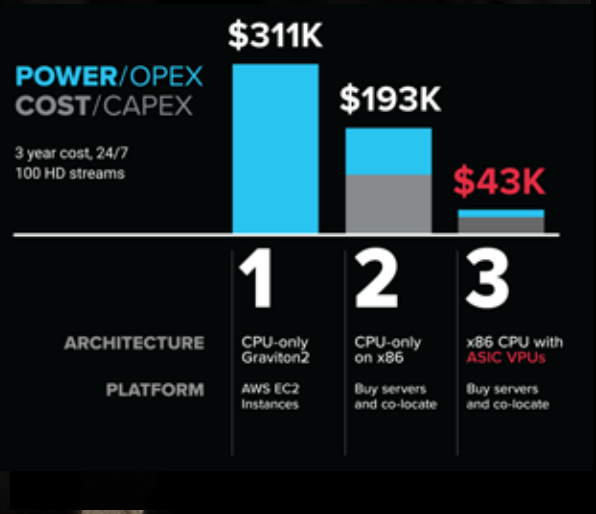
NETINT

Cut streaming OPEX by 80% with ASICs

Google and Meta did.



All VPU Products

	1st Generation VPU			2nd Generation Smart VPUs			
	Modules		Server	Server	Modules		
	ASIC VPU **T408**	ASIC VPU **T432**	G4 VPU **Logan**	G5 VPU **Quadra**	QUADRA VPU **T1U**	QUADRA VPU **T1A**	QUADRA VPU **T2A**
Performance							
ASIC Codensity chip	G4	G4 (4x)	G4, T408s (10x)	G5, T1Us (10x)	G5	G5	G5 (2x)
Price	$300	$1,200	starting at $7,000	starting at $19,000	$1,500	$1,500	$2,750
Form Factor	U.2	AIC, HHHL	1RU Server	1RU Server	U.2	AIC, HHHL	AIC, HHHL
Power Consumption	7W	27W	~400W	~500W	17W	20W	40W
Real-time Throughput Up to:	8x 1080p30 2x 4Kp30	32x 1080p30 8x 4Kp30	80x 1080p30 20x 4Kp30	320x 1080p30 80x 4Kp30 20x 8Kp30	32x 1080p30 8x 4Kp30 2x 8Kp30	32x 1080p30 8x 4Kp30 2x 8Kp30	64x 1080p30 16x 4Kp30 4x 8Kp30
Latency	12.8 ms	12.8 ms	12.8 ms	8 ms	8 ms	8 ms	8 ms
Encode Codecs	H.264, HEVC, YUV			H.264, HEVC, JPEG, YUV, AV1			
Decode Codecs	H.264, HEVC, YUV			H.264, HEVC, JPEG, YUV, VP9			
Audio Codecs	n/a			MP3, AAC-LC, HE-AAC			
Features							
Artificial Intelligence	n/a	n/a	n/a	150 TOPS	15 TOPS	18 TOPS	36 TOPS
New Capped CRF	●	●	●	●	●	●	●
Flexible GOP	●	●	●	●	●	●	●
Scaling	○	○	○	●	●	●	●
Cropping and Padding	○	○	○	●	●	●	●
Video Overlay	○	○	○	●	●	●	●
YUV / RGB Conversion	○	○	○	●	●	●	●
Configurable tuning of quality/throughput	n/a	n/a	n/a	●	●	●	●

● Feature supported on VPU ○ Feature runs on host CPU

NETINT

ASIC VPUs are the only way to build a profitable cloud gaming platform

NETINT

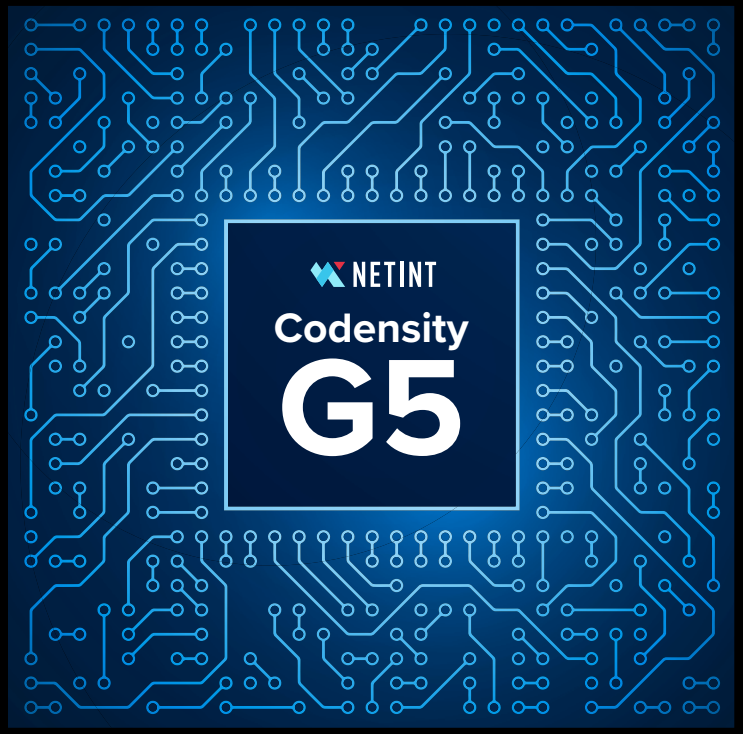
HYPERSCALE PROFITABLY

Why ASICs are needed.

Density is a dirty expensive problem

Global corporations spend 20% of their annual OPEX powering data centers.

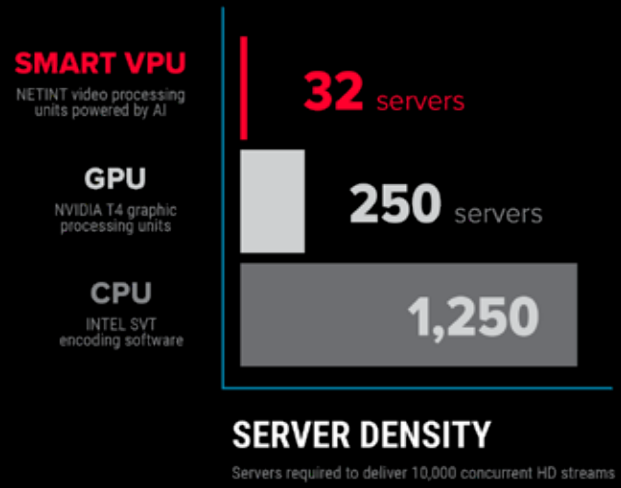
NETINT



We designed an ASIC to slash the encoding footprint up to 80%

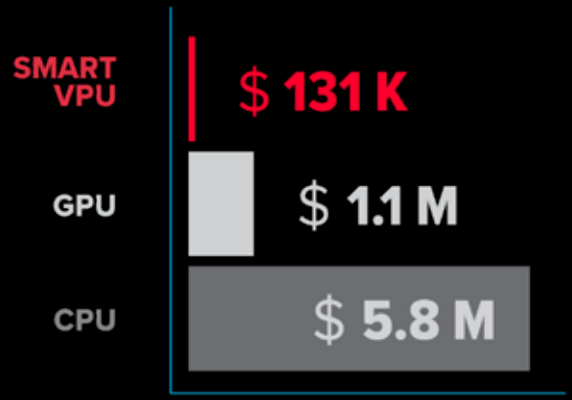
VPUs solve these problems:

1. Increase density / capacity
2. Reduce costs / consumption
3. AI power your workflow



SERVER DENSITY

Servers required to deliver 10,000 concurrent HD streams



ANNUAL OPERATING COST

Cost running servers required to deliver 10,000 concurrent HD stream

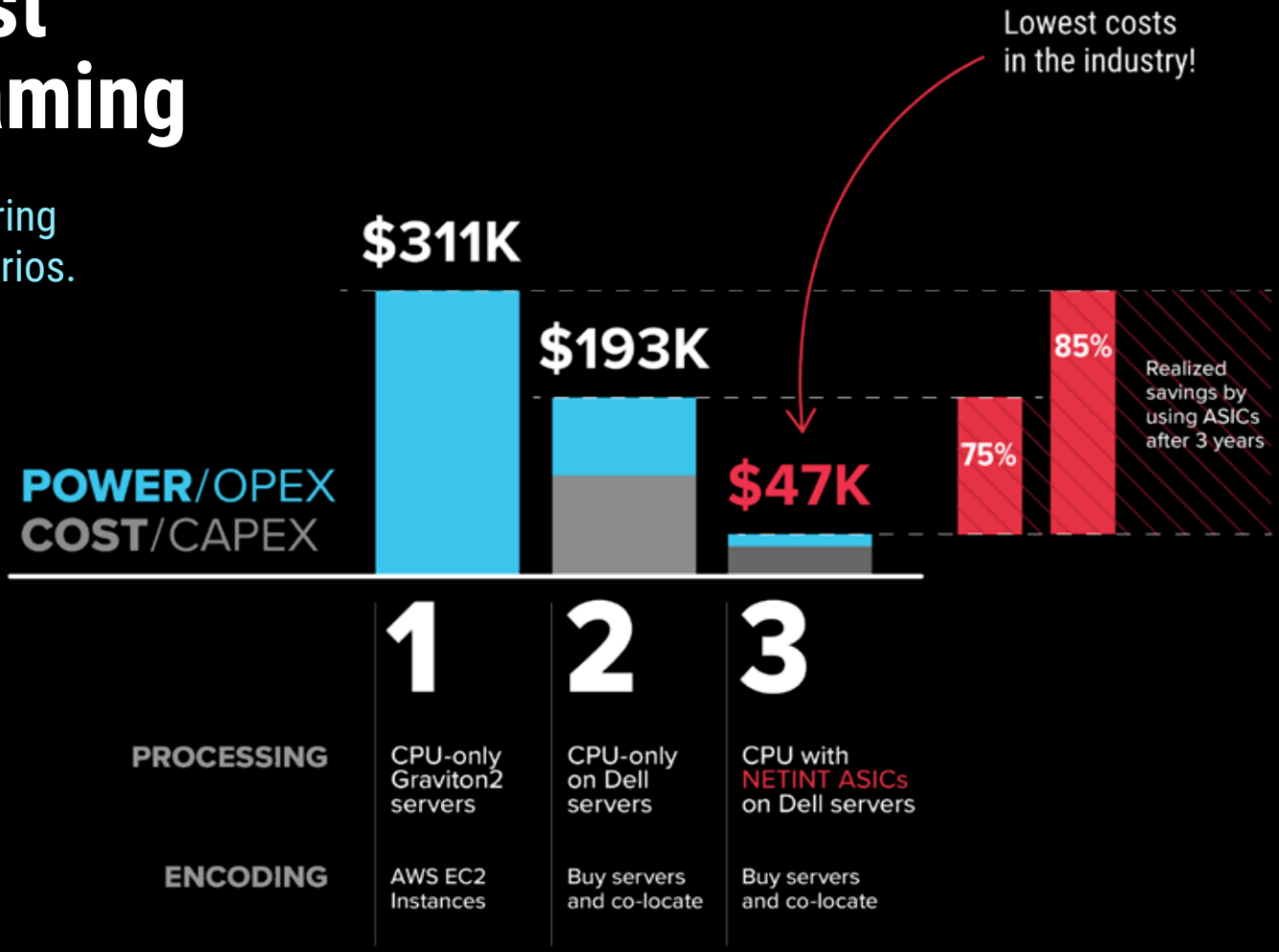
This is why Google built a custom chip for YouTube

For everyone else who isn't Google, we did the heavy lifting for you.

We developed commercial-ready Smart VPU cards for easy drop-in replacement and immediate deployment.

The real cost of live streaming

CAPEX and OPEX comparing
3 video processing scenarios.



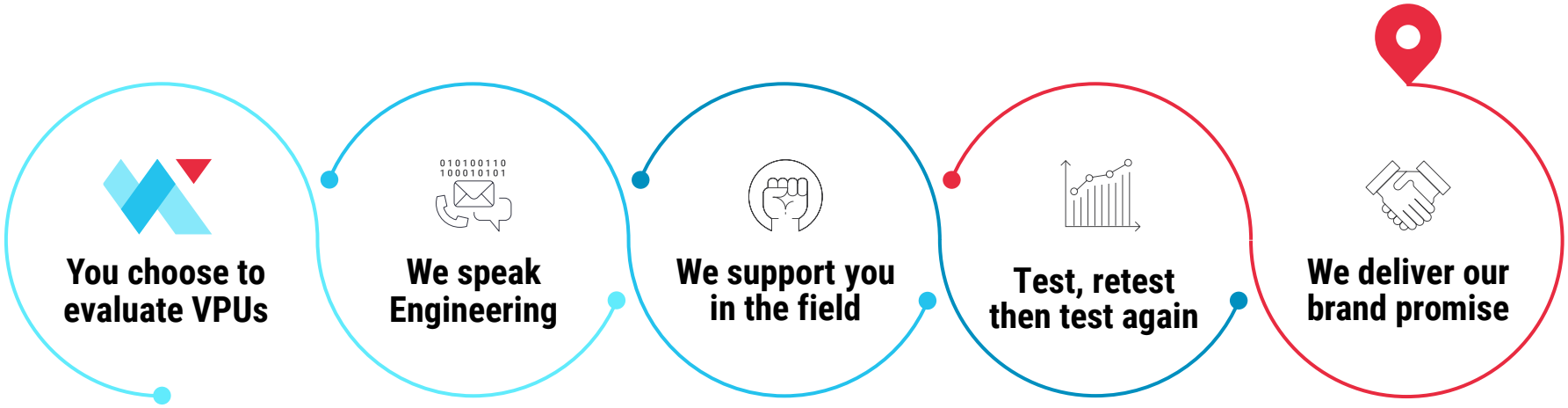
Test assumptions:

- Servers run 100 concurrent five-rung encoding ladders
- x264 very fast preset used for CPU-only processing

Your Buying Journey

What to expect when evaluating NETINT

We know the typical sales cycle prospective buyers endure is a 12-18 month process and we're prepared to stand beside you and navigate you through. We're demonstrating our committment to supporting you by heavily investing in this process so you can realize the value in our product and in working with us.



You chose wisely with Smart VPUs.

We speak your technical language and meet you where you are.

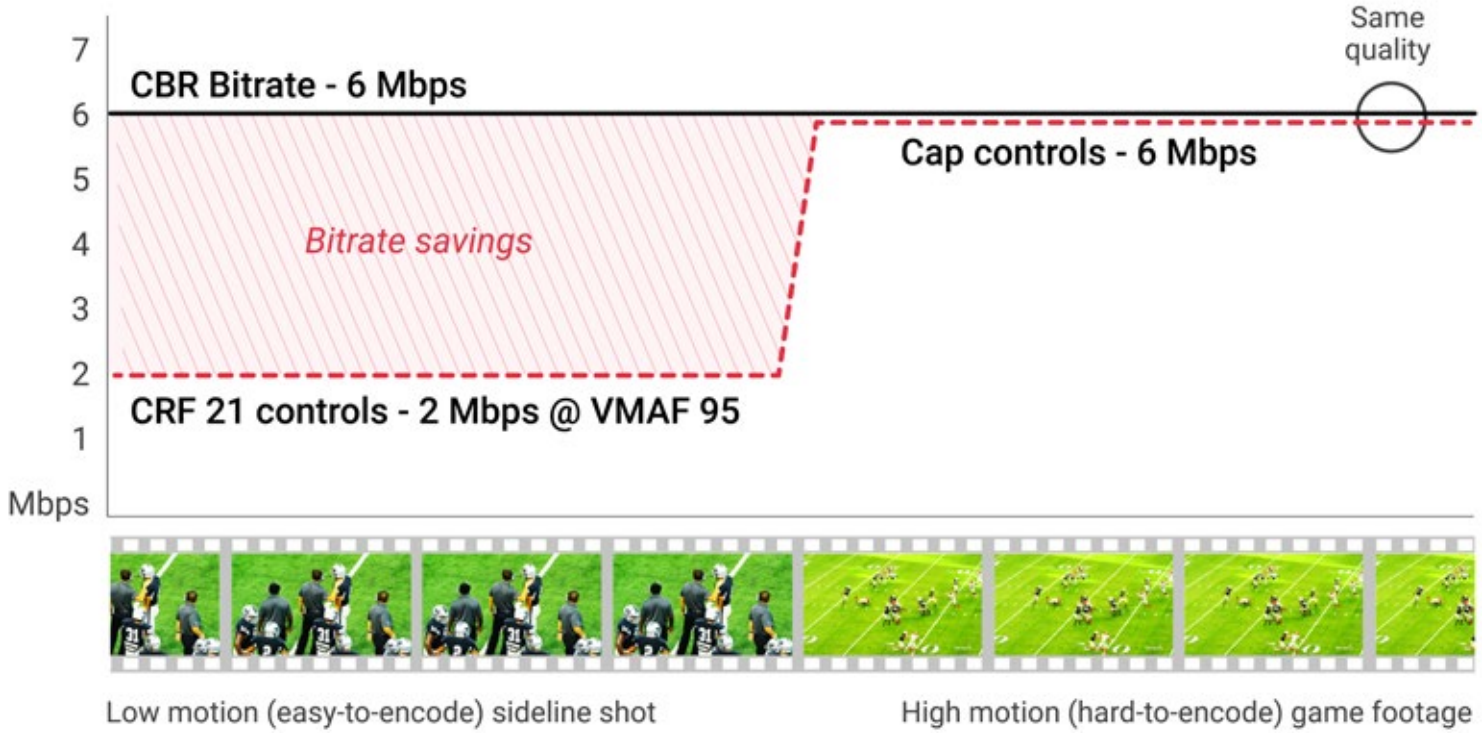
Our Field Engineers have boots in the trenches and exist solely for you.

Testing cycles require long term support, know we're committed to your successful implementation.

We promise your company will Hyperscale Profitably with Smart VPUs.

Advanced Encoder Feature: Capped CRF

CRF 21 with a Cap of 6 Mbps versus 6 Mbps CBR



VPU Product Specifications

NETINT

All VPU Products

	1st Generation VPU			2nd Generation Smart VPUs			
	Modules		Server	Server	Modules		
	ASIC VPU **T408**	ASIC VPU **T432**	G4 VPU **Logan**	G5 VPU **Quadra**	QUADRA VPU **T1U**	QUADRA VPU **T1A**	QUADRA VPU **T2A**
Performance							
ASIC Codensity chip	G4	G4 (4x)	G4, T408s (10x)	G5, T1Us (10x)	G5	G5	G5 (2x)
Price	$300	$1,200	starting at $7,000	starting at $19,000	$1,500	$1,500	$2,750
Form Factor	U.2	AIC, HHHL	1RU Server	1RU Server	U.2	AIC, HHHL	AIC, HHHL
Power Consumption	7W	27W	~400W	~500W	17W	20W	40W
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Encode Codecs	H.264, HEVC, YUV			H.264, HEVC, JPEG, YUV, AV1			
Decode Codecs	H.264, HEVC, YUV			H.264, HEVC, JPEG, YUV, VP9			
Audio Codecs	n/a			MP3, AAC-LC, HE-AAC			
Features							
Artificial Intelligence	n/a	n/a	n/a	150 TOPS	15 TOPS	18 TOPS	36 TOPS
New Capped CRF	●	●	●	●	●	●	●
Flexible GOP	●	●	●	●	●	●	●
Scaling	○	○	○	●	●	●	●
Cropping and Padding	○	○	○	●	●	●	●
Video Overlay	○	○	○	●	●	●	●
YUV / RGB Conversion	○	○	○	●	●	●	●
Configurable tuning of quality/throughput	n/a	n/a	n/a	●	●	●	●

● Feature supported on VPU ○ Feature runs on host CPU

NETINT

T408
VPU

Codensity ASIC G4

Form Factor	U.2 (SFF-8639)
Interface	PCIe 3.0 x4
Protocol	NVMe
Power Consumption (Typ)	7W
Usage	24/7 Operation
Operation Temperature	0 - 70°C
RoHS Compliance	Meets requirements of European Union (EU) ROHS Compliance Directives
Product Health Monitoring	Self-Monitoring, Analysis, and Reporting Technology (SMART) commands Temperature Monitoring & Logging
Video Encoding Standards/Formats	H.264 AVC, CBP / BP / XP / MP / HiP / HiP10 H.265 HEVC, Main / Main 10
Video Decoding Standards/Formats	H.264 AVC, CBP / BP / XP / MP / HiP / Hi10P H.265 HEVC, Main / Main 10
Throughput Capacity	1x 4Kp60 or 4x 1080p60
Level	1 to 6.2 Main Tier
Min / Max Resolution	32 x 32 to 8192 x 5120
Scan Type	Progressive
Bitrate	64kbit/s to 700Mbit/s
Software Integration	FFmpeg and GStreamer SDKs and direct integration with LibXcoder API
Region of Interest (ROI)	ROI enables the quality of some regions to be improved at the expense of other regions
Closed Captioning	EIA CEA-708 for H.264 and H.265 encode/decode
High Dynamic Range (HDR)	HDR10 & HDR10+ for H.264 & H.265 encode/decode
Low Latency	Sub-frame latency
IDR Insert	Forced IDR frame inserts at any location
Flexible GOP Structure	8 presets plus customizable GOP structure

T432
VPU

Codensity ASIC G4

Form Factor	AIC (HHHL)
Interface	PCIe 3.0 x16 bifurcated to 4x4
Protocol	NVMe
Power Consumption (Typ)	27W
Usage	24/7 Operation
Operation Temperature	0 - 70°C
RoHS Compliance	Meets requirements of European Union (EU) ROHS Compliance Directives
Product Health Monitoring	Self-Monitoring, Analysis, and Reporting Technology (SMART) commands Temperature Monitoring & Logging

Video Encoding Standards/Formats	H.264 AVC, CBP / BP / XP / MP / HiP / HiP10 H.265 HEVC, Main / Main 10
Video Decoding Standards/Formats	H.264 AVC, CBP / BP / XP / MP / HiP / Hi10P H.265 HEVC, Main / Main 10
Throughput Capacity	4x 4Kp60 or 16x 1080p60
Level	1 to 6.2 Main Tier
Min / Max Resolution	32 x 32 to 8192 x 5120
Scan Type	Progressive
Bitrate	64kbit/s to 700Mbit/s
Software Integration	FFmpeg and GStreamer SDKs and direct integration with LibXcoder API

Region of Interest (ROI)	ROI enables the quality of some regions to be improved at the expense of other regions
Closed Captioning	EIA CEA-708 for H.264 and H.265 encode/decode
High Dynamic Range (HDR)	HDR10 & HDR10+ for H.264 & H.265 encode/decode
Low Latency	Sub-frame latency
IDR Insert	Forced IDR frame inserts at any location
Flexible GOP Structure	8 presets plus customizable GOP structure

Logan
Video Server

VPU | Codensity ASIC G4

CPU Options	AMD EPYC™ 7232P Server Processor (8-core)
	AMD EPYC 7543P Server Processor (32-core)
	AMD EPYC 7713P Server Processor (64-core)
Operating System	Ubuntu 20.04.05 LTS (as of May 2023)
Memory	8x 16GB DDR4-3200
Storage	400GB M.2 SSD
NVMe Support	10x
PCIe Expansion	Up to 3x PCIe slots
Network Options	Dual 10GBase-T LAN
Power Supply	700W: 100 - 140Vac
	750W: 200 - 240Vac
	750W: 200 - 240Vdc (CCC only)
Transcoders	10x NETINT T408
Encoding Capacity	Up to 10x 4Kp60 or 80x 1080p30 (HEVC and H.264)
Codec Support	H.264 - Encode/Decode
	HEVC - Encode/Decode
Transcoder Software	FFmpeg, GStreamer

Physical Dimensions	W: 17.2” (437mm), H: 1.7” (43mm), D: 23.5” (597mm)
Rack Size	1U
Weight	39 lbs (17.69 kg) *(includes 10 processors)*
Environmental	50 degrees F to 95 degrees F Operating Temperature, 8% to 90% Operating Relative Humidity
Power Inputs	100 - 140Vac / 8 - 6V / 50-60Hz
	200 - 240Vac / 4.5 - 3.8A / 50-60Hz
	200 - 240Vdc / 4.5 - 3.8A (CCC Only)
Certifications	RoHS Compliant, UL Approved

Quadra T1U
Smart VPU

Codensity Quadra G5

Form Factor	U.2
ASIC	1x Codensity G5
Interface	PCIe 4.0 x4
Protocol	NVMe
Power Consumption (Typ)	17W
Usage	24/7 Operation
Operation Temperature	0 - 50°C
RoHS Compliance	European Union (EU) ROHS Compliance Directives
Product Health Monitoring	Self-Monitoring, Analysis, and Reporting Technology (SMART) commands Temperature Monitoring & Logging
Video Encoding Standards/Formats	AVC/H.264 Baseline, Main, High, High 10 HEVC/H.264 Main, Main 10 AV1 Main JPG YUV 420 8 bit/10 bit encoding
Video Decoding Standards/Formats	AVC/H.264 Baseline, Main, High, High 10 HEVC/H.265 Main, Main 10 VP9 Profile 0, 2 JPEG YUV 420 8 bit/10 bit decoding
Throughput Capacity	Up to 16x 1080p60, 4x 4Kp60, 1x 8Kp60
Audio Standards/Formats	MP3, AAC-LC, HE-AAC
Level	1 to 6.2 Main Tier
Resolution	32 x 32 to 8192 x 5120
Scan Type	Progressive
Bitrate	64kbit/s to 700Mbit/s
Software Integration	FFmpeg SDKs, LibXcoder API integration
AI Deep Neural Network Engine	15 TOPS AI Assisted Encoding
Region of Interest (ROI)	ROI enables the quality of some regions to be improved at the expense of other regions
Closed Captioning	EIA CEA-708 for H.264 and HEVC encode/decode
High Dynamic Range (HDR)	HDR10, HDR10+, HLG for H.264 & HEVC encode/decode
Low Latency	Sub-frame latency
IDR Insert	Forced IDR frame inserts at any location
Flexible GOP Structure	8 presets plus customizable GOP structure
Video 2D Processing Engine	Crop & Padding/Scaling/Overlay/YUV & RGB Conversion

Quadra T1A
Smart VPU

Codensity Quadra G5

Form Factor	AIC (HH HL)
ASIC	1x Codensity G5
Interface	PCIe 4.0 x4
Protocol	NVMe
Power Consumption (Typ)	20W
Usage	24/7 Operation
Operation Temperature	0 - 50°C
RoHS Compliance	European Union (EU) ROHS Compliance Directives
Product Health Monitoring	Self-Monitoring, Analysis, and Reporting Technology (SMART) commands Temperature Monitoring & Logging
Video Encoding Standards/Formats	AVC/H.264 Baseline, Main, High, High 10 HEVC/H.264 Main, Main 10 AV1 Main JPG YUV 420 8 bit/10 bit encoding
Video Decoding Standards/Formats	AVC/H.264 Baseline, Main, High, High 10 HEVC/H.265 Main, Main 10 VP9 Profile 0, 2 JPEG YUV 420 8 bit/10 bit decoding
Throughput Capacity	Up to 16x 1080p60, 4x 4Kp60, 1x 8Kp60
Audio Standards/Formats	MP3, AAC-LC, HE-AAC
Level	1 to 6.2 Main Tier
Resolution	32 x 32 to 8192 x 5120
Scan Type	Progressive
Bitrate	64kbit/s to 700Mbit/s
Software Integration	FFmpeg SDKs, LibXcoder API integration
AI Deep Neural Network Engine	18 TOPS AI Assisted Encoding
Region of Interest (ROI)	ROI enables the quality of some regions to be improved at the expense of other regions
Closed Captioning	EIA CEA-708 for H.264 and HEVC encode/decode
High Dynamic Range (HDR)	HDR10, HDR10+, HLG for H.264 & HEVC encode/decode
Low Latency	Sub-frame latency
IDR Insert	Forced IDR frame inserts at any location
Flexible GOP Structure	8 presets plus customizable GOP structure
Video 2D Processing Engine	Crop & Padding/Scaling/Overlay/YUV & RGB Conversion

Quadra T2A
Smart VPU

Codensity Quadra G5

Form Factor	AIC (HH HL)
ASIC	2x Codensity G5
Interface	PCIe 4.0 x4
Protocol	NVMe
Power Consumption (Typ)	40W
Usage	24/7 Operation
Operation Temperature	0 - 50°C
RoHS Compliance	European Union (EU) ROHS Compliance Directives
Product Health Monitoring	Self-Monitoring, Analysis, and Reporting Technology (SMART) commands Temperature Monitoring & Logging
Video Encoding Standards/Formats	AVC/H.264 Baseline, Main, High, High 10 HEVC/H.264 Main, Main 10 AV1 Main JPG YUV 420 8 bit/10 bit encoding
Video Decoding Standards/Formats	AVC/H.264 Baseline, Main, High, High 10 HEVC/H.265 Main, Main 10 VP9 Profile 0, 2 JPEG YUV 420 8 bit/10 bit decoding
Throughput Capacity	Up to 32x 1080p60, 8x 4Kp60, 2x 8Kp60
Audio Standards/Formats	MP3, AAC-LC, HE-AAC
Level	1 to 6.2 Main Tier
Resolution	32 x 32 to 8192 x 5120
Scan Type	Progressive
Bitrate	64kbit/s to 700Mbit/s
Software Integration	FFmpeg SDKs, LibXcoder API integration
AI Deep Neural Network Engine	36 TOPS AI Assisted Encoding
Region of Interest (ROI)	ROI enables the quality of some regions to be improved at the expense of other regions
Closed Captioning	EIA CEA-708 for H.264 and HEVC encode/decode
High Dynamic Range (HDR)	HDR10, HDR10+, HLG for H.264 & HEVC encode/decode
Low Latency	Sub-frame latency
IDR Insert	Forced IDR frame inserts at any location
Flexible GOP Structure	8 presets plus customizable GOP structure
Video 2D Processing Engine	Crop & Padding/Scaling/Overlay/YUV & RGB Conversion

Quadra
Video Server

Smart VPU | Codensity Quadra G5

CPU Options	AMD EPYC™ 7232P Server Processor (8-core)
	AMD EPYC 7543P Server Processor (32-core)
	AMD EPYC 7713P Server Processor (64-core)
Operating System	Ubuntu 20.04.05 LTS (as of May 2023)
Memory	8x 16GB DDR4-3200
Storage	400GB M.2 SSD
NVMe Support	10x
PCIe Expansion	Up to 3x PCIe slots
Network Options	Dual 10GBase-T LAN
Power Supply	700W: 100 - 140Vac
	750W: 200 - 240Vac
	750W: 200 - 240Vdc (CCC only)
Transcoders	10x NETINT Quadra T1U
Encoding Capacity	Up to 40 4Kp60 or 320 1080p30
Codec Support	H.264 - Encode/Decode
	HEVC - Encode/Decode
	VP9 - Decode
	AV1 - Encode
Transcoder Software	FFmpeg, GStreamer

Physical Dimensions	W: 17.2” (437mm), H: 1.7” (43mm), D: 23.5” (597mm)
Rack Size	1U
Weight	39 lbs (17.69 kg) *(includes 10 processors)*
Environmental	50 degrees F to 95 degrees F Operating Temperature, 8% to 90% Operating Relative Humidity
Power Inputs	100 - 140Vac / 8 - 6V / 50-60Hz
	200 - 240Vac / 4.5 - 3.8A / 50-60Hz
	200 - 240Vdc / 4.5 - 3.8A (CCC Only)
Certifications	RoHS Compliant, UL Approved

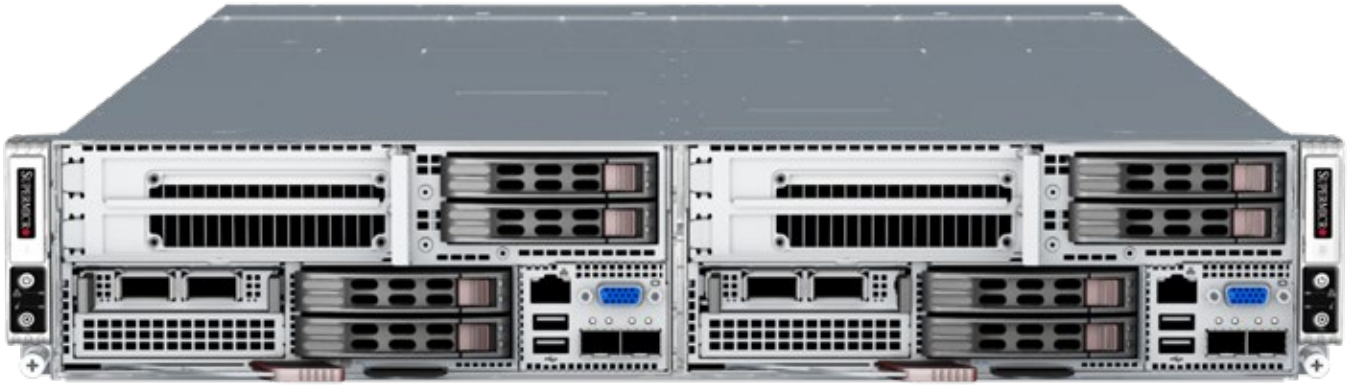
Reference Cloud Gaming Video Server

Smart VPU | Quadra T2A ASIC G5

Supermicro AS-2015CS-TNR server with 2 Quadra T2A Smart VPUs and 1 GPU

- **Up to 200x 720p30 cloud gaming sessions**
- **AV1 / HEVC / H.264 video encoding**
- **Up to 8K and 60fps**

Processor Support	Single AMD Genoa SP5 processors up to 360W (cTDP: 400W)
Memory Capacity	12x DIMM slots, DDR5-4800 memory
Expansion	4x PCIe 5.0 x16
	2x AIOM PCIe 5.0x16 slots (OCP 3.0 compliant)
Networking & I/O	1x COM port (rear), 2x USB 3.0 ports (2 rear), 1x VGA port
System Management	Built-in server management tool (IPMI 2.0, KVM/media over LAN) with dedicated LAN port, Root of Trust (ROT) ready
Drive Bays	12x hot-swap 3.5" SATA3 drives or 8 SATA3 + 4NVMe via optional cables
	2x M.2 NVMe 2280/22110 slots
System Cooling	3x heavy duty 8cm PWM fans
Power Supply	1200W 1+1 high-efficiency redundant (titanium level)
Dimensions	H: 3.5" x W: 17.2" x D: 25.5"



Logan
Video Server

VPU | Codensity ASIC G4

NETINT

Logan
Video Server

VPU | Codensity ASIC G4

Ultra-high density encoding capacity

Built on the Supermicro 1114S-WN10RT server platform, server contains ten T408 VPUs.

- **HEVC and H.264 video encoding**
- **Up to 4K resolution**
- **10-bit HDR**

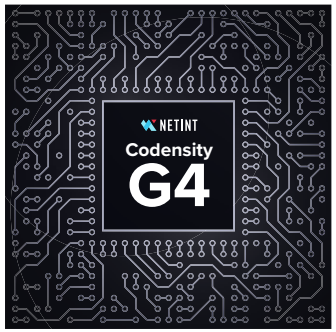
Codensity G4
ASIC

Application Specific Integrated Circuit

ASIC Video Transcoder

The Codensity G4 ASIC combines on-chip H.264 and HEVC video encoding, decoding, and processing engines which deliver scalability for video-intensive live streaming applications. The core of NETINT's Codensity technology is an in-house built ASIC that increases encoding density compared to CPU-based software encoding solutions.

This increase in encoding density expands the number of channels that can be encoded without increasing the rack footprint. Reduced power and HVAC cost means a lower TCO without sacrificing video quality or latency.



4K UHD Video Transcoding

On-chip H.264 and HEVC encoders and decoders deliver 4K live streaming scalability. Today, video is streamed using the ubiquitous H.264 standard while HEVC is a more complex codec. This limits the scalability of CPU and GPU-based encoders, which precipitously drop in throughput when encoding HEVC.

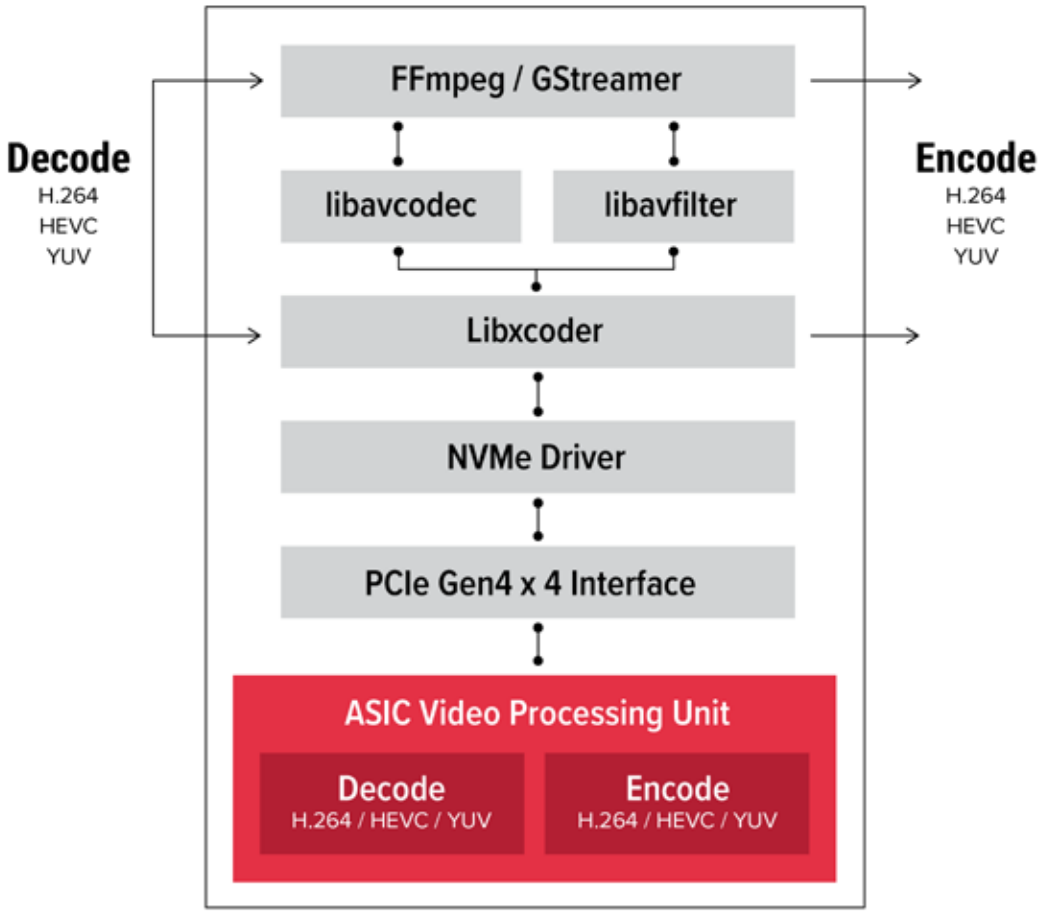
Not so for the Codensity G4 ASIC, which produces nearly identical throughput for both H.264 and HEVC. For both codecs, the Codensity G4 delivers the flexibility and quality of software with the performance of hardware for 4K live transcoding.

Flexible Architecture

The Codensity G4 is built on a programmable microprocessor architecture that optimizes firmware and pipeline processing and enables continual performance and quality improvements. This counters a criticism that silicon-based encoders lack upgrade flexibility.

Logan VPU Workflow

Open-source suite of processing tools.



T408
VPU

Codensity ASIC G4

Form Factor	U.2 (SFF-8639)
Interface	PCIe 3.0 x4
Protocol	NVMe
Power Consumption (Typ)	7W
Usage	24/7 Operation
Operation Temperature	0 - 70°C
RoHS Compliance	Meets requirements of European Union (EU) ROHS Compliance Directives
Product Health Monitoring	Self-Monitoring, Analysis, and Reporting Technology (SMART) commands Temperature Monitoring & Logging
Video Encoding Standards/Formats	H.264 AVC, CBP / BP / XP / MP / HiP / HiP10 H.265 HEVC, Main / Main 10
Video Decoding Standards/Formats	H.264 AVC, CBP / BP / XP / MP / HiP / Hi10P H.265 HEVC, Main / Main 10
Throughput Capacity	1x 4Kp60 or 4x 1080p60
Level	1 to 6.2 Main Tier
Min / Max Resolution	32 x 32 to 8192 x 5120
Scan Type	Progressive
Bitrate	64kbit/s to 700Mbit/s
Software Integration	FFmpeg and GStreamer SDKs and direct integration with LibXcoder API
Region of Interest (ROI)	ROI enables the quality of some regions to be improved at the expense of other regions
Closed Captioning	EIA CEA-708 for H.264 and H.265 encode/decode
High Dynamic Range (HDR)	HDR10 & HDR10+ for H.264 & H.265 encode/decode
Low Latency	Sub-frame latency
IDR Insert	Forced IDR frame inserts at any location
Flexible GOP Structure	8 presets plus customizable GOP structure

Logan
Video Server

VPU | Codensity ASIC G4

CPU Options	AMD EPYC™ 7232P Server Processor (8-core)
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	AMD EPYC 7713P Server Processor (64-core)
Operating System	Ubuntu 20.04.05 LTS (as of May 2023)
Memory	8x 16GB DDR4-3200
Storage	400GB M.2 SSD
NVMe Support	10x
PCIe Expansion	Up to 3x PCIe slots
Network Options	Dual 10GBase-T LAN
Power Supply	700W: 100 - 140Vac
	750W: 200 - 240Vac
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Transcoders	10x NETINT T408
Encoding Capacity	Up to 10x 4Kp60 or 80x 1080p30 (HEVC and H.264)
Codec Support	H.264 - Encode/Decode
	HEVC - Encode/Decode
Transcoder Software	FFmpeg, GStreamer

Physical Dimensions	W: 17.2” (437mm), H: 1.7” (43mm), D: 23.5” (597mm)
Rack Size	1U
Weight	39 lbs (17.69 kg) *(includes 10 processors)*
Environmental	50 degrees F to 95 degrees F Operating Temperature, 8% to 90% Operating Relative Humidity
Power Inputs	100 - 140Vac / 8 - 6V / 50-60Hz
	200 - 240Vac / 4.5 - 3.8A / 50-60Hz
	200 - 240Vdc / 4.5 - 3.8A (CCC Only)
Certifications	RoHS Compliant, UL Approved

Logan Video Server: Transcoding with Scaling

This table details the H.264 and HEVC output at the specified resolutions and frame rates; and the associated cost per stream. All inputs are scaled to the designated targets. Though the host CPU performs the scaling in these tests, **Note CPU utilization remains exceptionally low, reducing power costs and carbon emissions.**

Input	Output	Codec		FFmpeg	FFmpeg Low Delay	GStreamer	GStreamer Low Delay
4Kp30	1080p30	AVC > AVC	Instances	20	20	20	20
			CPU Usage	25.7	24.1	2.4	2.5
		AVC > HEVC	Instances	20	20	20	20
			CPU Usage	25.6	23.7	2.5	2.4
		HEVC > AVC	Instances	20	20	20	20
			CPU Usage	24.8	25.6	2.4	2.5
		HEVC > HEVC	Instances	20	20	20	20
			CPU Usage	24.2	25.2	2.4	2.6
1080p30	720p30	AVC > AVC	Instances	80	80	80	80
			CPU Usage	30.2	30.6	11.2	11.7
		AVC > HEVC	Instances	80	80	80	80
			CPU Usage	30.6	30.8	11.3	11.6
		HEVC > AVC	Instances	90	90	90	90
			CPU Usage	34.5	34.4	12.8	13.2
		HEVC > HEVC	Instances	90	90	90	90
			CPU Usage	35.4	35.1	12.8	13.1

Logan Video Server: Encoding Ladders

This table shows the number of full encoding ladders produced by the server and the cost per ladder for that output. Note the low CPU usage, despite all lower resolution rungs being scaled by the host CPU.

Input	Output	Codec		FFmpeg	FFmpeg Low Delay	GStreamer	GStreamer Low Delay
1080p30 - 5 Ladders	1080p30 @ 5Mbps	AVC > AVC	Instances	30	9	30	30
	1080p30 @ 3.5Mbps						
	720p30 @ 2Mbps						
	540p30 @ 1Mbps		CPU Usage	31.6	8.7	7.8	8.8
	360p30 @ 600kbps						
1080p30 - 4 Ladders	1080p30 @ 3.5Mbps	AVC > HEVC	Instances	26	14	28	28
	1080p30 @ 1.8Mbps						
	720p30 @ 1Mbps		CPU Usage	20.9	10.4	6.4	7.0
	360p @ 500kbps						
4Kp30 - 6 ladders	4Kp30 @ 12Mbps	AVC > HEVC	Instances	3	NA	7	7
	2Kp30 @ 7Mbps						
	1080p30 @ 3.5Mbps						
	1080p30 @ 1.8Mbps		CPU Usage	13.2		6.7	6.8
	720p30 @ 1Mbps						
	360p30 @ 500kbps						

Logan Video Server: Power Consumption

One of the key strengths of ASIC-based transcoders is ultra-low power consumption, which reduces OPEX and carbon emissions. You see this in the power figures, **particularly the Watts/Output, which are orders of magnitude lower than comparable figures for CPU-based transcoding.**

Operation	# Streams	Watts / Stream
Transcode 720p HEVC > HEVC, low delay	150	**2.1**
Scale 1080p > 720p HEVC to AVC, low delay	90	**3.4**
Five-rung AVC ladder, low delay	30	**10.8**

Quadra Video Server

Smart VPU | Quadra ASIC G5

NETINT

Quadra
Video Server

Smart VPU | Codensity Quadra G5 ASIC

Ultra-high density, low cost and powered by AI

Built on the Supermicro 1114S-WN10RT server platform, server contains ten Quadra T1U VPUs.

- **HEVC, H.264 and AV1 video encoding**
- **HEVC, H.264, and VP9 video decoding**
- **Up to 8K resolution**
- **10-bit HDR**

NETINT

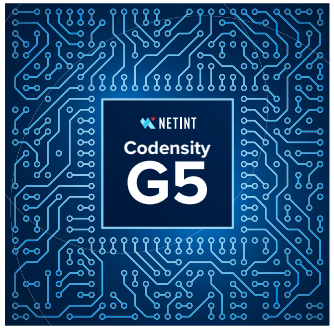
Codensity G5
ASIC

Application Specific Integrated Circuit

ASIC Video Transcoder

The Codensity G5 architecture uniquely combines on-chip AV1, H.264 and HEVC video encoding and AI processing engines to deliver scalability for metaverse, live streaming, and interactive applications.

The core of NETINT's Codensity technology is an in-house built ASIC that increases encoding density compared to CPU-based software encoding solutions. This increase in encoding density expands the number of channels that can be encoded without increasing the rack footprint. This reduces power and HVAC costs to deliver a lower TCO without sacrificing video quality or latency.



8K UHD Video Encoding

The Codensity G5 ASIC enables up to 8K video transcoding using the HEVC and H.264 codecs (AV1 is limited to 4K). Advanced codecs like AV1 and HEVC deliver superior quality to H.264 with up to a 60% reduction in bitrate, but when produced by CPU-only encoders, can require up to 10x the processing power, limiting throughput severely. HEVC and AV1 output with the Codensity G5 ASIC should be similar to H.264, making 4K and 8K live resolutions affordable and scalable for the first time.

Flexible Architecture

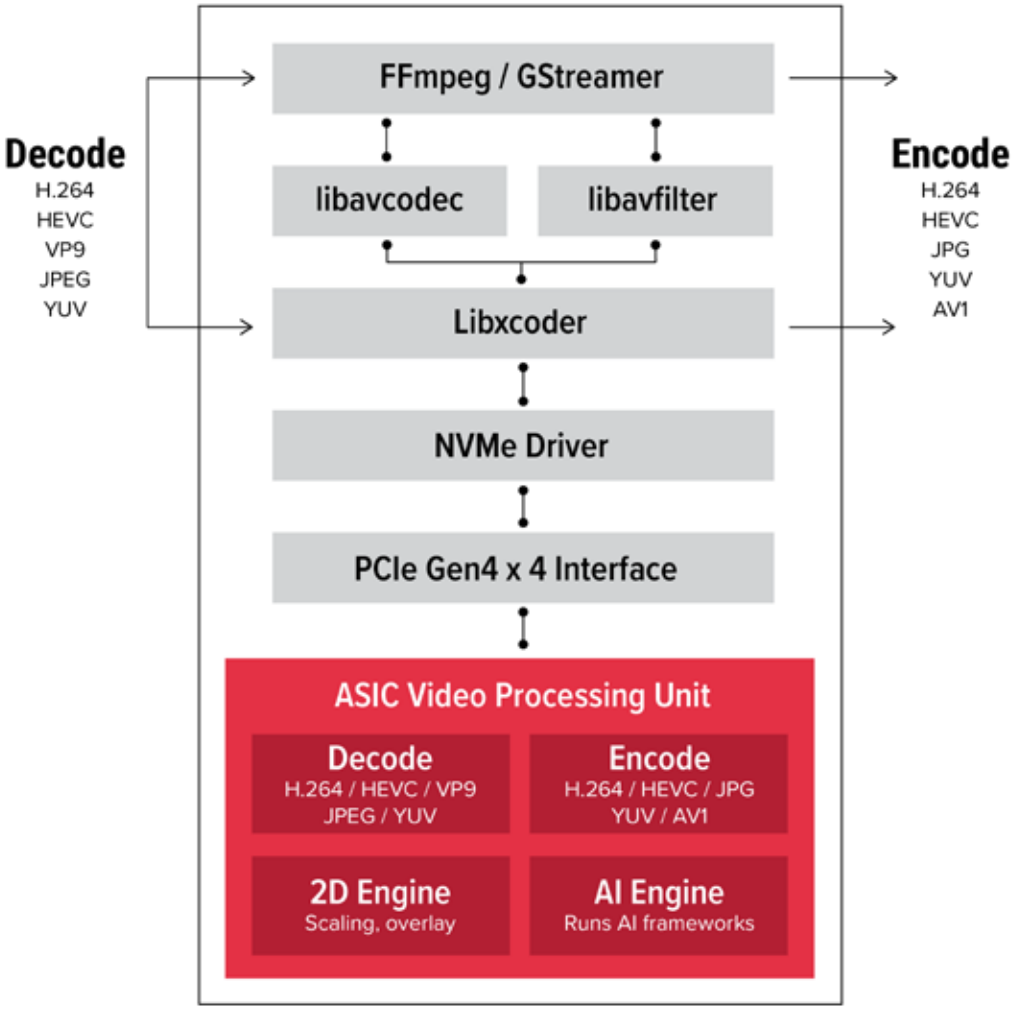
The Codensity G5 is built on a programmable microprocessor architecture to optimize the firmware and pipeline processing for improved performance and increased video quality. This counters a criticism that silicon-based encoders lack upgrade flexibility.

AI Engine

Two Deep Neural Network engines capable of 18 trillion operations per second (TOPS) enable object detection, classification, and segmentation to provide additional data to the encoding engine for image quality improvement and content-adaptive rate control for advanced performance and functionality. Seamlessly integrated for region-of-interest (ROI) encoding and background replacement. Additional features to be released.

Quadra VPU Workflow

Open-source suite
of processing tools.



Quadra T1U
Smart VPU

Codensity Quadra G5

Form Factor	U.2
ASIC	1x Codensity G5
Interface	PCIe 4.0 x4
Protocol	NVMe
Power Consumption (Typ)	17W
Usage	24/7 Operation
Operation Temperature	0 - 50°C
RoHS Compliance	European Union (EU) ROHS Compliance Directives
Product Health Monitoring	Self-Monitoring, Analysis, and Reporting Technology (SMART) commands Temperature Monitoring & Logging
Video Encoding Standards/Formats	AVC/H.264 Baseline, Main, High, High 10 HEVC/H.264 Main, Main 10 AV1 Main JPG YUV 420 8 bit/10 bit encoding
Video Decoding Standards/Formats	AVC/H.264 Baseline, Main, High, High 10 HEVC/H.265 Main, Main 10 VP9 Profile 0, 2 JPEG YUV 420 8 bit/10 bit decoding
Throughput Capacity	Up to 16x 1080p60, 4x 4Kp60, 1x 8Kp60
Audio Standards/Formats	MP3, AAC-LC, HE-AAC
Level	1 to 6.2 Main Tier
Resolution	32 x 32 to 8192 x 5120
Scan Type	Progressive
Bitrate	64kbit/s to 700Mbit/s
Software Integration	FFmpeg SDKs, LibXcoder API integration
AI Deep Neural Network Engine	15 TOPS AI Assisted Encoding
Region of Interest (ROI)	ROI enables the quality of some regions to be improved at the expense of other regions
Closed Captioning	EIA CEA-708 for H.264 and HEVC encode/decode
High Dynamic Range (HDR)	HDR10, HDR10+, HLG for H.264 & HEVC encode/decode
Low Latency	Sub-frame latency
IDR Insert	Forced IDR frame inserts at any location
Flexible GOP Structure	8 presets plus customizable GOP structure
Video 2D Processing Engine	Crop & Padding/Scaling/Overlay/YUV & RGB Conversion

Quadra
Video Server

Smart VPU | Codensity Quadra G5

CPU Options	AMD EPYC™ 7232P Server Processor (8-core)
	AMD EPYC 7543P Server Processor (32-core)
	AMD EPYC 7713P Server Processor (64-core)
Operating System	Ubuntu 20.04.05 LTS (as of May 2023)
Memory	8x 16GB DDR4-3200
Storage	400GB M.2 SSD
NVMe Support	10x
PCIe Expansion	Up to 3x PCIe slots
Network Options	Dual 10GBase-T LAN
Power Supply	700W: 100 - 140Vac
	750W: 200 - 240Vac
	750W: 200 - 240Vdc (CCC only)
Transcoders	10x NETINT Quadra T1U
Encoding Capacity	Up to 40 4Kp60 or 320 1080p30
Codec Support	H.264 - Encode/Decode
	HEVC - Encode/Decode
	VP9 - Decode
	AV1 - Encode
Transcoder Software	FFmpeg, GStreamer

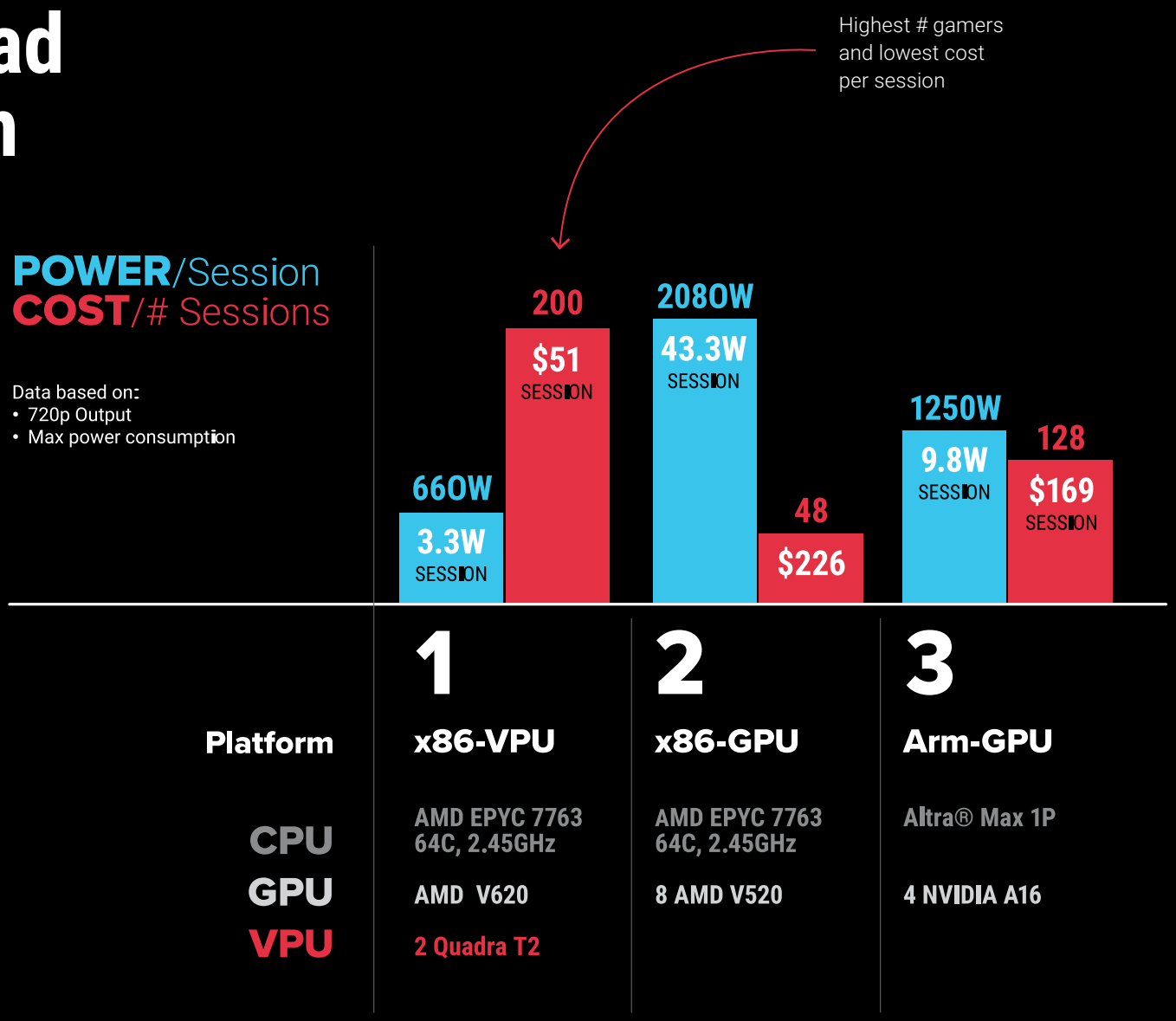
Physical Dimensions	W: 17.2” (437mm), H: 1.7” (43mm), D: 23.5” (597mm)
Rack Size	1U
Weight	39 lbs (17.69 kg) *(includes 10 processors)*
Environmental	50 degrees F to 95 degrees F Operating Temperature, 8% to 90% Operating Relative Humidity
Power Inputs	100 - 140Vac / 8 - 6V / 50-60Hz
	200 - 240Vac / 4.5 - 3.8A / 50-60Hz
	200 - 240Vdc / 4.5 - 3.8A (CCC Only)
Certifications	RoHS Compliant, UL Approved

Cloud Gaming Video Server

Smart VPU | Quadra ASIC G5

NETINT

Head to head comparison



VPUs for Cloud Gaming

Ultra High Density

40x increase in game streaming density compared to software.

Low Cost

The industry's most cost efficient server platform with ultra-low CAPEX and OPEX costs.

720p30 - 4Kp60

Encode up to 10x 4Kp60 live streams and supports a wide variety of cloud gaming formats.

Ultra-Low Latency

As low as 8ms latency that's ideal for cloud gaming applications.

AV1 / HEVC / H.264

Multi-format support for operational flexibility.

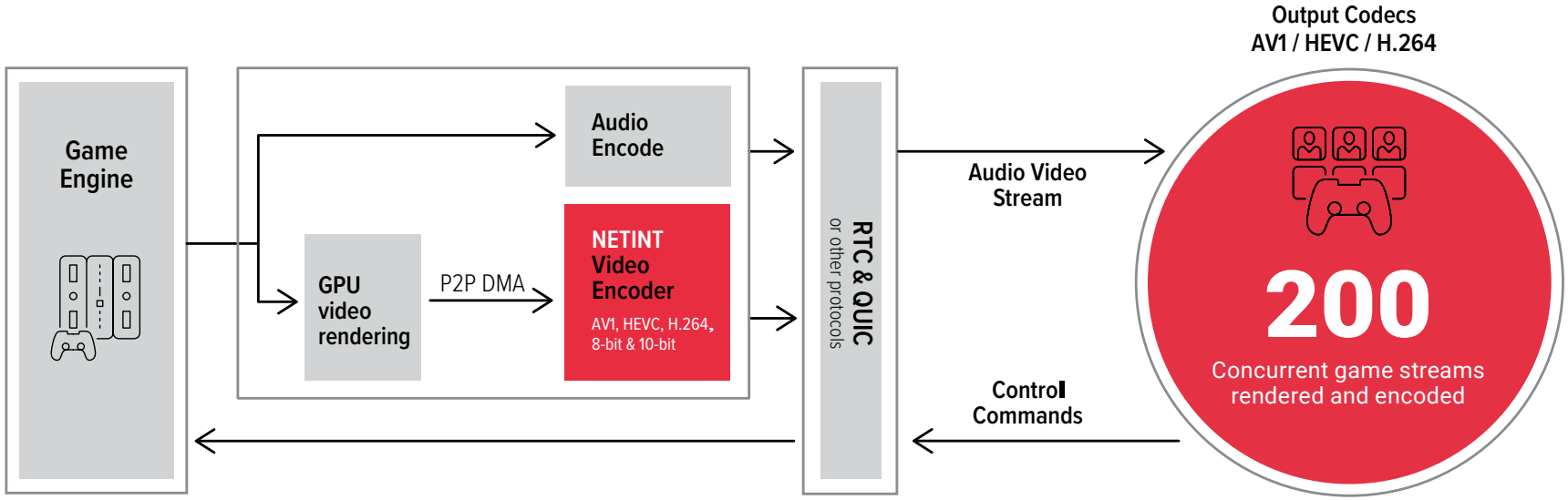
Scalable

High capacity throughput for rapid deployment and simple drop-in upgrade path to gain additional game sessions.

Video 2D Processing Engines

Cropping, padding and scaling for encoding ladder generation, image composition, video overlay, YUV and RGB conversion.

Cloud gaming architecture



Quadra T2A
Smart VPU

Codensity Quadra G5

Form Factor	AIC (HH HL)
ASIC	2x Codensity G5
Interface	PCIe 4.0 x4
Protocol	NVMe
Power Consumption (Typ)	40W
Usage	24/7 Operation
Operation Temperature	0 - 50°C
RoHS Compliance	European Union (EU) ROHS Compliance Directives
Product Health Monitoring	Self-Monitoring, Analysis, and Reporting Technology (SMART) commands Temperature Monitoring & Logging
Video Encoding Standards/Formats	AVC/H.264 Baseline, Main, High, High 10 HEVC/H.264 Main, Main 10 AV1 Main JPG YUV 420 8 bit/10 bit encoding
Video Decoding Standards/Formats	AVC/H.264 Baseline, Main, High, High 10 HEVC/H.265 Main, Main 10 VP9 Profile 0, 2 JPEG YUV 420 8 bit/10 bit decoding
Throughput Capacity	Up to 32x 1080p60, 8x 4Kp60, 2x 8Kp60
Audio Standards/Formats	MP3, AAC-LC, HE-AAC
Level	1 to 6.2 Main Tier
Resolution	32 x 32 to 8192 x 5120
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Software Integration	FFmpeg SDKs, LibXcoder API integration
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High Dynamic Range (HDR)	HDR10, HDR10+, HLG for H.264 & HEVC encode/decode
Low Latency	Sub-frame latency
IDR Insert	Forced IDR frame inserts at any location
Flexible GOP Structure	8 presets plus customizable GOP structure
Video 2D Processing Engine	Crop & Padding/Scaling/Overlay/YUV & RGB Conversion

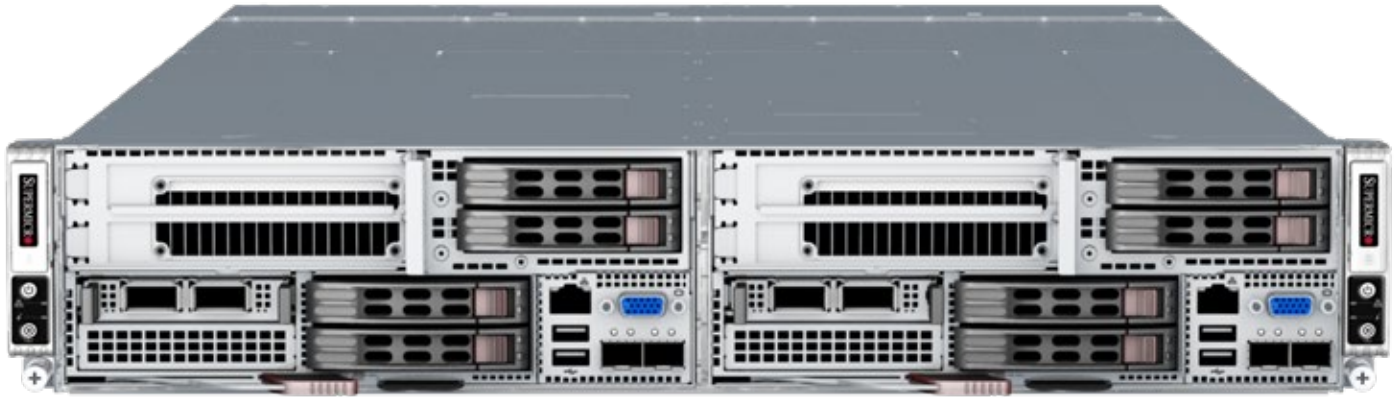
Reference Cloud Gaming Video Server

Smart VPU | Quadra T2A ASIC G5

Processor Support	Single AMD Genoa SP5 processors up to 360W (cTDP: 400W)
Memory Capacity	12x DIMM slots, DDR5-4800 memory
Expansion	4x PCIe 5.0 x16
	2x AIOM PCIe 5.0x16 slots (OCP 3.0 compliant)
Networking & I/O	1x COM port (rear), 2x USB 3.0 ports (2 rear), 1x VGA port
System Management	Built-in server management tool (IPMI 2.0, KVM/media over LAN) with dedicated LAN port, Root of Trust (ROT) ready
Drive Bays	12x hot-swap 3.5" SATA3 drives or 8 SATA3 + 4NVMe via optional cables
	2x M.2 NVMe 2280/22110 slots
System Cooling	3x heavy duty 8cm PWM fans
Power Supply	1200W 1+1 high-efficiency redundant (titanium level)
Dimensions	H: 3.5" x W: 17.2" x D: 25.5"

Supermicro AS-2015CS-TNR server with 2 Quadra T2A Smart VPUs and 1 GPU

- **Up to 200x 720p30 cloud gaming sessions**
- **AV1 / HEVC / H.264 video encoding**
- **Up to 8K and 60fps**



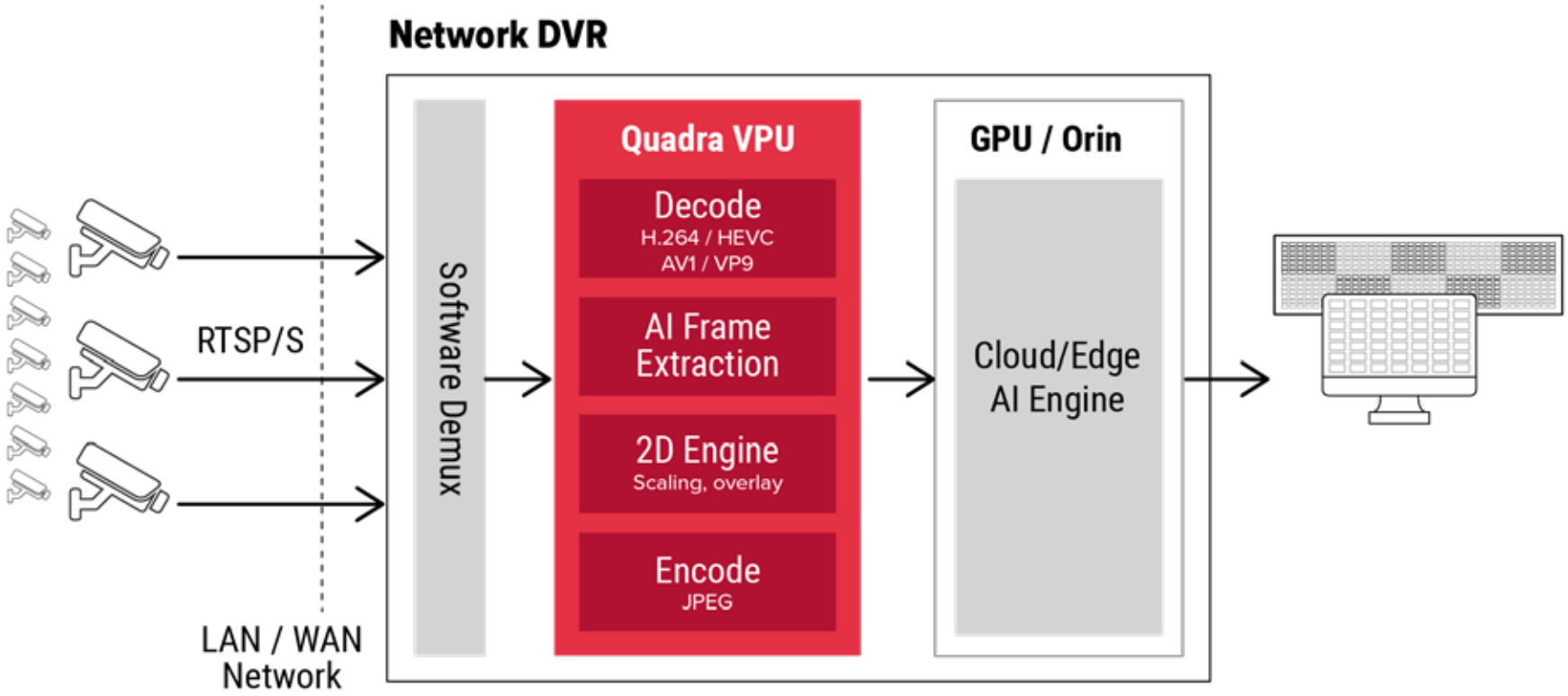
Surveillance Video Processing

Smart VPU | **Quadra ASIC G5**

NETINT

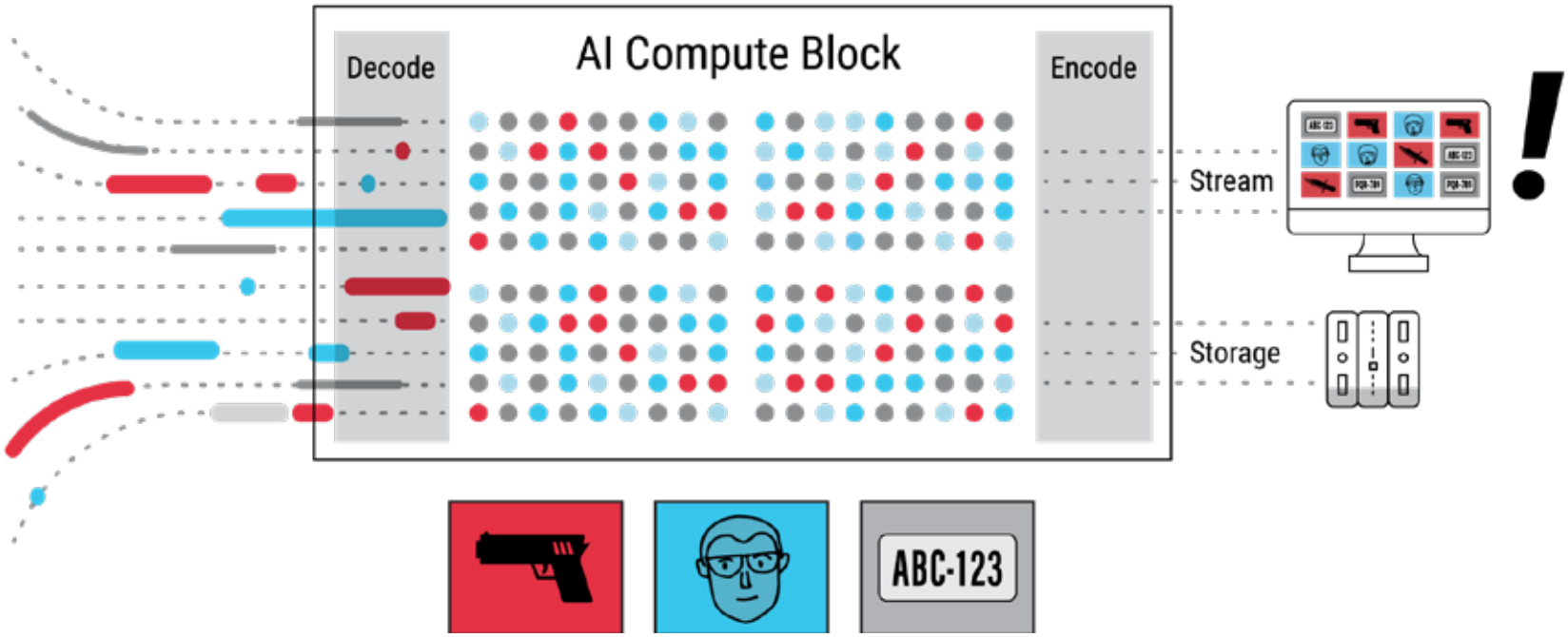
Ultra dense decoding

For video walls



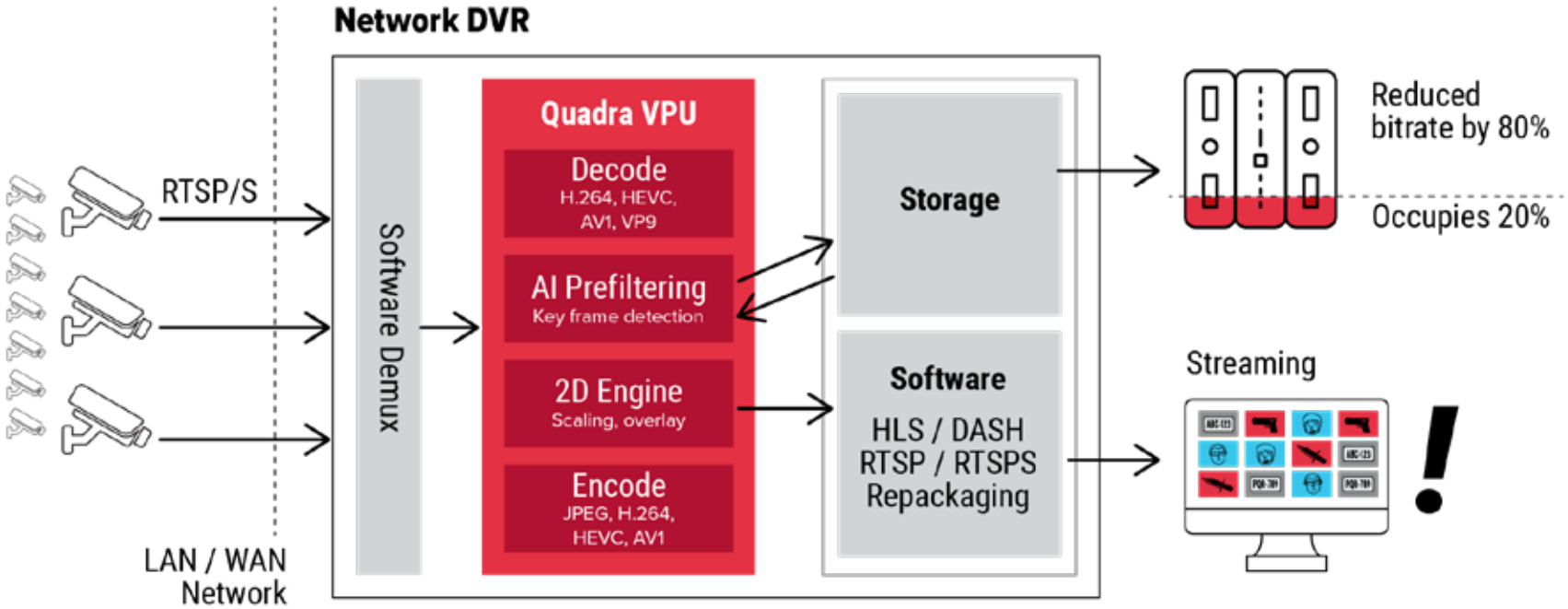
AI powered warning alerts

Key frame detection AI filter captures priority content by scanning every 10th frame.



80% more server storage

Intelligent compression quadruples bandwith



Security Application:
Quadra Modules

Codensity G5

	Quadra T1U	Quadra T1A	Quadra T2A
Form Factor	U.2	AIC	AIC
ASIC	1x G5	1x G5	2x G5 G5
Power	17 Watts	20 Watts	40 Watts
Codecs	Encoder: H.264, HEVC, JPG, YUV, AV1 Decoder: H.264, HEVC, VP9, JPG, YUV Audio: MP3, AAC-LC, HE-AAC		
Decoding Throughput	Up to 48x 1080p30		Up to 96x 1080p30
Encoding Throughput	Up to 32x 1080p30		Up to 64x 1080p30
AI Capacity	15 TOPs	18 TOPS	36 TOPs

NETINT is a proud member of the Security Industry Association.
For more information about what NETINT can do for you,
email: sales@netint.ca