

Mustang-200 Accelerate to the Future



Multiple Applications & Tasking



➤ Intelligent, Versatile, Dense Computing Accelerator for standard servers and cloud networks.

In the era of information explosion, various digital services such as over-the-top (OTT), multiple-system operator (MSO), content delivery network (CDN), SaaS providers are faced with shortage of computing resources. These service providers need more computing power that is large and strong enough to cope with enormous amount of information, data, audio and video, etc.

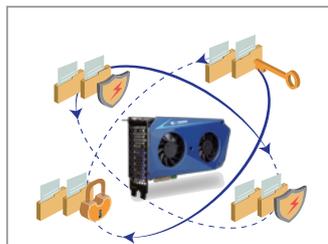
In the past, in the absence of space constraints, we will increase the number of servers to deal with huge amounts of data, but the space is still limited.

In the limited space, we can only use FPGA expansion cards or GPU expansion cards to increase the performance of the server. However, these cards often have only one single function and are lack of flexibility. The only one solution is to create an intelligent, versatile, dense computing accelerator.

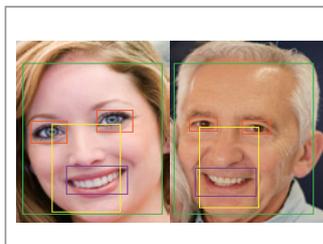
Therefore, Mustang-200 is born!



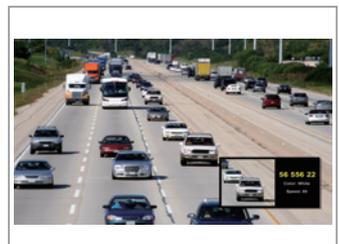
Video Transcoding/
Live Streaming



Numerous File
Encryption/Decryption



Numerous Face
Analysis



Numerous Car Plate
Analysis

Accelerator Card Comparison

	General Purpose GPU	Fixed Function HW (ASIC , FPGA)	Flexible Accelerator (CPU, x86 architecture)
Multiple Applications & Tasking	No	No	Yes 🏆
Flexibility	Low	Low	High 🏆
Power Consumption	High	Low	Low 🏆
Development Cost	High	High	Low 🏆

Mustang-200 Overview

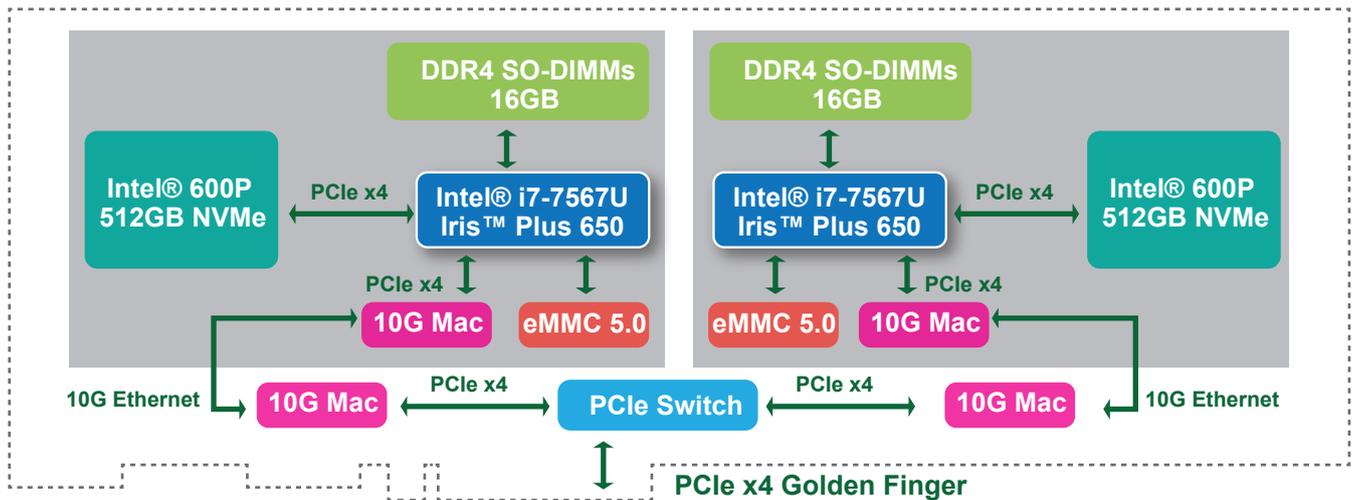
➔ 10Gbps Network Based x86 Computing Accelerator

- 10 Gigabit Ethernet based x86 computing nodes support decentralized computing architecture
- Perfectly integrated QNAP QTS-Lite provides a flexible and secure developing environment
- Support virtualization technology, virtual machine (VM) & container technology
- Fit standard server, compatible with PCI-Express x4, x8, x16
- Increase computing power without changing or adding servers
- Achieve higher densities computing and lower the total cost



➔ Mustang-200 Block Diagram

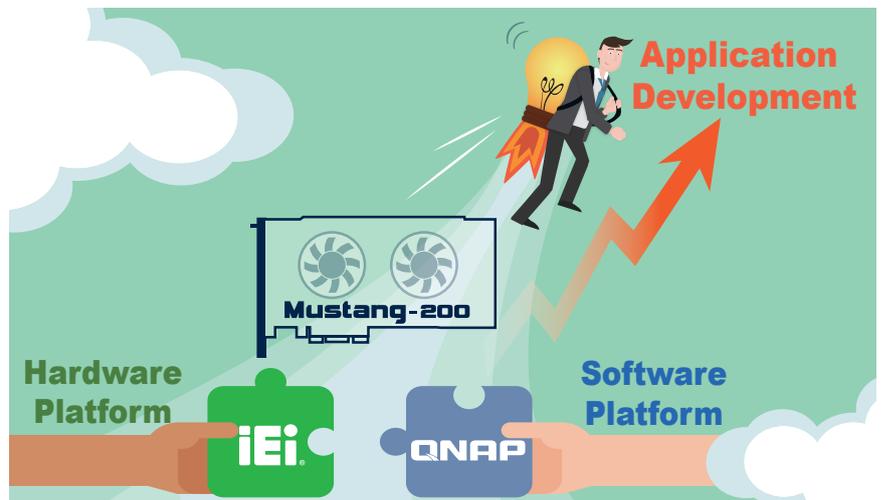
Every CPU on the Mustang-200 is accompanied with 16GB (2 x 8GB) RAM and an Intel® 600P series 512GB NVMe SSD. Once installed in a PCIe x4 slot, the host computer will be connected to both computing nodes on the Mustang-200 with 10GbE networks. The advantage of utilizing network-based structures is that no proprietary hardware is needed thus a lower cost is achieved. The computing nodes are powered by QTS-Lite, a lightweight version of QNAP's award-winning QTS operating system, and the eMMC component will serve as storage for QTS-Lite.



➔ Mustang-200: The best platform for application developers



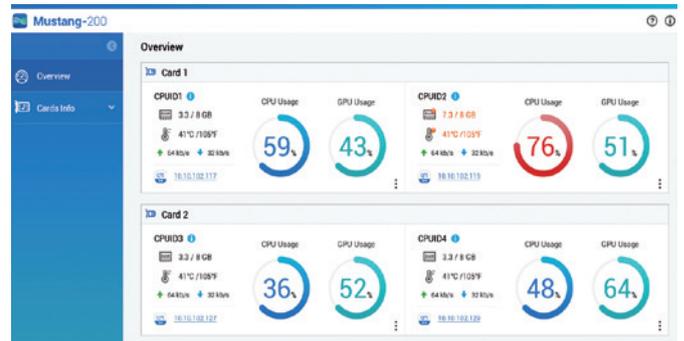
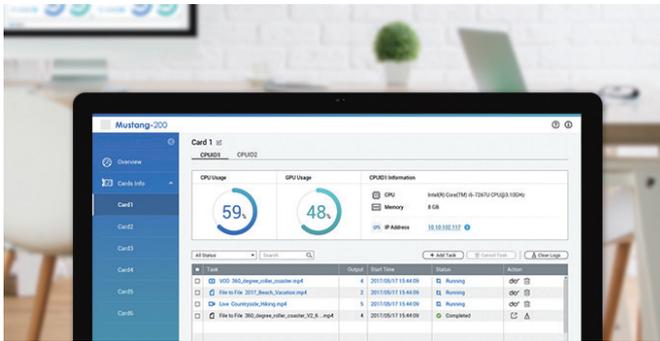
- IEI which has focused on Industrial PC for 20 years provides stable and durable H/W platform.
- QNAP QTS-Lite which supports virtualization technology, information security and data protection is a flexible, secure and friendly S/W platform.
- Mustang-200 combines IEI H/W and QNAP S/W as a perfect platform for you to integrate your software application into a solution



www.ieiworld.com

➤ Distribute tasks among units of Mustang-200

With Mustang-200, every additional CPU works independently, so you can assign tasks to any nodes of your choice, and have real-time control of every node works.



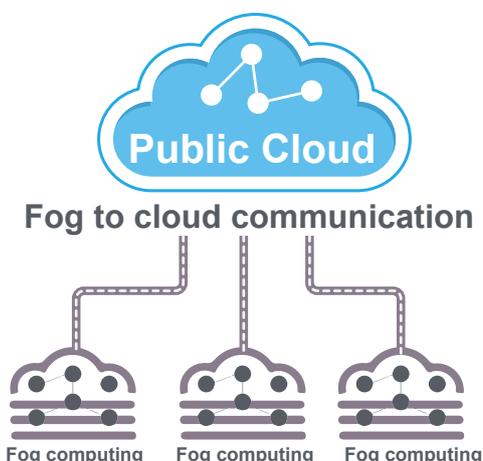
➤ Scalable infrastructure to suit your needs

The Mustang-200 needs no proprietary hardware and can be immediately installed into your existing system. If you need to perform additional calculations, you can always add additional Mustang-200 as they work independently from each other. The maximum amount of Mustang-200 is limited only by the number of available PCIe x4 slots in your system. This gives you enormous potential to expand your total computing capabilities.



➤ Perfect for fog computing

With robust computing capabilities and scalable characteristics, the Mustang-200 is perfectly suited for fog/edge computing. With fog/edge computing, you can pre-process data generated within your organization or across your devices on-premise, to filter out irrelevant information and only keep valuable insights, and then further utilize them by sending or uploading to cloud platforms. You can save a great deal of cloud platform and bandwidth fees as your data to be analyzed is filtered and only relevant data will be further dealt with.



► Software of the Mustang-200

The integrated QTS-Lite operating system supports various virtualization technologies such as containers and virtual machines, so you can convert your physical system into a virtual one (P2V) and assign it to one of the nodes on the Mustang-200. Performance can be instantly boosted without interruption or additional physical space requirements.

No matter what kind of software you use, it can be hosted inside the Mustang-200, allowing you to do more and achieve more in performance-critical applications such as artificial intelligence, academic research, and simulations.



► QTS Lite Features

- Real-time computing
- Batch computing
- Parallel processing
- Automatic load balancing in each computing node
- Combine multiple cards as cluster via QTS Lite
Assign each node to compute at the same time
- Control and manage QTS Lite via APIs

► 3 ways to drive Mustang-200 Accelerator

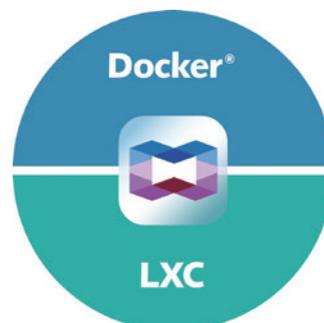
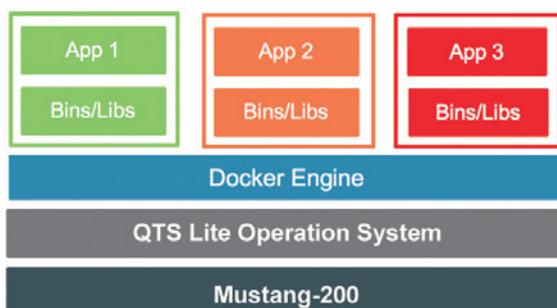


Container Station Design your owned Container Applications

QNAP Container Station exclusively integrates LXC (Linux Container) and Docker® lightweight virtualization technologies, allowing you to operate multiple isolated Linux® systems on a QNAP NAS as well as download thousands of apps from all over the world.

Container Station extended the JeOS (Just enough OS) concept and uses lightweight virtualization technology to allow developers and IT administrators to easily and freely switch between Mustang-200 and cloud.

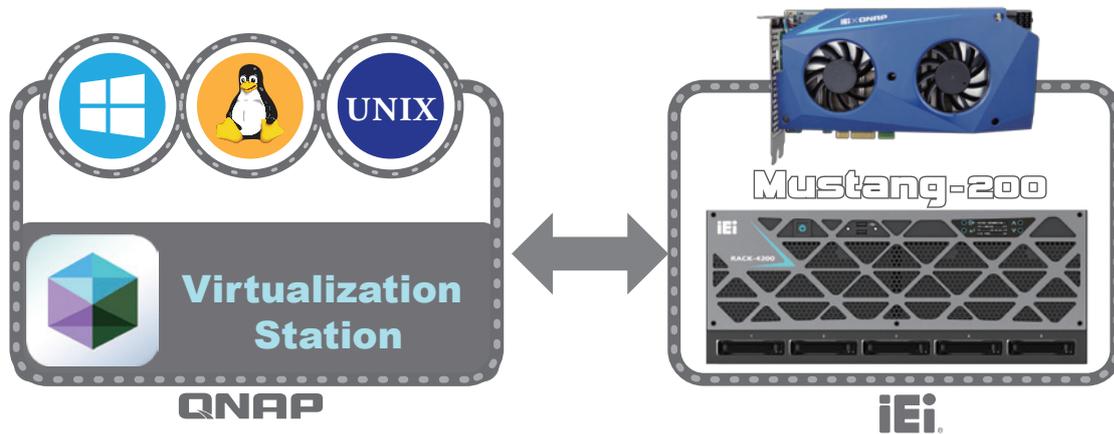
- Micro services, quick deployment
- Best partner for IoT maintenance and operation
- A growing number of popular Apps





Virtualization Station Running your existing S/W application

QNAP's Virtualization Station is a full virtualization solution for x86-based IEI x QNAP Mustang-200 with virtualization extensions that allows you to operate and manage multiple virtual machines (VM) on Mustang-200. Virtualization Station adds incredible versatility to your Mustang-200, so that you can build up a really high density computing environment by creating virtual machines (VM) and run the programs or the services that you already have on several PCs



Mustang-200 App (QPKG) Development

Use the following approaches to design applications:

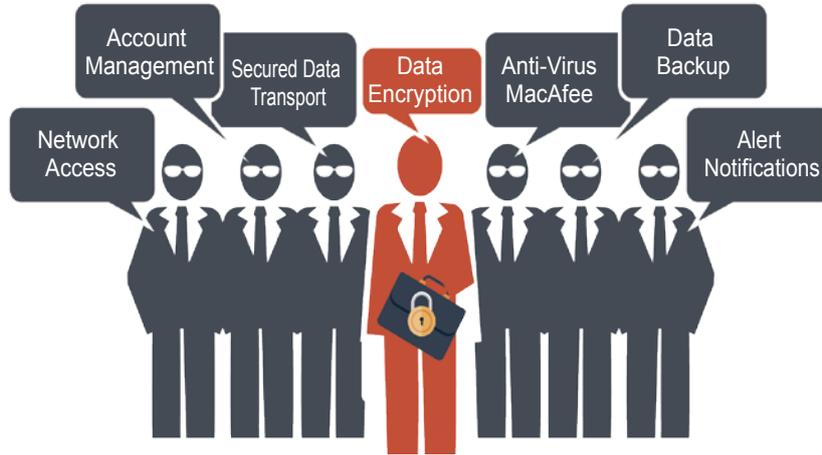
1. QTS-Lite App (QPKG) development platform allows developers to design s/w applications running on Mustang-200.
2. Development Toolkit (API & SDK): Developers can design smart phone or PC applications that can remotely manage and access files and s/w applications on Mustang-200.

The development platform is designed for use by professional software developers, network and system integrators, and independent software developers to construct complete hardware and software integration platforms and develop applications. We welcome all passionate professionals to join our development team and help create a win-win future for IEI x QNAP and you.

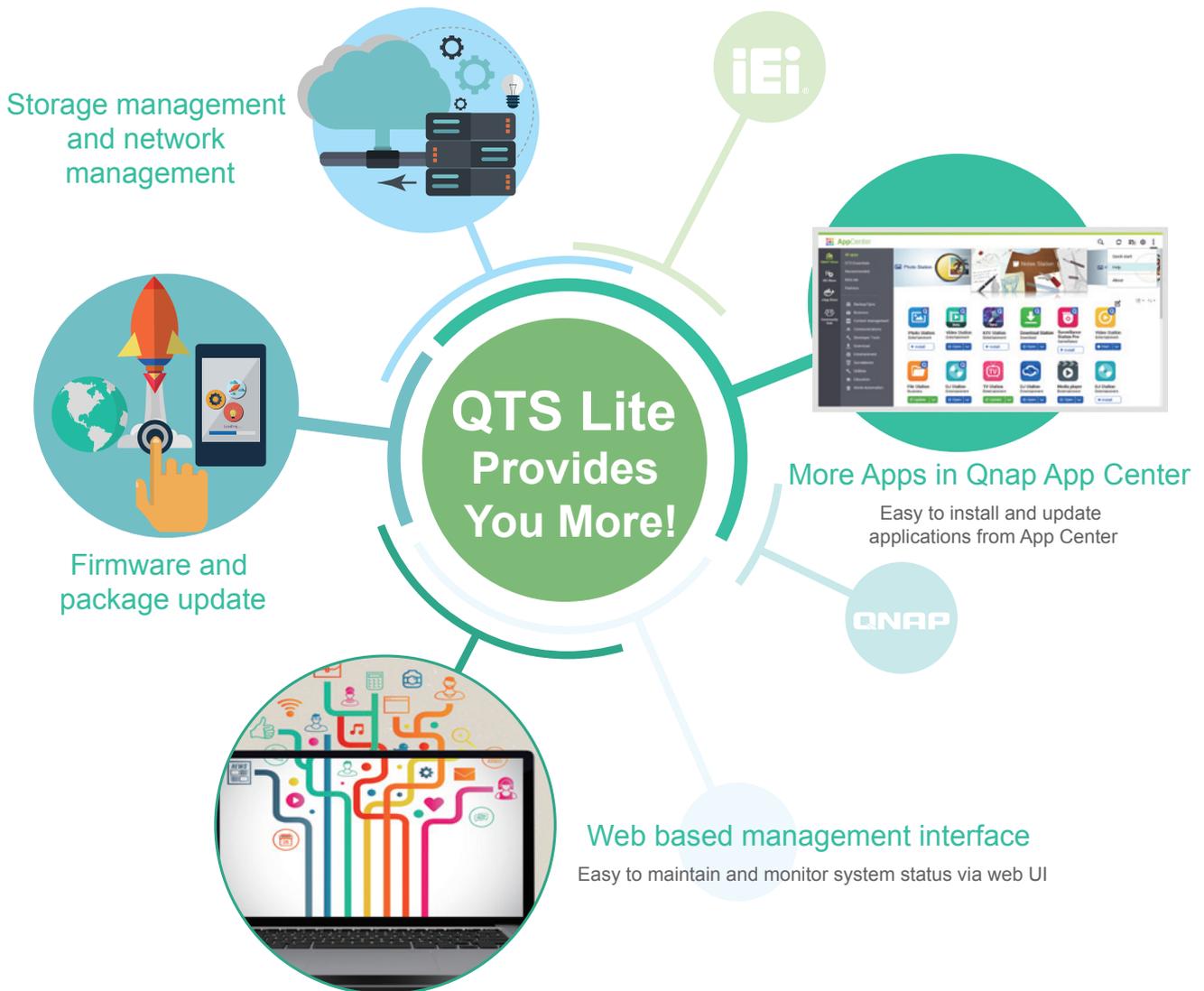


7 bodyguards to ensure information security

QTS-Lite provides 7 bodyguards to ensure information security and data protection, so that your effort and time on application development can be saved to focus on S/W development.



QTS Lite provides you MORE !!





Mustang-200 Video Transcoding (MVT) Overview

Video Processing and Graphic Rendering Made Easy



Video transcoding and streaming are also ideal applications of the Mustang-200. The powerful processors of the Mustang-200 can easily process high-definition 360° surround videos. The networked structure of the Mustang-200 is also perfectly applicable for render farms where a lot of parallel computing resources are needed. The Mustang-200 can help creative professionals streamline their workflows and accelerate their processes.

➔ Transcoding with GPU Accelerated Computing

- Mustang-200 uses a graphics processing unit (GPU) together with a CPU to accelerate media transcoding, AI (VR & deep learning), big data analytics, and other engineering applications.
- As an add-on card, Mustang-200 offers quick and scalable integration with existing and standard server architectures to meet demands of video streaming platform providers
- Mustang-200 offers full hardware transcoding (encoding & decoding)

Card	GPU1 Usage	GPU2 Usage	GPU3 Usage	GPU4 Usage
Card 1	59%	43%	76%	51%
Card 2	36%	52%	48%	64%
Card 3				

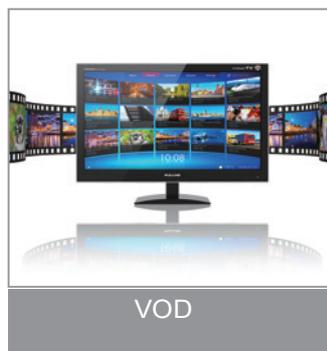
➔ Transcoding Applications



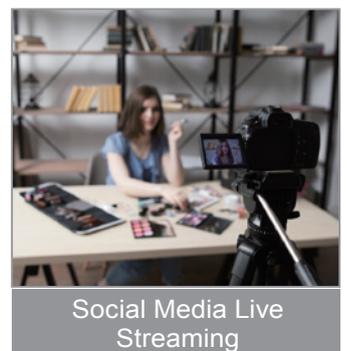
Online Course



Conference/ Seminar



VOD



Social Media Live Streaming

▶ Mustang-200 Video Transcoding (MVT) Key functions

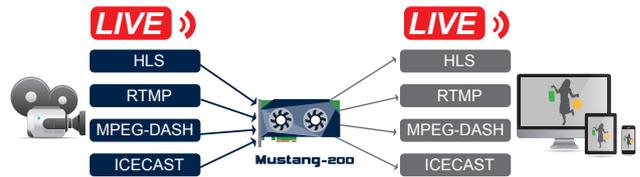
▶ Live to Live Transcoding

Mustang-200 can transcode live streams into different resolutions for different clients.



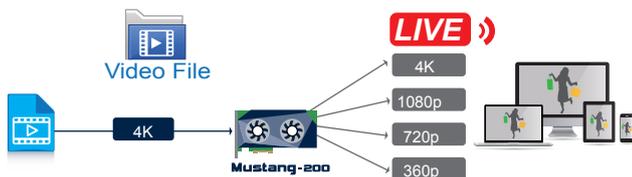
▶ Live to Live Transcoding

Mustang-200 supports several types of live streaming, For example, HLS, RTMP, MPEG-DASH and ICE CAST.



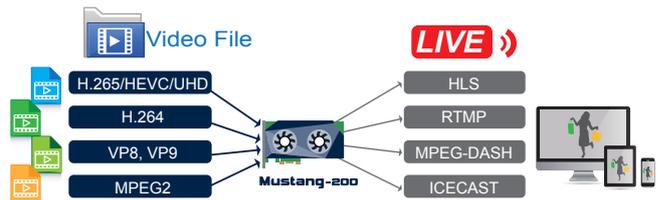
▶ File to Live Transcoding (VOD)

Mustang-200 can stream files by different resolutions for different clients.



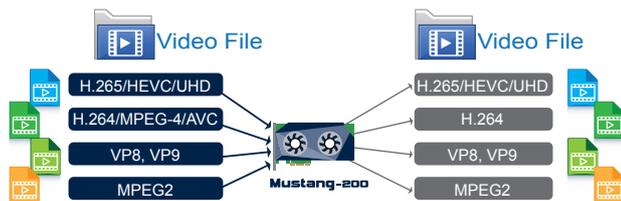
▶ File to File Transcoding (VOD)

Mustang-200 supports several types of video file formats, and it can transcode them into different kinds of live streaming formats, such as HLS, RTMP, MPEG-DASH and ICE CAST.



▶ File to File Transcoding

Mustang-200 supports several types of live streaming, including H.264, H.265/HEVC /UHD, VP8, VP9 and MPEC2.



▶ Transcoding Host API Support

- **VOD API**
VOD includes file to live streaming APIs.
- **LIVE API**
Live includes live to live streaming APIs. Live input supports RTMP streaming only; VP9 does not support RTMP but supports RTSP.
- **File API**
File includes file to file transcoding APIs.
- **Card Info API**
Basic card information APIs
(Card Info Attributes CPU Info Attributes)
- **CPU/GPU Monitor API**
CPU and GPU Monitoring APIs
(CPU/GPU Attributes & Usage Attributes)

▶ Transcoding Specifications

Video File	H.264/MPEG-4/AVC H.265/HEVC /UHD/4K VP8 VP9 MPEG2
Audio File	AAC MP3 Vorbis Copy Disable
Streaming Format	RTMP HLS MPEG-DASH ICECAST

Resolution	3840 x 2160 2560 x 1440 1920 x 1080 1280 x 720 858 x 480 640 x 360 426 x 249
Video Bit Rate	1 Mbps ~25 Mbps
Frame Rate	24 fps ~ 60 fps
QP Value	1 ~ 50



➔ Transcoding Performance

Video Source	Video Output	Resolution	Channel Number per Node	Channel Number per Mustang-200
HEVC 4K	H.264 4K	3840x2160	3	6
HEVC 4K	H.264 2K	2560x1440	5	10
HEVC 4K	H.264 1080P	1920x1080	8	16
HEVC 1080p	H.264 1080p	1920x1080	10	20

Video Source	Video Output	Resolution	Channel Number per Node	Channel Number per Mustang-200
H.264 4K	H.264 4K	3840x2160	3	6
H.264 4K	H.264 2K	2560x1440	5	10
H.264 4K	H.264 1080P	1920x1080	6	12
H.264 1080p	H.264 1080p	1920x1080	12	24

Mustang-200



Hardware Features

- Dual 10Gbps network based x86 computing accelerator
- Decentralized computing architecture for independent tasks
- PCI Express x4 delivers scalable and flexible solution
- Two Intel® Core™ i7-7567U/i5-7267U/Celeron® 3865U processors, up to 4.00 GHz
- Support high-end graphics engine - Intel® Iris™ Plus Graphics 650
- Pre-installed 32 GB DDR4 (max. 64 GB) and 1 TB NVMe (max. 2 TB)

Specifications

Main Chipset	Two (2) Intel Kabylake ULT CPU
	Intel® Core™ i7-7567U (28 W) (4M Cache, up to 4.00 GHz)
	Intel® Core™ i5-7267U (28 W) (4M Cache, up to 3.50 GHz)
	Intel® Celeron® 3865U (15W) (2M Cache, 1.80 GHz)
Processor Graphics	Intel® Core™ i7-7567U & i5-7267U support Iris™ Plus Graphics 650 (GT3e) <ul style="list-style-type: none"> •Graphics base frequency 300 MHz •Graphics max dynamic frequency: 1.05 GHz •Embedded graphics DRAM per GPU: 64 MB
	Intel® Celeron® 3865U supports Intel® HD Graphics 610 <ul style="list-style-type: none"> •Graphics base frequency 300 MHz •Graphics max dynamic frequency: 900 MHz
	H.264, H.265/HEVC
	MPEG2, MJPEG
Hardware Video Decode	VC-1
	VP8(8 bit)/VP9(10 bit)
	H.264, H.265/HEVC
Hardware Video Encode	MPEG2, MJPEG
	VC-1
	VP8 (8-bit)

Display Output	2 x Micro HDMI for debugging
USB 2.0	4 x USB 2.0 (pin header) for debugging
Memory	(2 SO-DIMMs per CPU)
	4 x DDR4 8GB SO-DIMM (Core™ i7/i5 SKU) 4 x DDR4 2GB SO-DIMM (Celeron® 3865U SKU)
Storage	2 x Intel® SSD 600P series (Core™ i7/i5 SKU only) (512GB M.2 80mm PCIe 3.0 x4, 3D1, TLC)
Dataplane Interface	PCI Express x4
	Compliant with PCI Express Specification V2.0
	Compatible with PCI Express x4, x8, and x16 slots
External Interfaces	Reset button
	Power button
Indicator	Seven segment (indicate card number and debug code)
Power Input	12V PCIe 6-pin power input
Power Consumption	12V@7.41A (Intel® Core™ i7-7567U SKU)
Operating Temperature	0°C~40°C
Fan	Dual fan
Dimensions (DxWxH)	40mm x 210mm x 111mm
Operating Humidity	10% ~ 90%

Packing List

1 x Mustang-200
1 x QIG
1 x 4-pin to PCIe power cable

Ordering Information

Part No.	Description
Mustang-200-i7-1T/32G-R10	Computing Accelerator Card supports Two Intel® Core™ i7-7567U with Intel® 600P 1TB (512GB x2) SSD, 32GB (8GB x4) DDR4, PCIe x4 interface, QTS-Lite, and RoHS
Mustang-200-i5-1T/32G-R10	Computing Accelerator Card supports Two Intel® Core™ i7-7267U with Intel® 600P 1TB (512GB x2) SSD, 32GB (8GB x4) DDR4, PCIe x4 interface, QTS-Lite, and RoHS
Mustang-200-C-8G-R10	Computing Accelerator Card supports Two Intel® Celeron® 3865U with 8GB (2GB x4) DDR4, PCIe x4 interface, QTS-Lite, and RoHS (without NVMe storage)
19B00-000396-00-RS	Mustang-200 dual-port USB cable

RACK-4200G-M-R10



Features

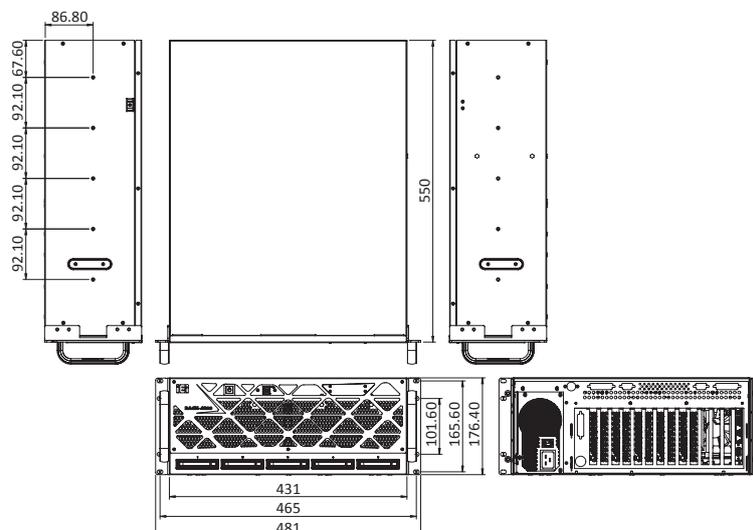
- Support PICMG 1.3 SBC and Mustang-200
- Support six PCIe x4 (physical PCIe x16)
- One 2.5" cabled drive bay; five 2.5" hot-plugging drive bay
- 1000W PSU

Specifications

Color	Black
SBC Form Factor	SPCIE-C236-R10
Backplane	SPCIE-11S1-R10
PSU	ACE-A210A-R10 (1000W)
Drive Bays	1 x 2.5" internal drive bay 5 x 2.5" external Hot-Plug drive bay
I/O	2 x USB 2.0 (front IO)
Expansion Slots	6 x PCIe x4 (physical PCIe x16)
Front Panel	2 x USB 2.0
Indicators	1. Power 2. OLED indicators
Buttons	Power switch
System Fan	4 x System fan
Construction	Heavy duty metal
Dimensions (DxWxH)	551mm x 431mm x 176 mm
Operating Temperature	0°C~40°C (SPCIE-C236-R10 & 6 x MUSTANG-200)
Operating Humidity	10% ~ 90%

Ordering Information

Part No.	Description
RACK-4200G-M-R10	4U 14-slot rackmount system for six Mustang-200, RoHS



Dimensions (mm)