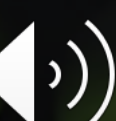




NVIDIA嵌入式计算平台JETSON最新更新

NVIDIA 李雨倩
2022.06



MASS-MARKET EDGE SYSTEMS NEED AI



NETWORK VIDEO RECORDER
200 million 1080p streams



MACHINE VISION/AOI
1 trillion product units per
year require visual inspection



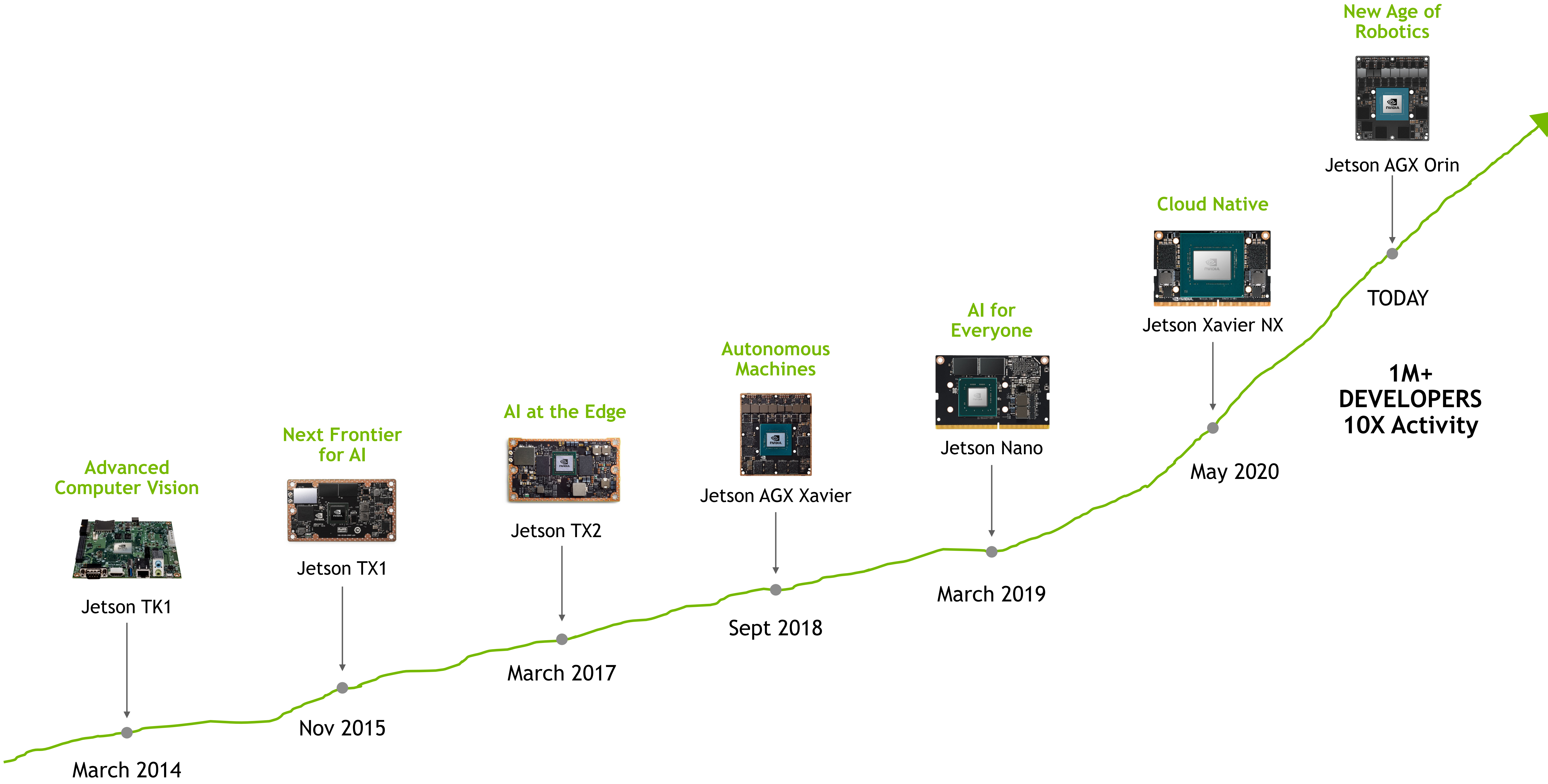
HOME/SERVICE ROBOTS
175 billion hours per year on
household chores (US)



AIOT
80% of Enterprise IOT
projects will use AI by 2022

Global market for Edge Computing estimated at **US\$4 Billion** in the year 2020, is projected to reach a revised size of **US\$17.8 Billion** by 2026, growing at a CAGR of 27%.

NVIDIA JETSON POWERING THE NEXT AIOT & ROBOTICS REVOLUTION



NVIDIA JETSON

Software-Defined AI Platform

AI at the Edge

Sensor Fusion & Compute Performance

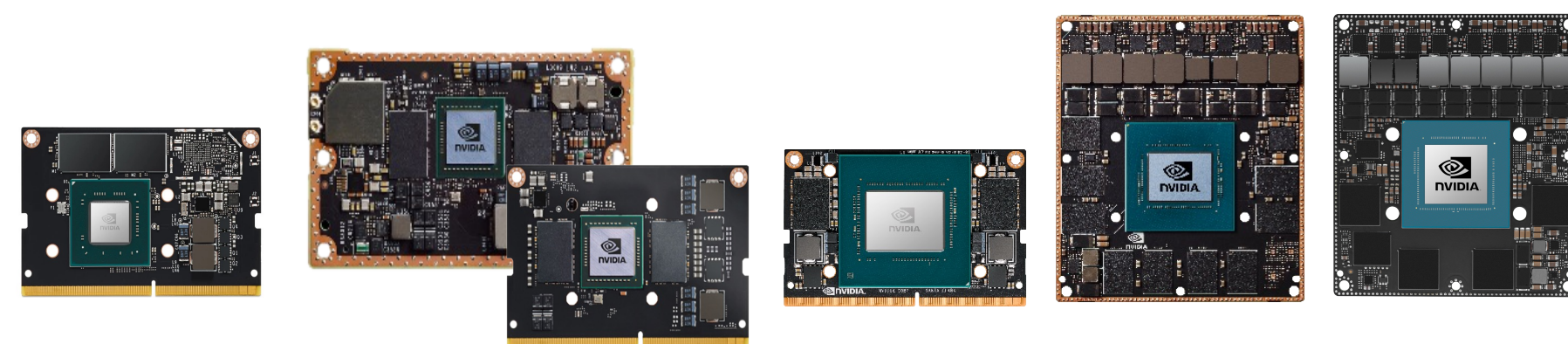
Sense



Act

Reason

JETSON COMPUTER



SOFTWARE DEFINED

SDK, Design Tools, Libs, GEMs



Jetpack SDK · CUDA · TensorRT · TensorFlow · ONMX · ROS

ECOSYSTEM

Expertise, Time to Market



GROWING JETSON ECOSYSTEM PARTNERS (130+)

DISTRIBUTION



SOFTWARE



HARDWARE & SENSORS



EDGE AI MOMENTUM BUILDING ON NVIDIA JETSON

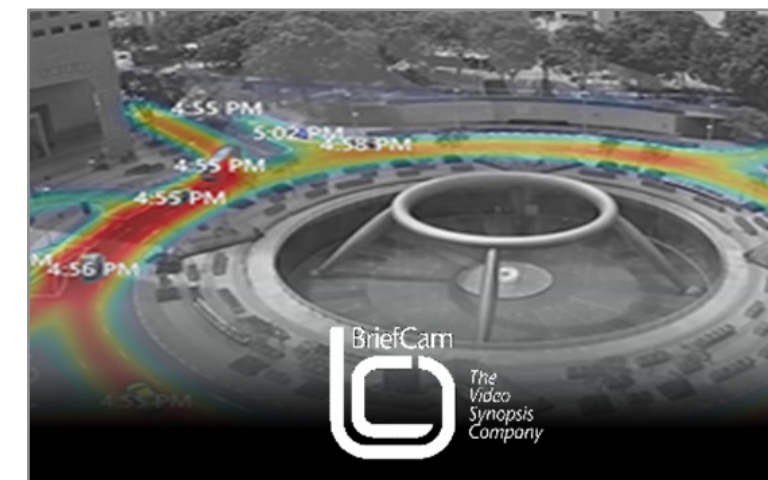
AMR



RETAIL



SMART CITY



AGRICULTURE/
CONSTRUCTION



SERVICES



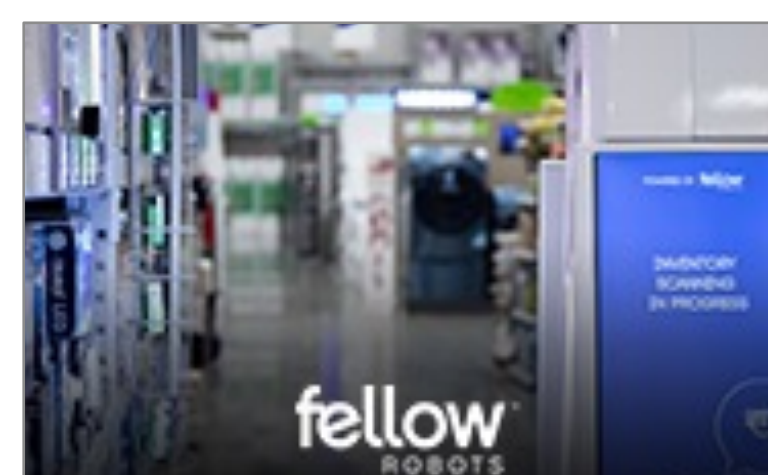
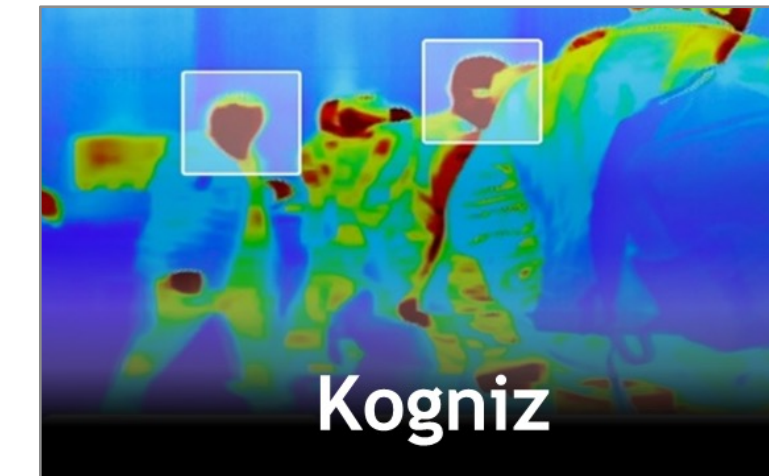
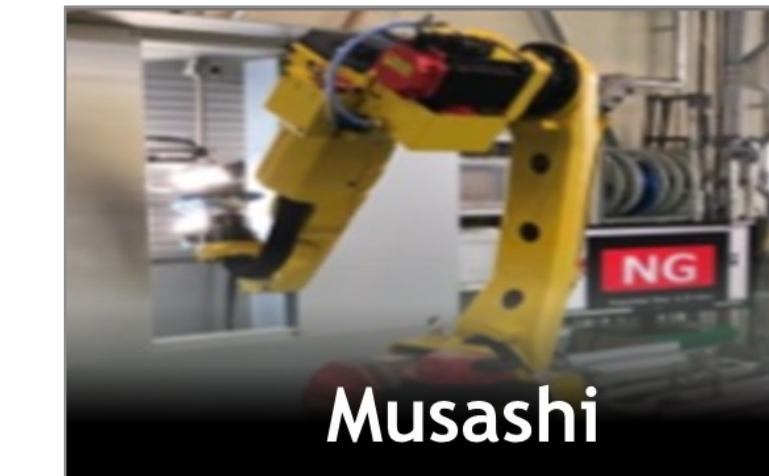
LOGISTICS



MANUFACTURING



HEALTHCARE

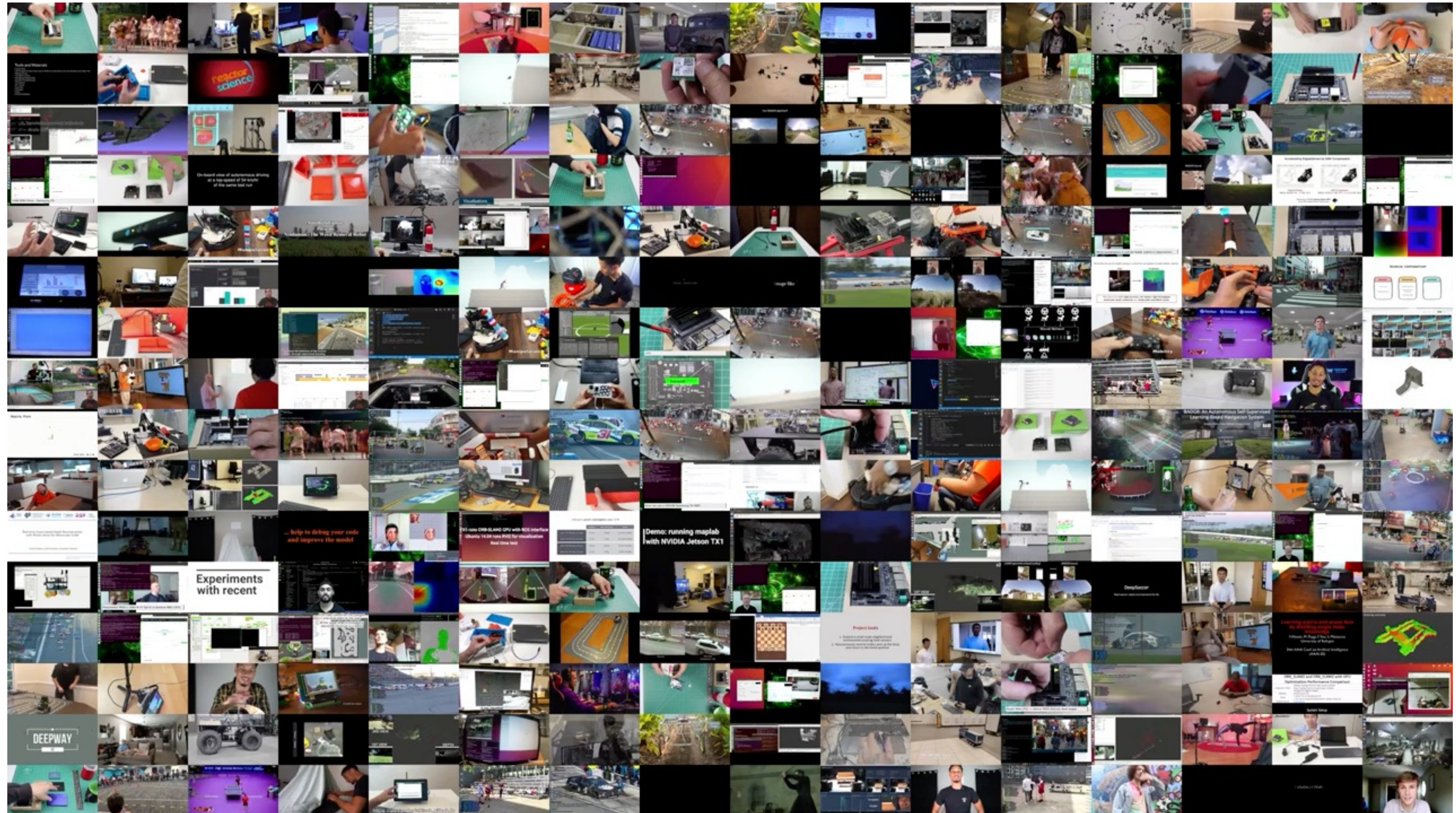


1,000,000
Developers

6,000+
Customers

JETSON COMMUNITY PROJECTS

<https://developer.nvidia.com/embedded/community/jetson-projects>



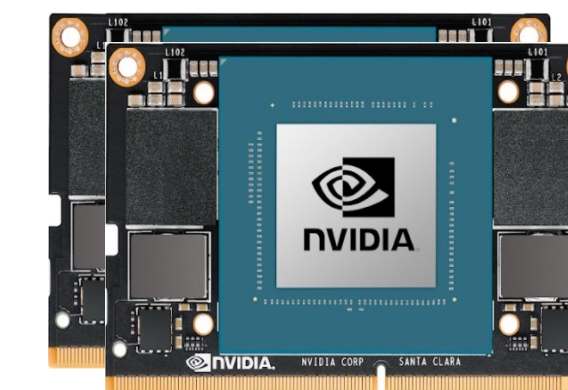
THE JETSON FAMILY

For AI at the Edge and Autonomous Machines

Next Gen Jetson

JETSON Orin NX Series

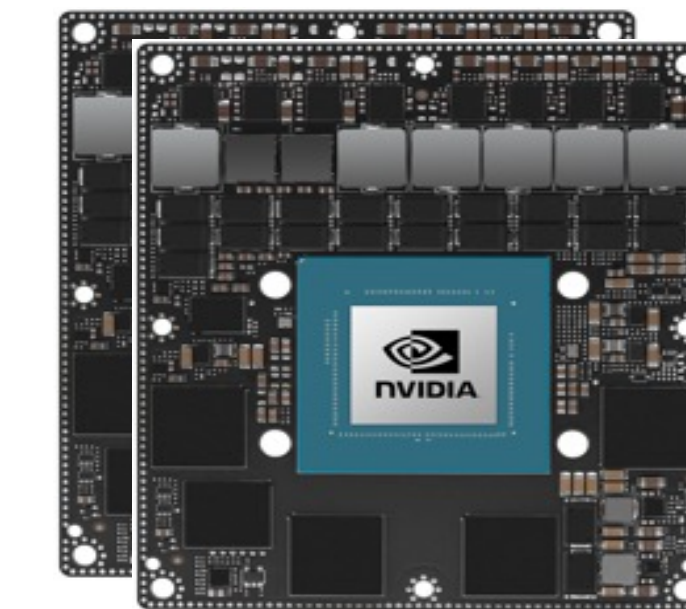
100 TOPs (INT8)



10 - 25W
8GB/16GB
45mm x 70mm

JETSON AGX Orin Series

275 TOPs (INT8)



15- 60W
32GB/64GB
100mm x 87mm

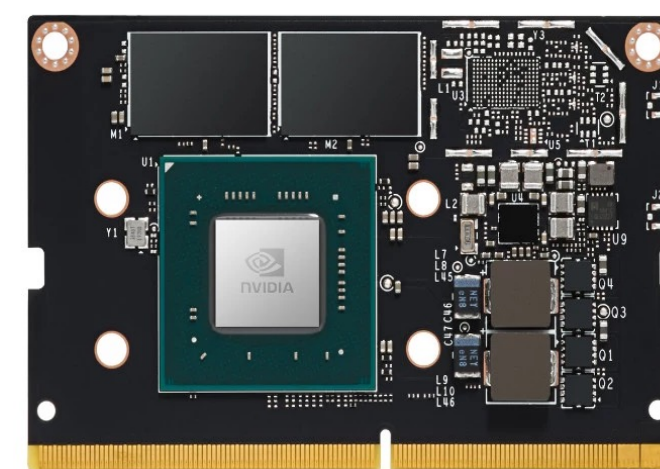
ENTRY

MAINSTREAM

AUTONOMOUS MACHINES

JETSON NANO

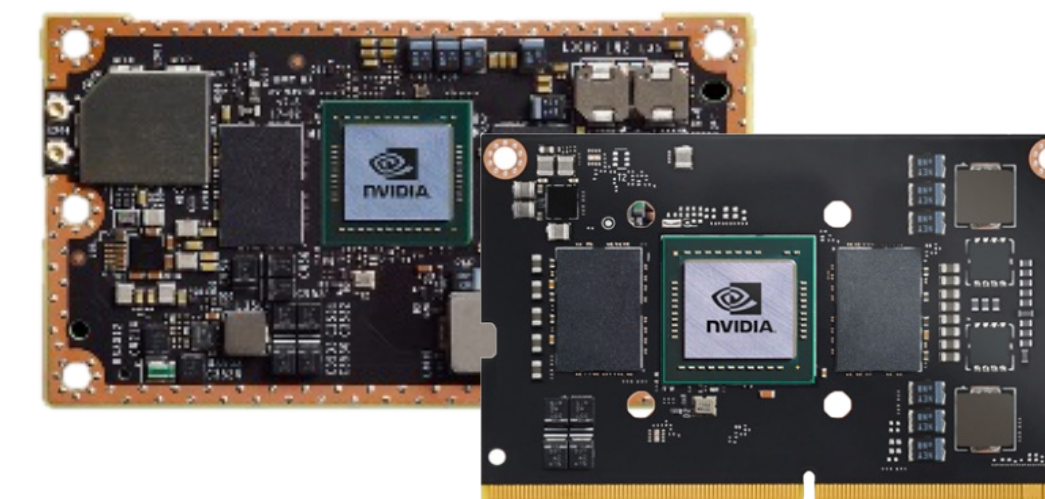
0.5 TFLOPS (FP16)



5 - 10W
45mm x 70mm

JETSON TX2 series

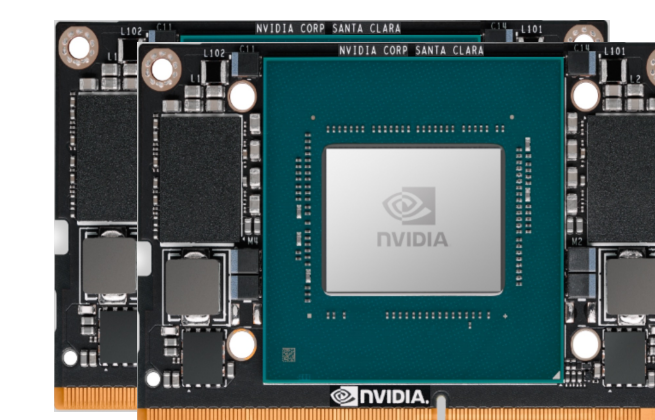
1.33 TFLOPS (FP16)



7.5 - 15W*
45mm x 70mm
50mm x 87mm

JETSON Xavier NX series

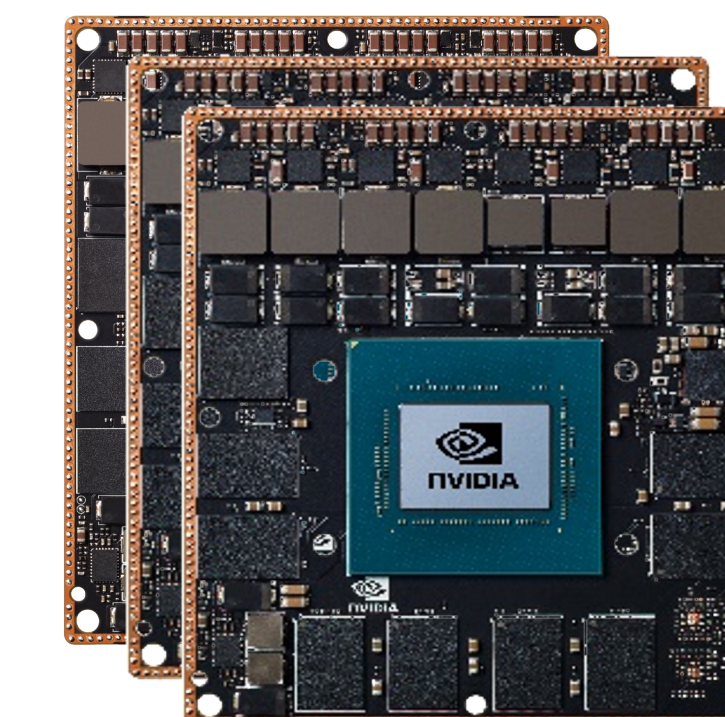
6 TFLOPS (FP16)
21 TOPs (INT8)



10 - 20W
8GB/16GB
45mm x 70mm

JETSON AGX Xavier Series

11 TFLOPS (FP16)
32 TOPs (INT8)



10 - 30W**
32GB/64GB
100mm x 87mm

Full specs at developer.nvidia.com/jetson

*TX2i: 10-20W ** Jetson AGX Xavier Industrial 20W-40W

INTRODUCING THE ORIN ARCHITECTURE

Advanced CPU

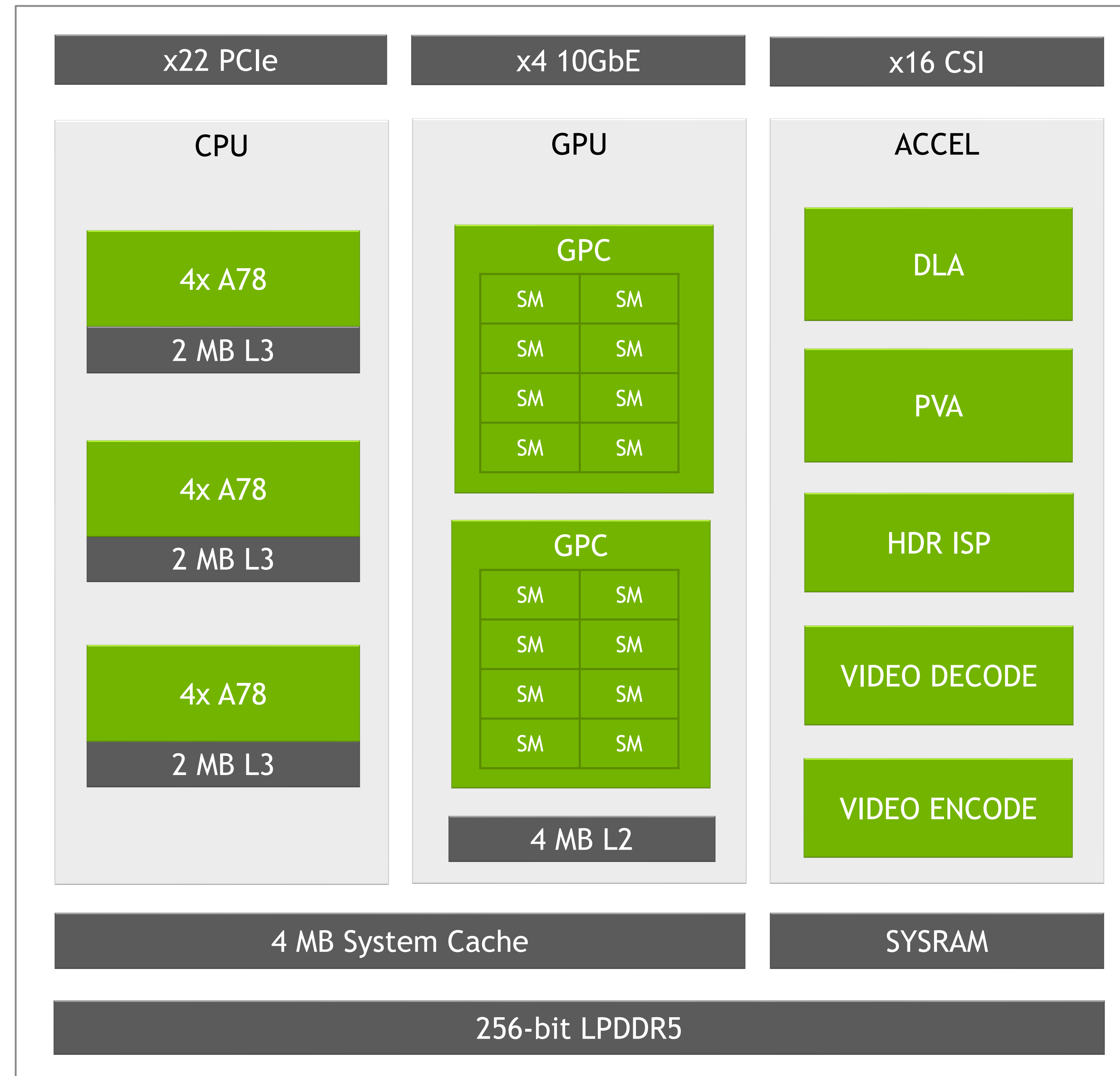
- *12x Cortex A78 Cores ARM Arch V8.2
- *259 SPECint_rate 2006

Next-gen GPU

- *2 GPC / 8 TPC / 16 SMs
- *5.3 FP32 CUDA TFLOPs
- *10.6 FP16 CUDA TFLOPs

Higher DRAM BW

- 256-bit LPDDR5
- 205 GB/s



Rich IO Connectivity

- x4 10 GbE
- x22 PCIe, x16 CSI

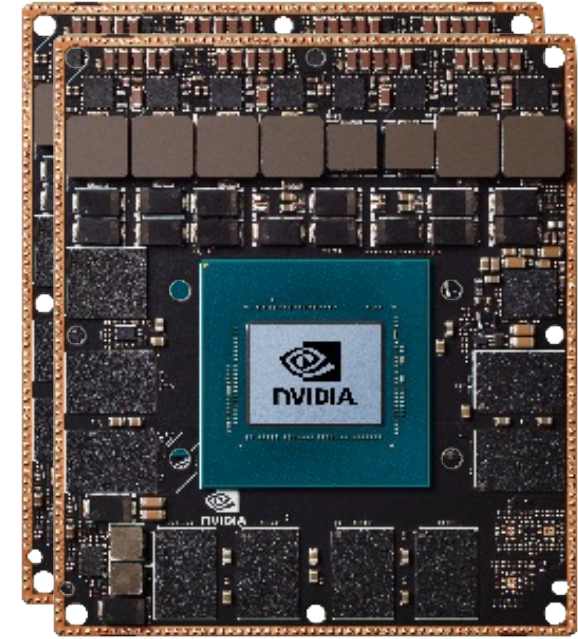
DL Performance

- *275 INT8 DL Sparse TOPs
- *138 INT8 DL Dense TOPs

Enhanced PVA

- 512 INT16 GMAC/s
- 2048 INT8 GMAC/s

JETSON ORIN MODULES FOR NEXT-GEN AI PERFORMANCE

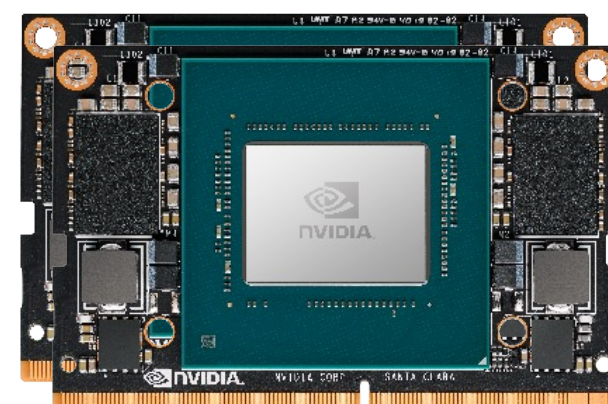


JETSON AGX XAVIER 64GB

- 32 Dense INT8 TOPS
- 10W to 30W
- \$1299*

JETSON AGX XAVIER (32GB)

- 32 Dense INT8 TOPS
- 10W to 30W
- \$899*

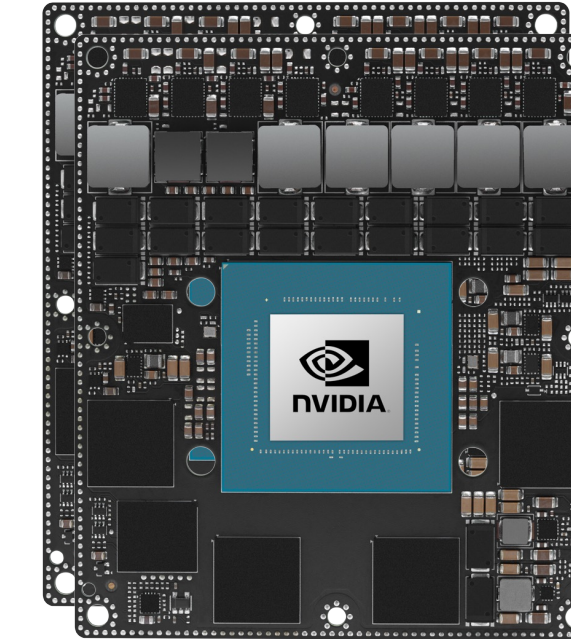


JETSON XAVIER NX 16GB

- 21 Dense INT8 TOPS
- 10W to 20W
- \$499*

JETSON XAVIER NX (8GB)

- 21 Dense INT8 TOPS
- 10W to 20W
- \$399*

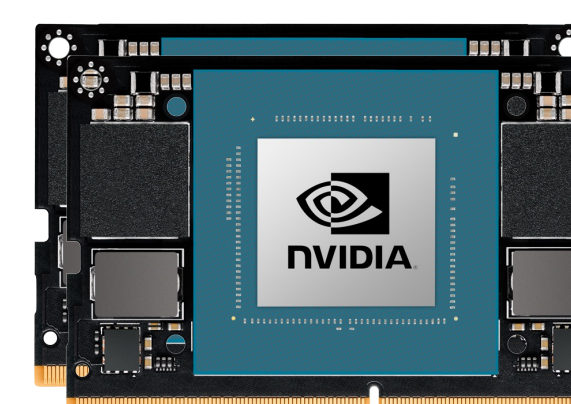


JETSON AGX ORIN 64GB

- 275 SPARSE | 138 DENSE, INT8 TOPS
- 15W to 60W
- \$1599*
- Available: **End Oct 2022**

JETSON AGX ORIN 32GB

- 200 SPARSE | 100 DENSE, INT8 TOPS
- 15W to 40W
- \$899*
- Available: **Mid July 2022**



JETSON ORIN NX 16GB

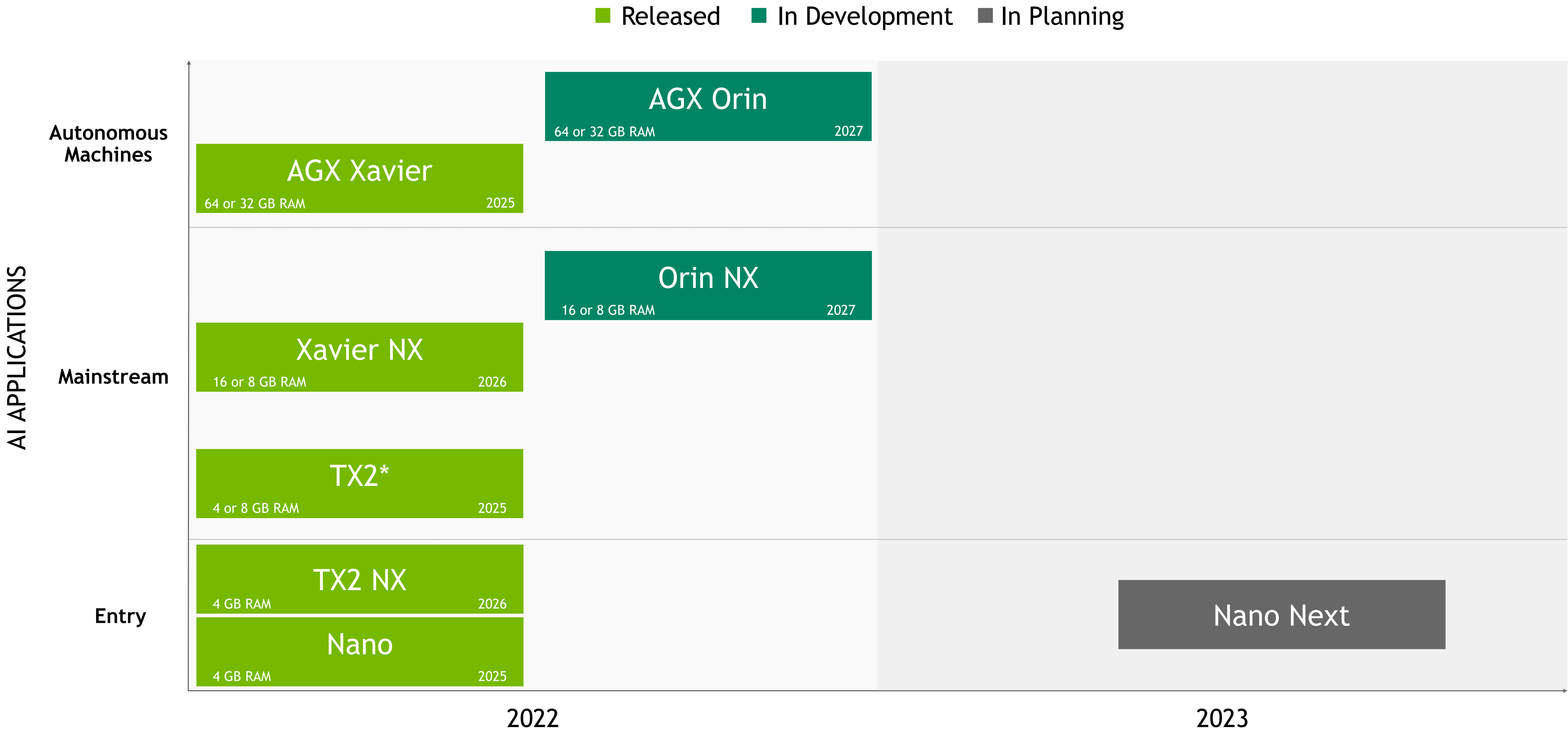
- 100 SPARSE | 50 DENSE, INT8 TOPS
- 10W to 25W
- \$599*
- Available: **Mid Aug 2022**

JETSON ORIN NX 8GB

- 70 SPARSE | 35 DENSE, INT8 TOPS
- 10W to 20W
- \$399*
- Available: **Mid Nov 2022**

*All prices are based on 1Ku+ Qty. | AGX Orin series and AGX Xavier series are pin and form factor compatible.

JETSON MODULES – COMMERCIAL ROADMAP

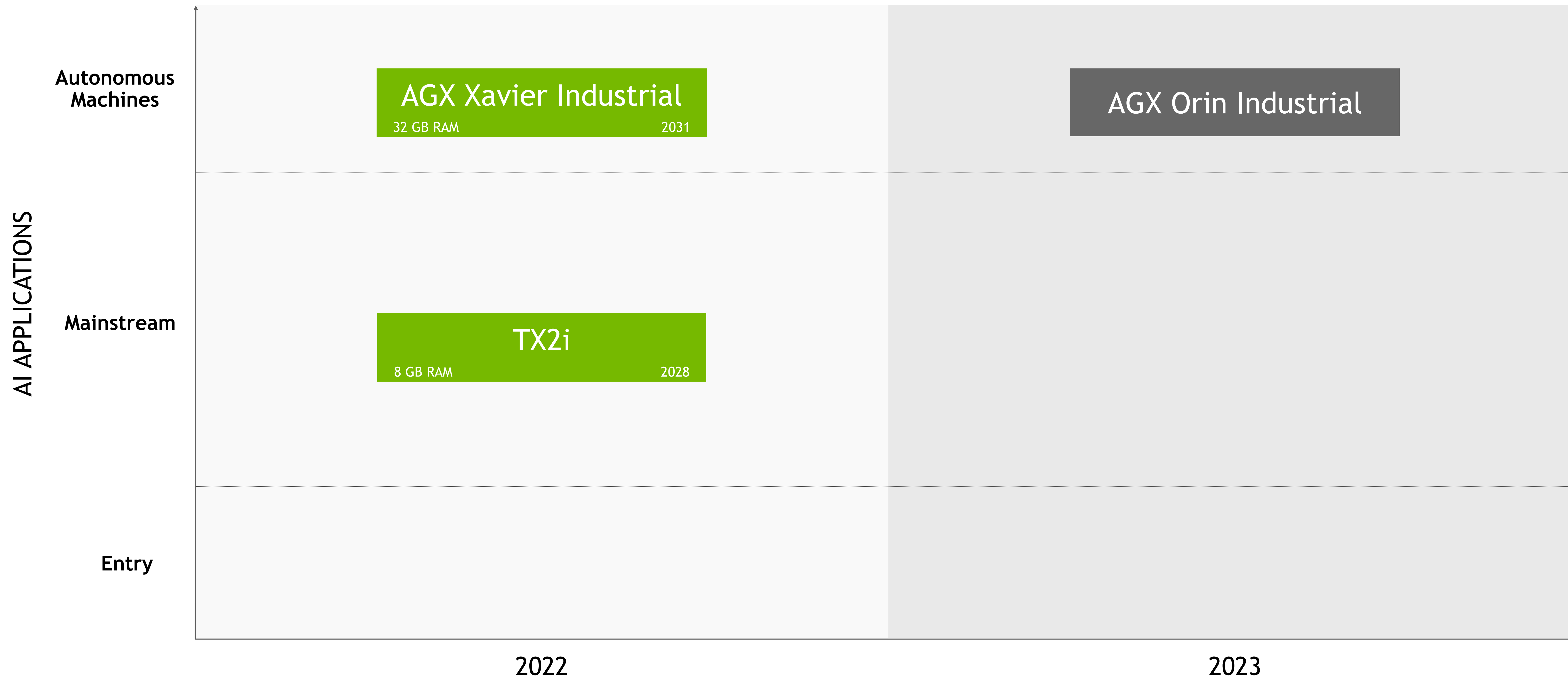


The year in each box indicates supply availability at least / until. Lifecycle might be extended further; contact your partner sales manager. Operating life is 10 years 24x7 for industrial Jetson production modules. Products in development and planning are subject to change.

JETSON MODULES – INDUSTRIAL ROADMAP

Check Out Our New Ruggedized Systems Page: [Jetson Ruggedized Systems | NVIDIA Developer](#)

■ Released ■ In Planning



*We recently released a technical brief on system level guidelines customers can take with our SODIMM Modules for operating in ruggedized environments: [here](#)

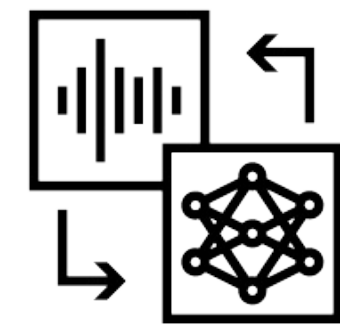
*The year in each box indicates supply availability at least / until. Lifecycle might be extended further; contact your partner sales manager.
Operating life is 10 years 24x7 for industrial Jetson production modules. Products in development and planning are subject to change.*

THE SECRET IS CONTINUOUS SOFTWARE ADVANCEMENTS

Accelerate AI Applications and Time-to-Market

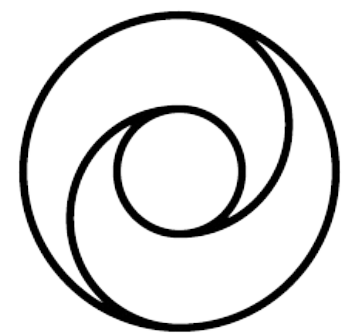
AI MODEL DEVELOPMENT

Production-ready AI pre-trained models and toolkits to accelerate development by up to 10X

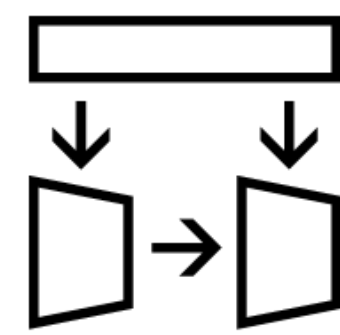


PRE-TRAINED
MODELS

NVIDIA Omniverse



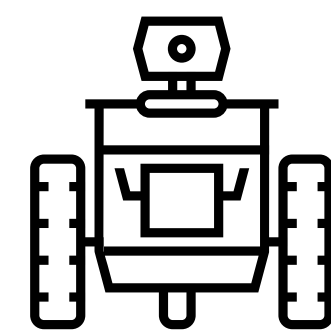
SYNTHETIC DATA
GENERATOR



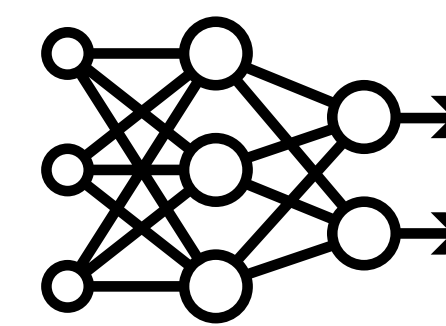
TAO
TOOLKIT

APPLICATION FRAMEWORKS

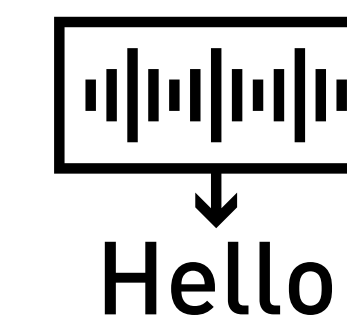
Easy-to-use libraries that accelerate run-time applications



ISAAC



DEEPSTREAM



RIVA

JETPACK SDK

A Comprehensive SDK for building an end-to-end accelerated AI pipeline

JETPACK SDK
Linux | RTOS

CUDA-X

Deep
Learning

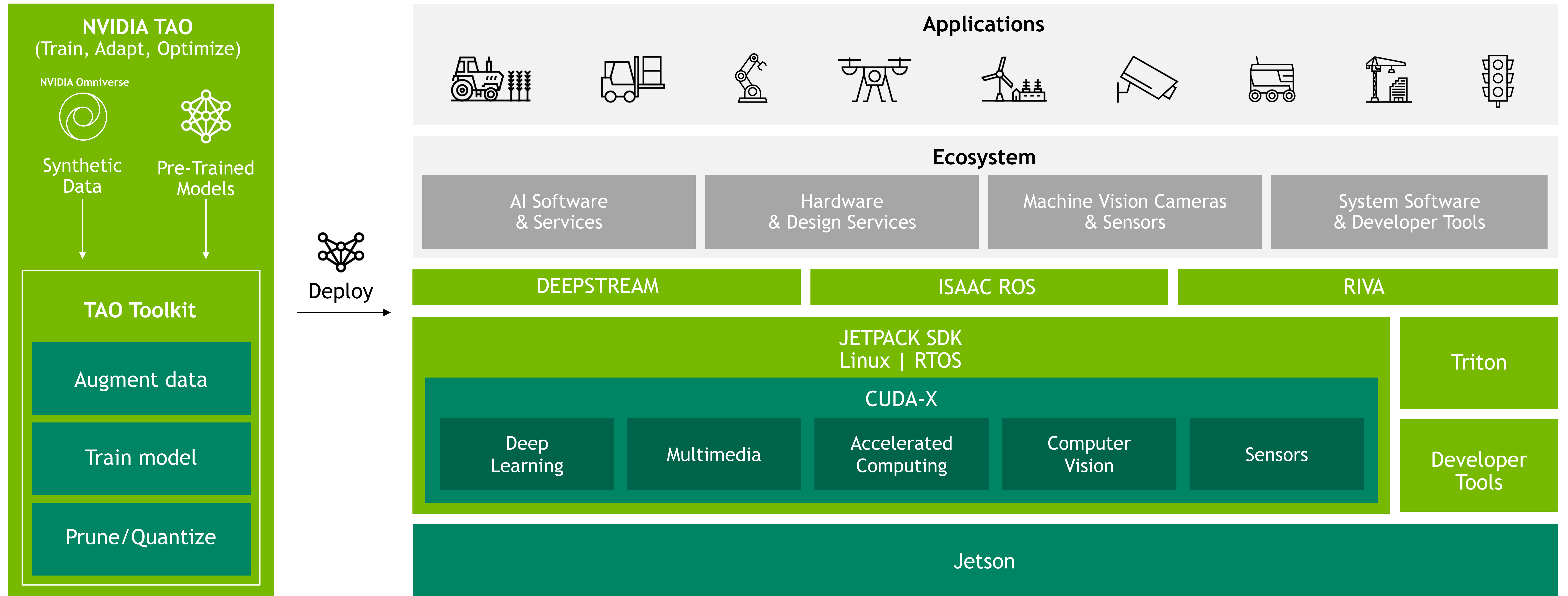
Multimedia

Accelerated
Computing

Computer
Vision

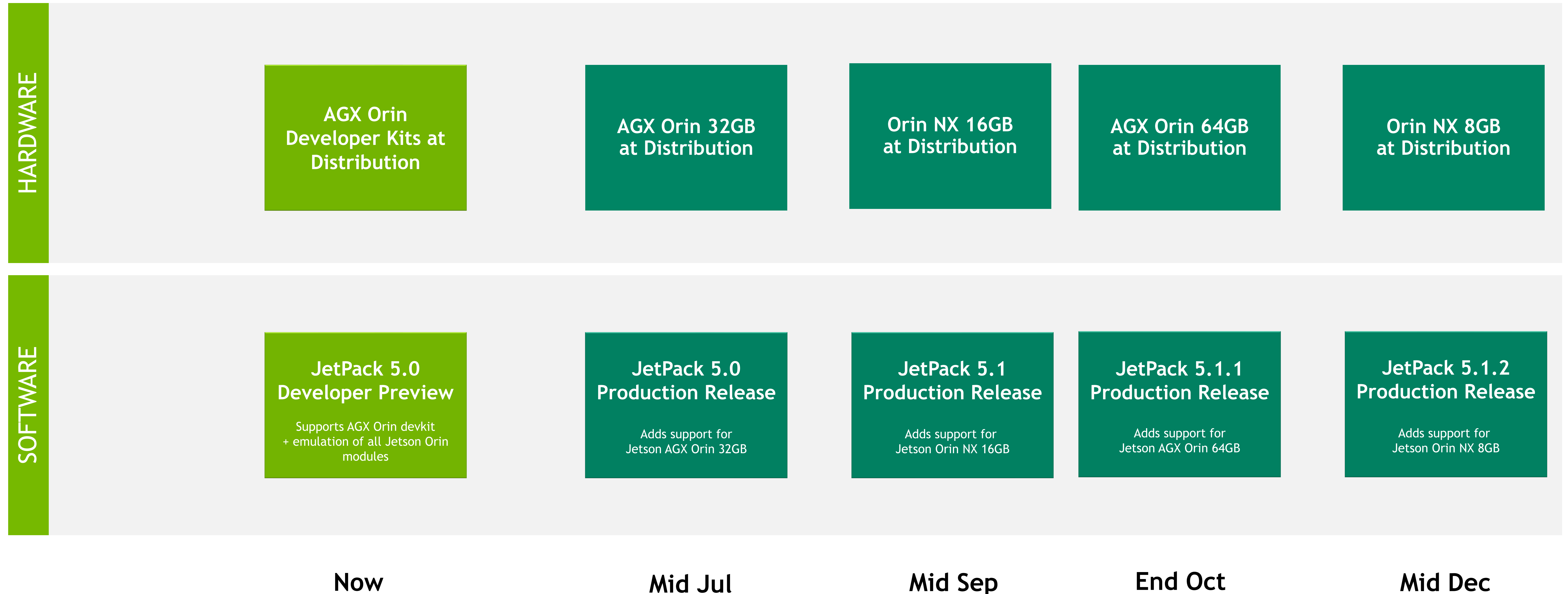
Sensors

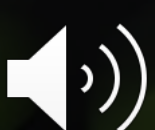
JETSON SOFTWARE



JETSON ORIN PRODUCTION MODULES AND SW RELEASE TIMELINE

■ Released ■ In Development





JETSON MODULES – SPEC COMPARISON (1 OF 3)

	NANO	TX2 NX	XAVIER NX*	ORIN NX 8GB	ORIN NX 16GB	AGX XAVIER**	AGX ORIN 32GB	AGX ORIN 64GB
GPU ARCH	MAXWELL	PASCAL	VOLTA	AMPERE	AMPERE	VOLTA	AMPERE	AMPERE
GPU CORES	128 CUDA Cores	256 CUDA Cores	384 CUDA Cores 48 Tensor Cores	1024 CUDA Cores 32 Tensor Cores	1024 CUDA Cores 32 Tensor Cores	512 CUDA Cores 64 Tensor Cores	1792 CUDA Cores 56 Tensor Cores	2048 CUDA Cores 64 Tensor Cores
PEAK AI PERF	0.5 TFLOPS	1.3 TFLOPS	21 TOPS (De)	70 TOPS (Sp) 35 TOPS (De)	100 TOPS (Sp) 50 TOPS (De)	32 TOPS (De)	200 TOPS (Sp) 100 TOPS (De)	275 TOPS (Sp) 138 TOPS (De)
CPU	4X A57 1.5 GHz	4X A57 + 2X D15 2.0 GHz	6X Carmel 2.0GHz	6X A78 2.0 GHz	8X A78 2.0 GHz	8X Carmel 2.2 GHz	8X A78 2.2 GHz	12X A78 2.2 GHz
SPEC int 2k6	9	14	18	25	25	22	25	25
SPEC int rate	16	27	61	130	167	140	177	259
DLA	NA	NA	2X DLA v1	1X DLA v2	2X DLA v2	2X DLA v1	2X DLA v2	2X DLA v2
VISION ACC	NA	NA	PVA v1	PVA v2	PVA v2	PVA v1	PVA v2	PVA v2
DRAM SIZE	4GB	4GB	8GB/16GB	8GB	16GB	32GB/64GB	32GB	64GB
DRAM BW	25 GB/s	51 GB/s	60 GB/s	102 GB/s	102 GB/s	137 GB/s	204 GB/s	204 GB/s
MECHANICAL	70x45 mm 260 pins	70x45 mm 260 pins	70x45 mm 260 pins	70x45 mm 260 pins	70x45 mm 260 pins	100x87 mm 699 pins	100x87 mm 699 pins	100x87 mm 699 pins
MODULE POWER	5W 10W	7W 15W	10W 15W 20W	10W 15W 20W	10W 15W 25W	15W 30W	15W 30W 40W	15W 30W 50W MAXPower 60W

* Refers to both Jetson Xavier NX and Jetson Xavier NX 16GB

** Refers to both Jetson AGX Xavier and Jetson AGX Xavier 64GB

JETSON MODULES – SPEC COMPARISON (2 OF 3)

	NANO	TX2 NX	XAVIER NX*	ORIN NX 8GB	ORIN NX 16GB	AGX XAVIER**	AGX ORIN 32GB	AGX ORIN 64GB
PCIe	1 x4 Gen2	1 x1 Gen2 1 x2 Gen2	1 x1 Gen3 1 x4 Gen4	3 x1 Gen4 1 x4 Gen4	3 x1 Gen4 1 x4 Gen4	1 x8 Gen4 1 x4 Gen4 1 x2 Gen4 2 x1 Gen4	2 x8 Gen4 1 x4 Gen4 2 x1 Gen4	2 x8 Gen4 1 x4 Gen4 2 x1 Gen4
USB	1x USB 3.1 (5 Gbps) 3x USB 2.0	1x USB 3.1 (5 Gbps) 3x USB 2.0	1x USB 3.1 (10 Gbps) 3x USB 2.0	3x USB 3.2 gen2 (10 Gbps) 3x USB 2.0	3x USB 3.2 gen2 (10 Gbps) 3x USB 2.0	3x USB 3.1 (10 Gbps) 4x USB 2.0	3x USB 3.2 gen2 (10 Gbps) 4x USB 2.0	3x USB 3.2 gen2 (10 Gbps) 4x USB 2.0
ETHERNET	1x GbE	1x GbE	1x GbE	1x GbE	1x GbE	1x GbE	1x GbE 4x 10GbE	1x GbE 4x 10GbE
CAMERA	12 lanes MIPI CSI-2 D-PHY 1.1 (18 Gbps)	12 lanes MIPI CSI-2 D-PHY 1.2 (30 Gbps)	12 lanes MIPI CSI-2 D-PHY 1.2 (30 Gbps)	8 lanes MIPI CSI-2 D-PHY 1.2 (20 Gbps) Use GMSL for 8x cameras	8 lanes MIPI CSI-2 D-PHY 1.2 (20 Gbps) Use GMSL for 8x cameras	16 lanes MIPI CSI-2 D-PHY 1.2 (40 Gbps) CPHY 1.1 (62 Gbps)	16 lanes MIPI CSI-2 D-PHY 2.1 (40 Gbps) C-PHY 2.0 (164 Gbps)	16 lanes MIPI CSI-2 D-PHY 2.1 (40 Gbps) C-PHY 2.0 (164 Gbps)
STORAGE	16GB eMMC	16GB eMMC	16GB eMMC	External NVMe Using x1 PCIe	External NVMe Using x1 PCIe	32GB eMMC	64GB eMMC	64GB eMMC
DISPLAY	2x 4K30	2x 4K60	2x 4K60	1 multi-mode (8K60, 2x4K60) DP1.4, HDMI2.1, eDP 1.4 HBR3, MST, DSCT)	1 multi-mode (8K60, 2x4K60) DP1.4, HDMI2.1, eDP 1.4 HBR3, MST, DSCT)	3x 4K60	1 multi-mode (8K60, 2x4K60) DP1.4, HDMI2.1, eDP 1.4 HBR3, MST, DSCT)	1 multi-mode (8K60, 2x4K60) DP1.4, HDMI2.1, eDP 1.4 HBR3, MST, DSCT)

* Refers to both Jetson Xavier NX and Jetson Xavier NX 16GB

** Refers to both Jetson AGX Xavier and Jetson AGX Xavier 64GB

JETSON MODULES – SPEC COMPARISON (3 OF 3)

	NANO	TX2 NX	XAVIER NX*	ORIN NX 8GB	ORIN NX 16GB	AGX XAVIER**	AGX ORIN 32GB	AGX ORIN 64GB
VIDEO ENCODE	H.265/H.264 1x4K30 2x1080p60 4x1080p30	H.265 1x4K60 3x4K30 4x1080p60 8x1080p30 H.264 1x4K60 3x4K30 7x1080p60 14x1080p30	H.265 2x4K60 4x4K30 10x1080p60 22x1080p30 H.264 2x4K60 4x4K30 10x1080p60 20x108p30 VP9 2x4K30 6x1080p60 14x108p30	AV1 1x4K60 2x4K30 5x1080p60 10x1080p30 H.265 1x4K60 2x4K30 5x1080p60 11x1080p30 H.264 1x4K60 2x4K30 5x1080p60 10x1080p30	AV1 1x4K60 2x4K30 5x1080p60 10x1080p30 H.265 1x4K60 2x4K30 5x1080p60 11x1080p30 H.264 1x4K60 2x4K30 5x1080p60 10x1080p30	H.265 4x4K60 8x4K30 16x1080p60 32x1080p30 H.264 4x4K60 8x4K30 14x1080p60 30x1080p30 VP9 2x4K60 4x4K30 10x1080p60 20x1080p30	AV1 1x4K60 2x4K30 5x1080p60 10x1080p30 H.265 1x4K60 3x4K30 6x1080p60 12x1080p30 H.264 1x4K60 2x4K30 5x1080p60 10x1080p30	AV1 2x4K60 4x4K30 7x1080p60 15x1080p30 H.265 2x4K60 4x4K30 8x1080p60 16x1080p30 H.264 2x4K60 4x4K30 7x1080p60 14x1080p30
	VIDEO DECODE	H.265/H.264 1x4K60 2x4K30 4x1080p60 4x1080p30	H.265/H.264 2x4K60 4x4K30 7x1080p60 14x1080p30	H.265 2x8K30 6x4K60 12x4K30 22x1080p60 44x1080p30 H.264 2x4K60 6x4K30 10x1080p60 22x1080p30 VP9 2x8K30 4x4K60 8x4K30 14x1080p60 30x1080p30	AV1 1x4K60 2x4K30 5x1080p60 10x1080p30 H.265 1x8K30 2x4K60 4x4K30 9x1080p60 18x1080p30 H.264 1x4K60 2x4K30 5x1080p60 11x1080p30 VP9 15x1080p30	AV1 1x4K60 2x4K30 5x1080p60 10x1080p30 H.265 1x8K30 2x4K60 4x4K30 9x1080p60 18x1080p30 H.264 1x4K60 2x4K30 5x1080p60 11x1080p30 VP9 15x1080p30	H.265 2x8Kp30 6x4K60 12x4K30 26x1080p60 52x1080p30 H.264 4x4K60 8x4K30 16x1080p60 32x1080p30 VP9 4x4K60 8x4K30 18x1080p60 38x 1080p30	AV1 1x4K60 2x4K30 5x1080p60 10x1080p30 H.265 1x8K30 2x4K60 4x4K30 9x1080p60 18x1080p30 H.264 1x4K60 2x4K30 5x1080p60 11x1080p30 VP9 15x1080p30

* Refers to both Jetson Xavier NX and Jetson Xavier NX 16GB
 ** Refers to both Jetson AGX Xavier and Jetson AGX Xavier 64GB

Specifications for Ampere generation products is preliminary and subject to Change