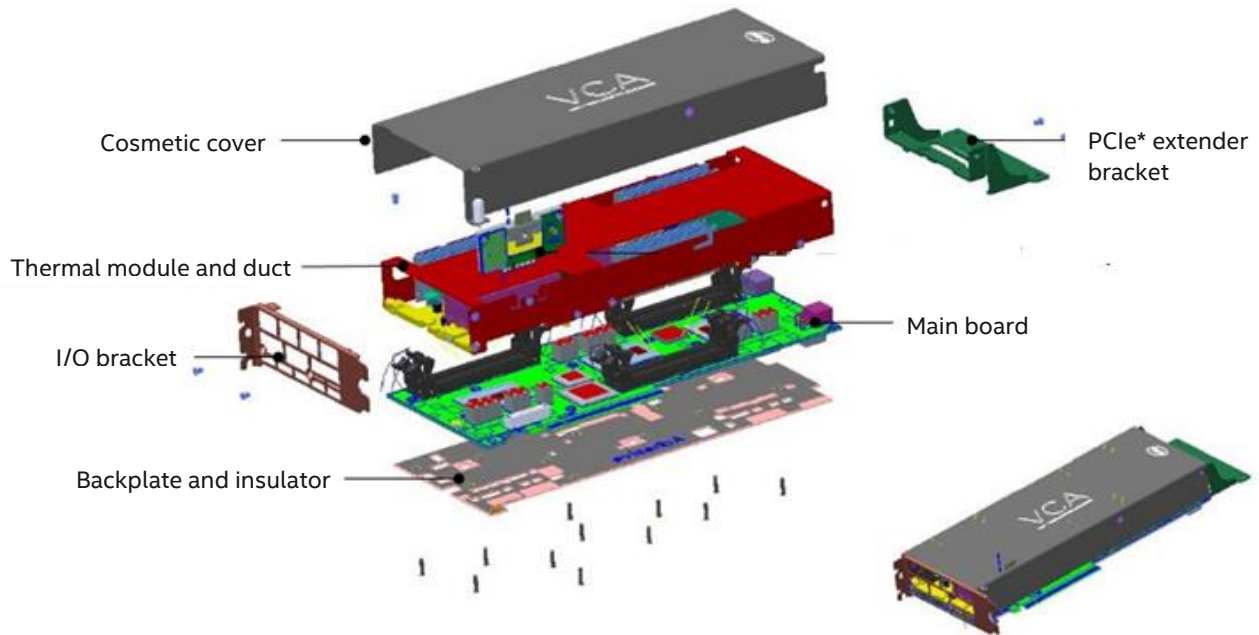
Figure 3. Intel® VCA 2 detachable components

Advisory Note: Intel VCA 2 must have the provided mechanical support bracket (or other custom support bracket) mounted to the card to ensure proper support when installed in the system. Failure to properly support the installed card may cause serious damage should the system be exposed to any level of shock or vibration or is transported to the end user location.

When in operation, the card temperature will rise. The cosmetic cover, thermal module, and duct must be in place to allow for proper airflow over and through the card assembly. Failure to have the card covers installed results in overheating which may impact performance or proper operation of the card.

3.3 Thermal and Airflow Specification

Figure 4 and Table 4 identify the thermal, airflow, and air pressure requirements that must be met by a chassis following the front-to-back air flow pattern of a common system.

Airflow out ⟵   ⟸ Airflow in

Figure 4. Standard airflow pattern

Table 4. Requirements for standard airflow pattern

Card Inlet Temperature	Flow Rate (Cubic Feet per Minute (CFM))	Pressure Drop (Inches of Water ("H2O))
45° C	25.5 CFM	0.476 "H2O
35° C	18.0 CFM	0.246 "H2O

Some custom chassis configurations may orient the card such that the airflow is reversed from the standard airflow pattern shown above. In these non-standard system configurations, the thermal, airflow, and air pressure boundary conditions must meet the following requirements.

Airflow in ⟹   ⟹ Airflow out

Figure 5. Non-standard airflow pattern

Table 5. Requirements for non-standard airflow pattern

Card Inlet Temperature	Flow Rate (Cubic Feet per Minute (CFM))	Pressure Drop (Inches of Water ("H2O))
35 °C	24.1 CFM	0.208 "H2O
25 °C	19.0 CFM	0.196 "H2O

Note: Intel VCA 2 CPU core temperatures must remain at or below 96 °C (204.8 °F). CPUs begin to throttle once they reach 100 °C (216 °F), impacting card performance. Should CPU temperatures continue to rise, the card may shut down due to a CPU Thermal Trip event. Should such events occur, adjustments must be made to the system fan speed controls to ensure increased airflow to the card. The `vcactl temp` command of the `vcactl` utility may be used to monitor card CPU core temperatures.

3.4   Power Specification

Intel VCA 2 has a maximum TDP of 235 W. Per the PCIe specification, the PCIe x16 connector can support up to 75 W. The remaining power to the card must be supplied via the 2x3 (75 W) and 2x4 (150 W) 12 V AUX power connectors on the card as shown in Figure 6.
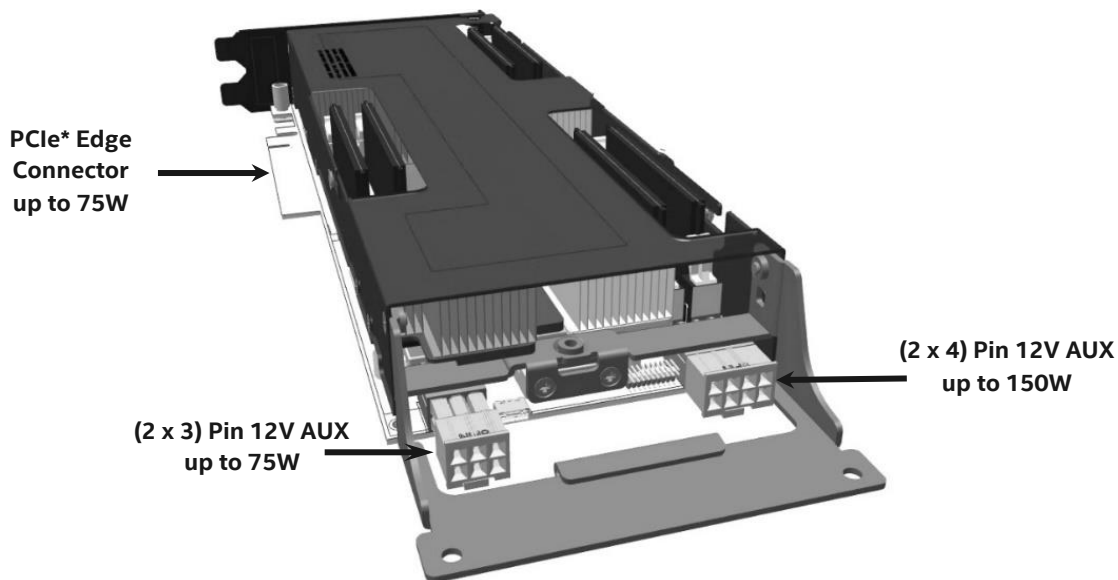
Figure 6. Intel® VCA 2 card power connectors

Note: Intel VCA 2 does not ship with cables. Contact the system supplier for 12 V AUX power cables appropriate for the system to which the card is being installed. See 6 for Intel® Server System support.

3.4.1   12 V AUX Power Connector Specification and Pinout

3.4.1.1   2x3 Pin 12 V AUX Power Connector

- Vendor – Lotes*
- Vendor Part # - APOW0001-P001C01
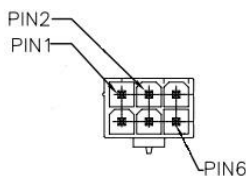
Figure 7. 2x3 pin 12 V AUX power connector pin diagram

Table 6. 2x3 pin 12 V AUX power connector pinout

Pin #	Description
1	12 V
2	12 V
3	12 V
4	GND
5	GND
6	GND

3.4.1.2   2x4 Pin 12 V AUX Power Connector
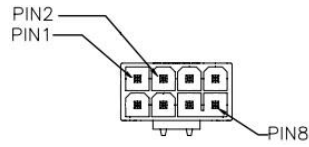
- Vendor – Lotes
- Vendor Part # – APOW0002-P001C01

Figure 8. 2x4 pin 12 V AUX power connector pin diagram

Table 7. 2x4 pin 12 V AUX power connector pinout

Pin #	Description
1	12 V
2	12 V
3	12 V
4	GND
5	GND
6	GND
7	GND
8	GND

4.   Host Server Validation Guidelines

4.1   Validating Hardware Compatibility

- Mechanical, thermal, and power supply – Refer to chapters in this guide on mechanical, airflow, and power supply specifications.
- Shock and vibration – There are no special requirements for testing shock and vibration. Use the standard testing procedure for PCIe* devices.
- Power cycling – AC, DC, reset. Recommend minimum of ten boards (20 preferred) cycled 700 times each at expected production ambient temperature with not failures.

4.2   Host Server BIOS Guidelines

- BIOS enumerates and recognizes PCIe add-in cards, x16 Gen3
- BIOS supports large MMIO regions ≥ 256 GB
- BIOS must support BAR up to 64 GB per device

4.3   Host Server PCIe* Reset Guidelines

- Signal – `PERST_N`, which is the PCIe reset signal coming from host
- Duration – Not relevant, but 10 ms is suggested
- Number of resets – Not limited, but strongly suggested two as maximum
- Time between resets – Recommended to be at least three seconds

5. Memory Support

Intel® VCA 2 includes three processors identified as CPU 1-3. Each of the three processors includes two memory channels identified as A and B. Each memory channel supports one SODIMM socket. Each processor can support up to 64 GB of memory. Figure 9 below identifies the SODIMM sockets for each processor.
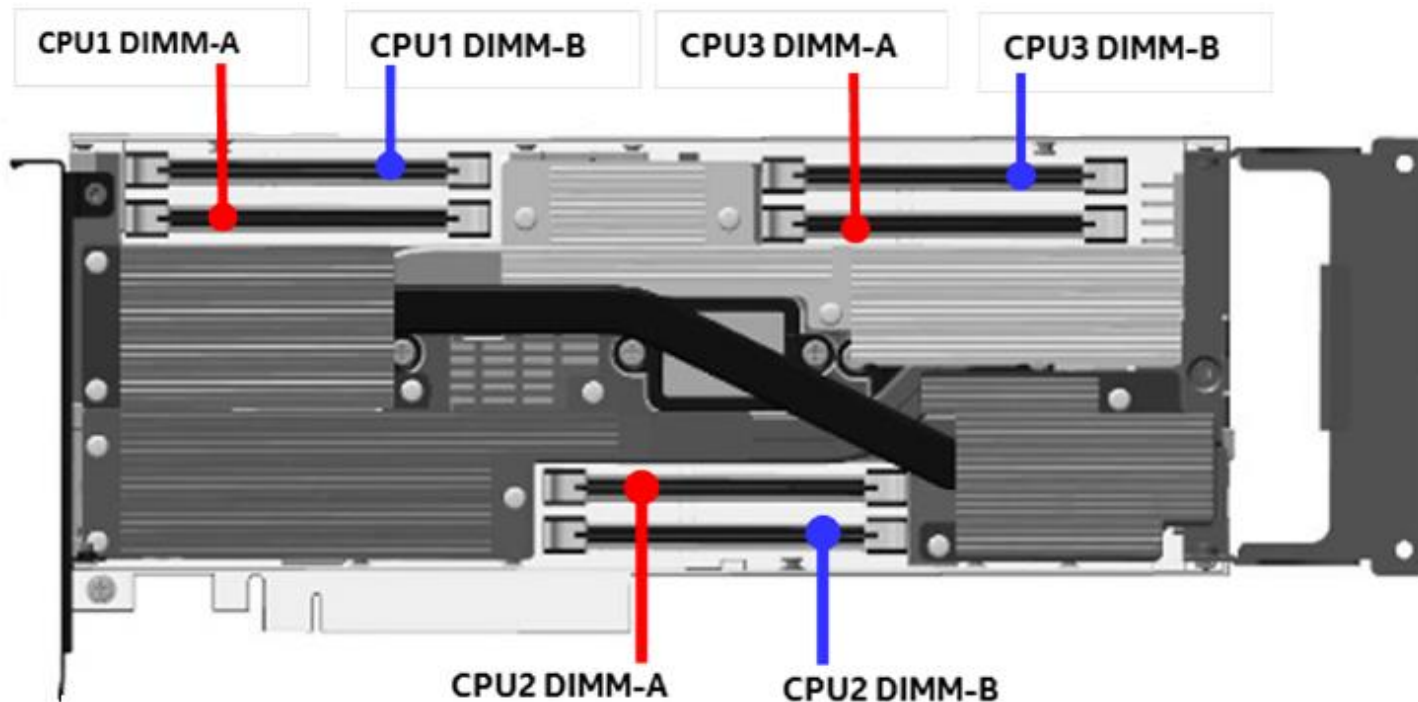

Figure 9. Intel® VCA 2 card DIMM slots

5.1 Memory Population Rules

Note: Although mixed DIMM configurations may be functional, Intel only supports and performs validation with cards that are configured with identical DIMMs installed across all CPUs

- All DIMMs must be DDR4 DIMMs.
- Only Error Correction Code (ECC) enabled DIMMs are supported.
- All processors must have at least one DIMM installed.
- DIMM slots for each processor must be installed in order, beginning with DIMM Slot A.
- When only one DIMM is installed for any given processor, it must be populated in the DIMM A slot.

5.2 Supported Memory

Intel VCA 2 has support for the following memory types:

Table 8. Supported memory types

Memory Type	Memory Size	Speed	Ranks per DIMM
SODIMM DDR4L ECC	8GB, 16GB	2133	Single-rank, dual-rank
SODIMM DDR4L Non-ECC	4GB, 8GB, 16GB	2133	Single-rank, dual-rank

5.3   Memory Compatibility List

The following lists of memory have been validated for use on Intel VCA 2. This list will be updated as additional DIMMs are tested.

Table 9. ECC memory compatibility list

Vendor	8 GB	16 GB
Micron*	MTA18ASF1G72HZ-2G3B1	MTA18ASF2G72HZ-2G3B1
SK-Hynix*	HMA41GS7AFR8N-TF	HMA82GS7MFR8N-TF
Samsung*	M474A1G43DB1-CRC	M474A2K43BB1-CRC
Crucial*		CT16G4TFD824A

Table 10. Non-ECC memory compatibility list

Vendor	4 GB	8 GB	16 GB
HyperX*	HX421S13IB/4	HX421S13IB/8	HX421S13IB/16
Crucial*	CT4G4SFS8213	CT8G4SFS8213	CT16G4SFD8213

6.   Operating System Support

Note: All utility software and boot images referenced in this section can be downloaded at https://downloadcenter.intel.com/product/98092.

Note: Supported operating systems and instructions for bringing up Intel® VCA 2 are provided in the *Intel® Visual Compute Accelerator Family Software Guide*: https://www.intel.com/content/www/us/en/support/server-products/server-accessories/000016708.html.

Intel VCA 2 boots the operating system from the host using a technology known as leverage boot. A `vcactl` utility is used to perform all boot operations. The utility loads the operating system into a RAMDisk that the CPUs boot from.

Users have the option of downloading one of several different boot images available from the Intel website or creating their own boot image. Refer to the *Intel® Visual Compute Accelerator Product Family Software Guide* for instructions on how to build a boot image.

6.1   Supported Hypervisors

- Xen
- KVM

6.2   Guest Operating System

Intel VCA 2 supports any operating system supported by Iris® Pro graphics, Intel® Graphics Virtualization Technology (Intel® GVT-d) virtualization, and the Intel® Media Server Studio.

Appendix A. Glossary

Term	Definition
AVC	Advanced Video Coding
BAR	Base Address Register
BIOS	Basic Input/Output System
ECC	Error Correction Code
HEVC	High Efficiency Video Coding
iPC	Intel Product Code
KVM	Keyboard, video, mouse
MMIO	Memory-Mapped Input/Output
NFS	Network File System
NVMe*	NVM Express*
PCH	Platform Controller Hub
PCIe*	PCI Express*
SPI	Serial Peripheral Interface
Intel® VCA	Intel® Visual Compute Accelerator

Appendix B. Additional Collateral

- *Intel® VCA 2 Product Brief*: https://www.intel.com/content/www/us/en/servers/accelerators/vca2-product-brief.html
- *Intel® VCA Product Family Software Guide*: https://www.intel.com/content/www/us/en/support/server-products/server-accessories/000016708.html