

**A205E Carrier Board**

**A205E User Guide**

Notice

Packing List

Interfaces

Software/BSP

Sample Applications

Develop Tool

## 1.1 Notice

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Please read manual carefully before install, operate, or transport device.

- Ensure that the correct power range is being used before powering the device.
- Avoid hot plugging.
- To properly turn off the power, please shut down the Ubuntu system first, and then cut off the power. Due to the particularity of the Ubuntu system, on the Nvidia developer kit, if the power is turned off when the startup is not completed, there will be a 0.03% probability of abnormality, which will cause the device to fail to start. Due to the use of the Ubuntu system, the same problem also exists on the device.
- Do not use cables or connectors other than described in this manual.
- Do not use device near strong magnetic fields.
- Backup your data before transportation or device is idle.
- Recommend to transport device in its original packaging.

## 1.2 Packing list

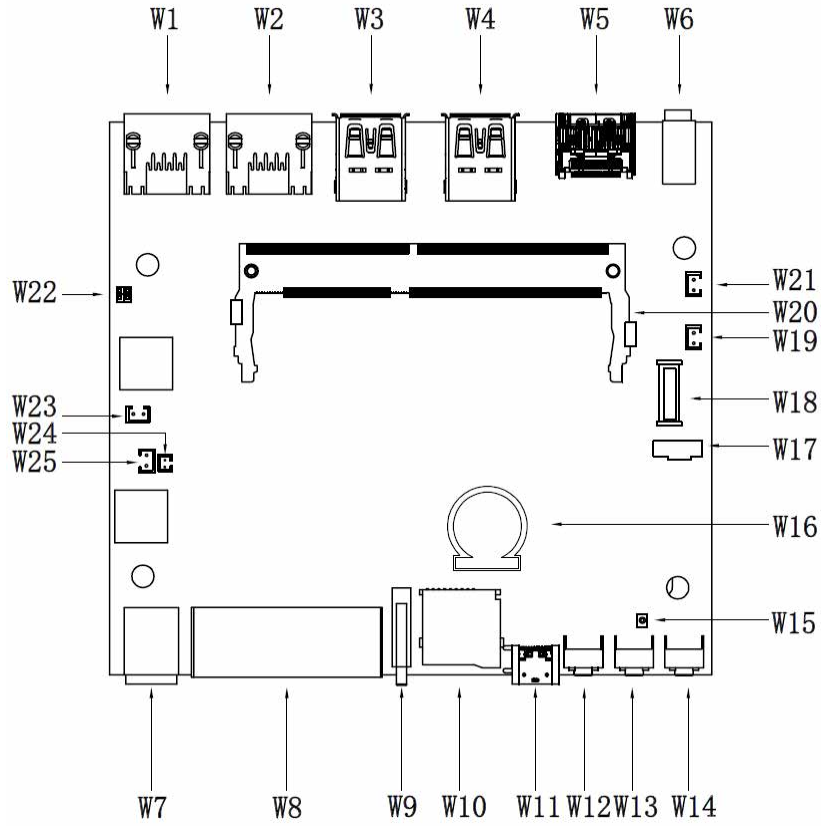
- A carrier board (A205E).
- Power supply without AC cord.

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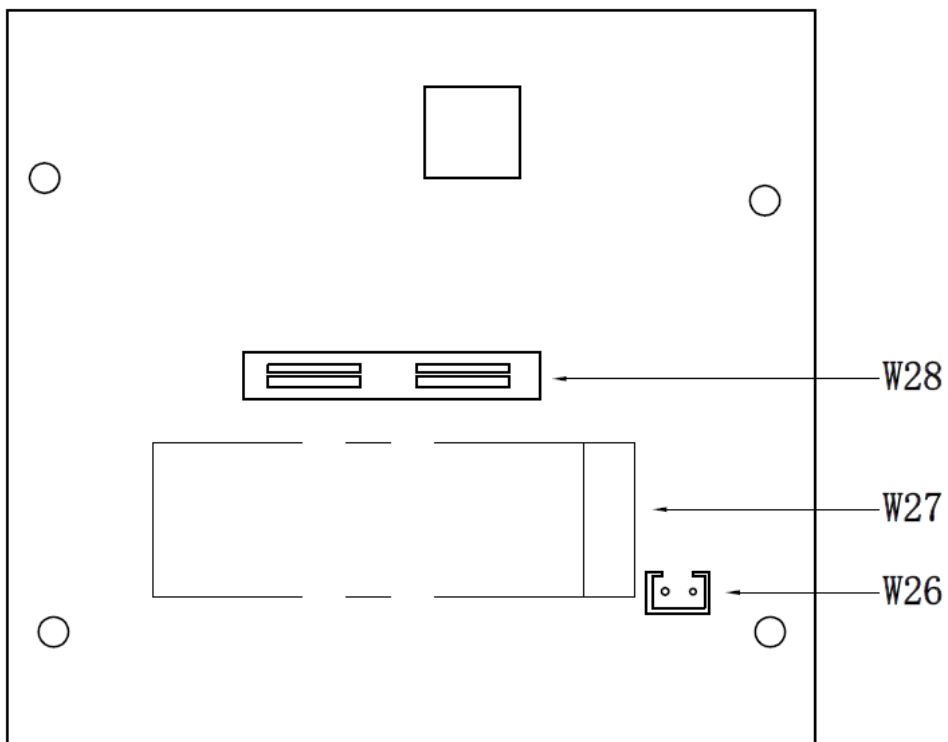
Note	Recommends using the Jetson A205e Development System only with the power supply provided. Using an incompatible power supply may damage the carrier board or the module or both. If you use another power supply in place of the one provided, you are responsible for ensuring that it is compatible with the 205E hardware.

# 1.3 A205E Development System INTERFACES

A205E Development System module and carrier board:



**1.3.1 A205e System carrier board: top view**



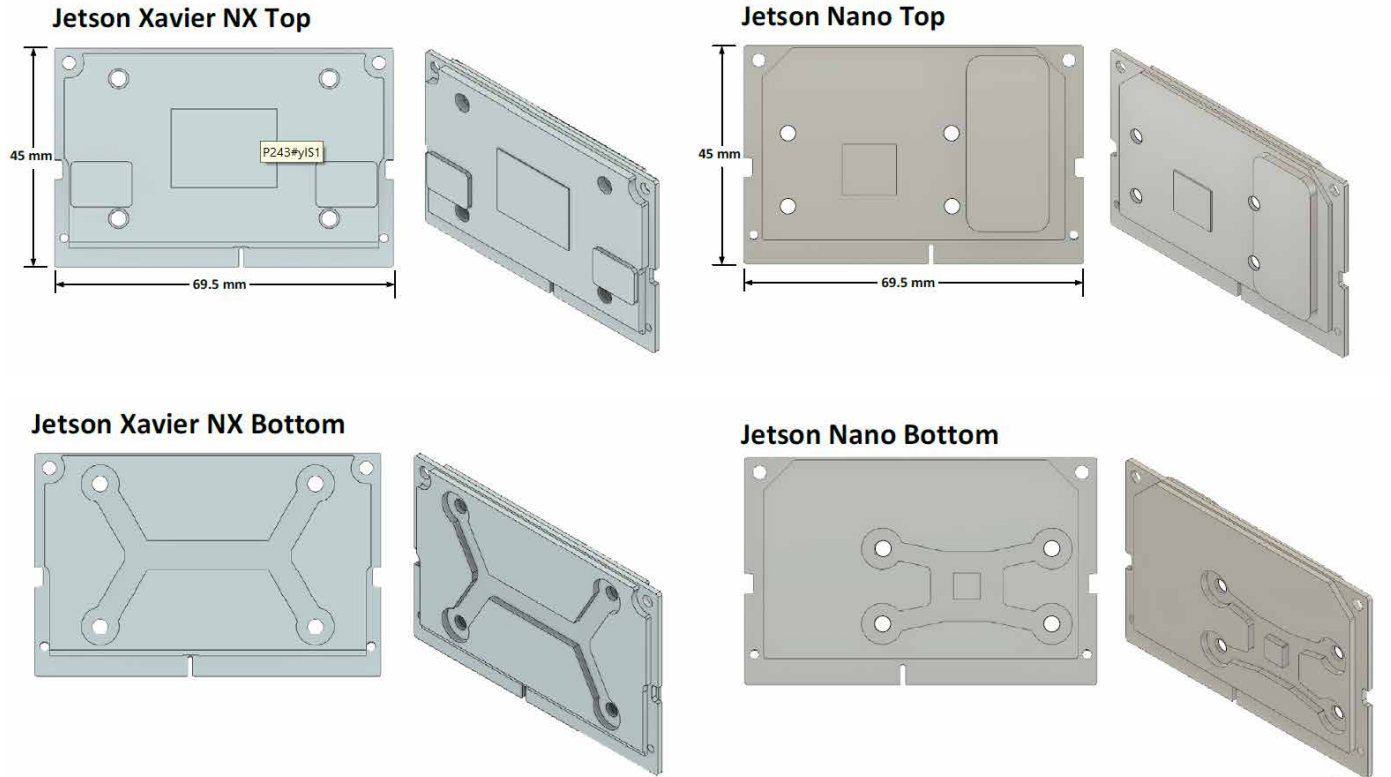
## 1.3.2 A205e System carrier board: bottom view

### 1.3.3 Interface Details

This section highlights some of the Jetson A205e Development System interfaces.

Designator	Connector	Description
W1 W2	RJ45 CON	RJ45 Gigabit Ethernet Connector (10/100/1000)
W3 W4	USB 3.0 CON	USB 3.0 Link 1 Type A Connector
W5	HDMI CON	HDMI Right Angle Vertical Connector
W6	Audio Jack	3.5 Earphone stand
W7	DC Jack	131010mm 6pins DC connector
W8	20PIN IO CON	3.5mm pitch
W9	LED indicator	
W10	TF Card	TF Card Slot
W11	TYPE C ( 2.0)	USB 2.0 Link TYPE C Connector
W12	RECOVERY KEY	
W13	RESET KEY	
W14	POWER KEY	
W15	WIFI/BT ANTCON	50 Ohms, MCRF, PCB Vertical Jack Receptacle, SMT, 1.25mm Mounted Height
W16	RTC CON	RTC battery Connector
W17	IIC CON	CON, 1.25mm PITCH, 4PIN, 4.7mm.SMD
W18	UDB2.0 CON	FPC 0.5MM 20P H=2MM
W19 W21	Speaker con	CON, 1.5mm PITCH, 2PIN, 5.1mm ,SMD
W20	NX CON	NVIDIA Jetson NX
W22	MCU CON	2.54mm 2X2
W23	5V DC CON	HDR_1X2 2.54MM
W25/W26	12V DC CON	HDR_1X2 2.54MM CON
<a href="#">W27</a>	SSD CON	67 pins M.2 KEY M connector
W28	CAMERA CON	CON_B2B_120_F_NORM-CON_QSH_SMT_2X60

### 1.3.3.1 Module (W0)



### 1.3.3.2 Carrier Board

- [W1W2] GbE

PIN	Signal Name	PIN	Signal Name
1	RJ45_TD_P	2	RJ45_TD_N
3	RJ45_RD_P	4	RJ45_TD1_P
5	RJ45_TD1_N	6	RJ45_RD_N
7	RJ45_RD1_P	8	RJ45_RD1_N
9	CGND	10	CGND

- [W1W2]USB3.0 (W3/W4)

PIN	Signal Name	PIN	Signal Name
1	VDD_5V0_IO	2	USB2_N
3	USB2_P	4,21,22	GND
5	USB2_RX_N	6	USB2_RX_P
7	GND	8	DSP2_TX_N1
9	DSP2_TX_P1	10	VDD_5V0_IO
11	USB1_N	12	USB1_P
13	GND	14	USB1_RX_N
15	USB1_RX_P	16,19,20,21,22	GND
17	DSP1_TX_N1	18	DSP1_TX_P1

- [W5] HDMI Jack

PIN	Signal Name	PIN	Signal Name
1	HDMI_TXD2_CON_P	2	GND
3	HDMI_TXD2_CON_N	4	HDMI_TXD1_CON_P
5	GND	6	HDMI_TXD1_CON_N
7	HDMI_TXD0_CON_P	8	GND
9	HDMI_TXD0_CON_N	10	HDMI_TXC_CON_P
11	GND	12	HDMI_TXC_CON_N
13	HDMI_CEC_CON	14	NC
15	HDMI_DDC_SCL_5V0	16	HDMI_DDC_SDA_5V0
17	GND	18	VDD_5V0_HDMI_CON
19	HDMI_HPD_CON	20,21,22,23	GND
21	HDMI1_TXD2_CON_P	22	GND
23	HDMI1_TXD2_CON_N	24	HDMI1_TXD1_CON_P
25	GND	26	HDMI1_TXD1_CON_N
27	HDMI1_TXD0_CON_P	28	GND
29	HDMI1_TXD0_CON_N	30	HDMI1_TXC_CON_P
31	GND	32	HDMI1_TXC_CON_N
33	HDMI1_CEC_CON	34	NC
35	HDMI1_DDC_SCL_5V0	36	HDMI1_DDC_SDA_5V0
37	GND	38	VDD_5V0_HDMI_CON
39	HDMI1_HPD_CON	40.41.42.43.44	GND

- [W6] Audio Jack

PIN	Signal Name	PIN	Signal Name
2	Microphone P	3	GND
4	HP_R	5	HP_L
6,7	AUD_HP_DET		

- [W7] DC Power Input Jack

PIN	Signal Name	PIN	Signal Name
1	+	2.3.4.5.6	GND

**Note:** After plugging in the power supply to turn on normally, LED lights up (red) DC +9V(8A) ~ +36V (2A)

- [W8] 20PIN IO CON

PIN	Signal Name	PIN	Signal Name
1	CAN_L	2	CAN_H
3	RS232_TX	4	RS232_RX
5	RS485_A	6	RS485_B
7	I2C1_SDA (3.3V)	8	I2C1_SCL(3.3V)
9	GND	10	3.3V
11	UART2_TXD_3V3	12	UART2_RXD_3V3
13	SPI0_MOSI_3V3	14	SPI0_SCK_3V3
15	SPI0_MISO_3V3	16	SPI0_CS0_3V3
17	SPI0_SC1_3V3	18	GPIO2_3V3
19	GND	20	5V

**Note:** UART2 is converted to 3.3V logic level by carrier board level conversion circuit; SPI0 is converted to 3.3V logic level by carrier board level conversion circuit; GPIO2\_3V3 is 3.3V logic level;

[W9] LED Red for power indicator, green for normal operation

[W10] TF CARD

PIN	Signal Name	PIN	Signal Name
1	SDCARD_D2	2	SDCARD_D3
3	SDCARD_CMD	4	VDD_3V3
5	SDCARD_CLK	6	GND
7	SDCARD_D0	8	SDCARD_D1
9	SD_DET	10,11,12,13	GND

- [W11] TYPE-C(2.0)

PIN	Signal Name	PIN	Signal Name
A1, A12, B1, B12	GND	A4, A9, B4, B9	5V VBUS
A5, B5,A8,B8	USB ID	A6, B6	USB D+
A7, B7	USB D-		

- [W12/W13/W14] Button

- 1)W12---- (RECOVERY)
- 2)W13---- (RESET)
- 3)W14---- (POWER KEY)



- [W15] WIFI/BT ANT CON

PIN	Signal Name	PIN	Signal Name
1	RF	2.3.4	GND

- [W16] RTC BATTERY CONNECTOR (W16)

PIN	Signal Name	PIN	Signal Name
1	VCC RTC	2	GND

- [W17] IIC

PIN	Signal Name	PIN	Signal Name
1	GND	2	3.3V
4	ID_I2C_SCL	5	ID_I2C_SDA

- [W18] 20PIN 0.5mm ZIF,USB2.0

PIN	Signal Name	PIN	Signal Name
1,2,3,4,5	VDD_5V	6	GND
7	D-	8	D+
9	GPIO1	10	GND
11	NC	12	NC
13	GND	14	NC
15	NC	16	GND
17	GPIO2	18	GND
19	GND	20	GND

- [W19/W21] Speaker con (W19/W21)

PIN	Signal Name	PIN	Signal Name
1	SPK-	2	SPK+

- [W20] NVIDIA NX interface

- [W22] MCU\_DOWNLOAD JACK

PIN	Signal Name	PIN	Signal Name
1	C2D	2	C2K
3	GND	4	ACOK

Note:

PIN4 (ACOK) and PIN3 (GND) short-circuit to turn off the power-on auto power-up

- [W23] 5V DC Power Jack (W23)

PIN	Signal Name	PIN	Signal Name
1	5V	2	GND

- [W24] FAN CON

PIN	Signal Name	PIN	Signal Name
1	GND	2	VDD_5V
3	FAN_TACH	4	FAN_PWM

- [W25/W26] 12V DC Power Jack (W25/W26)

PIN	Signal Name	PIN	Signal Name
1	12V	2	GND

- [W27] SSD CON

PIN	Signal Name	PIN	Signal Name
1	GND	2	3.3V
3	GND	4	3.3V
5	UPHY_RX5_N	6	NC
7	UPHY_RX5_P	8	NC
9	GND	10	NC
11	UPHY_TX5_N	12	3.3V
13	UPHY_TX5_P	14	3.3V
15	GND	16	3.3V
17	UPHY_RX4_N	18	3.3V
19	UPHY_RX4_P	20	NC
21	GND	22	NC
23	UPHY_TX4_N	24	NC
25	UPHY_TX4_P	26	NC
27	GND	28	NC
29	UPHY_RX3_N	30	NC
31	UPHY_RX3_P	32	NC
33	GND	34	NC
35	UPHY_TX3_N	36	NC
37	UPHY_TX3_P	38	NC
39	GND	40	I2C_GP4_CLK

PIN	Signal Name	PIN	Signal Name
41	UPHY_RX2_N	42	I2C_GP4_DAT
43	UPHY_RX2_P	44	GPIO34_M2_KEYM_ALERT
45	GND	46	NC
47	UPHY_TX2_N	48	NC
49	UPHY_TX2_P	50	PEX_L0_RST_N
51	GND	52	PEX_L0_CLKREQ_N
53	PEX_CLK0_N	54	GPIO29_M2_KEYM_PEWAKE
55	PEX_CLK0_P	56	NC
57	GND	58	NC
59	NC	60	32.768KHz OUT
61	NC	62	3.3V
63	GND	64	3.3V
65	GND	66	3.3V
67	GND	68	GND

- [W28] CAMERA CON

PIN	Signal Name	PIN	Signal Name
1	CSI_0_D0_P	2	CSI_1_D0_P
3	CSI_0_D0_N	4	CSI_1_D0_N
5	GND	6	GND
7	CSI_0_CLK_P	8	CSI_1_CLK_P
9	CSI_0_CLK_N	10	CSI_1_CLK_N
11	GND	12	GND
13	CSI_0_D1_P	14	CSI_1_D1_P
15	CSI_0_D1_N	16	CSI_1_D1_N
17	GND	18	GND
19	CSI_2_D0_P	20	CSI_3_D0_P
21	CSI_2_D0_N	22	CSI_3_D0_N
23	GND	24	GND
25	CSI_2_CLK_P	26	CSI_3_CLK_P
27	CSI_2_CLK_N	28	CSI_3_CLK_N
29	GND	30	GND

<b>PIN</b>	<b>Signal Name</b>	<b>PIN</b>	<b>Signal Name</b>
31	CSI_2_D1_P	32	CSI_3_D1_P
33	CSI_2_D1_N	34	CSI_3_D1_N
35	GND	36	GND
37	CSI_4_D0_P	38	CSI_6_D0_P
39	CSI_4_D0_N	40	CSI_6_D0_N
41	GND	42	GND
43	CSI_4_CLK_P	44	CSI_6_CLK_P
45	CSI_4_CLK_N	46	CSI_6_CLK_N
47	GND	48	GND
49	CSI_4_D1_P	50	CSI_6_D1_P
51	CSI_4_D1_N	52	CSI_6_D1_N
53	GND	54	GND
55	NC	56	NC
57	NC	58	NC
59	CSI_5_D0_P	60	NC
61	CSI_5_D0_N	62	NC
63	GND	64	GND
65	CSI_5_CLK_P	66	NC
67	CSI_5_CLK_N	68	NC
69	GND	70	GND
71	CSI_5_D1_P	72	NC
73	CSI_5_D1_N	74	NC
75	CAM_I2C_SCL	76	NC
77	CAM_I2C_SDA	78	NC
79	GND	80	GND
81	2.8V	82	2.8V
83	2.8V	84	TEST PIONT
85	NC	86	NC
87	NC	88	CAM2_MCKL
89	NC	90	CAM3_PWDN
91	CAM1_MCKL	92	GPIO10

PIN	Signal Name	PIN	Signal Name
93	CAM1_PWDN	94	GPIO11
95	CAM2_PWDN	96	NC
97	CAM6_PWDN (PIN126)	98	NC
99	GND	100	GND
101	TEST PIONT	102	1.8V
103	NC	104	NC
105	NC	106	NC
107	NC	108	3.3V
109	TEST PIONT	110	3.3V
111	NC	112	NC
113	NC	114	NC
115	GND	116	GND
117	NC	118	3.3V
119	PWM2 ( PIN 206)	120	3.3V
121-128	GND		

### 1.3.4 PHYSICAL CONFIGURATION INSTRUCTIONS

To prepare your Jetson A205E System for use, connect it as follows:

- Connect an external HDMI display to the carrier board's HDMI port.
- Connect a USB keyboard and mouse.
- Connect the 205E to your local network via Ethernet cable to the carrier board's Ethernet port.
  - Connect the included AC adapter to the carrier board's power jack. Plug the AC adapter into an appropriately rated electrical outlet.
  - Use only the supplied AC adapter, as it is appropriately rated for your device.

## 1.4 Software /BSP

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### 1.4.1 Software configuration

- **NVIDIA Linux For Tegra (L4T)**

A205E System supports native NVIDIA Linux for Tegra (l4t) builds. HDMI, Gigabit Ethernet, USB3.0, USB OTG, serial port, GPIO, SD card, I2C bus can be supported, and can run directly on A205 . Please note that the native system does not support PWM mode to control the fan. If the native system is used, ipcall-bsp must be deployed. LT4 can be downloaded from the following link:<https://developer.nvidia.com/embedded/linux-tegra>

Note:

The native system does not support PWM control of the fan, if you use the native system you must deploy IPCall-BSP

- **NVIDIA Jetpack for L4T**

Jetpack is a software package released by NVIDIA, The latest jetpack runs on Ubuntu 18.04 Linux 64 bit host and can be downloaded from the following link:<https://developer.nvidia.com/embedded/jetpack>

#### **Default configuration system**

A205E System with Ubuntu 18.04, default **username: nvidia password: nvidia**

### 1.4.2 Installation of Jtop tools

Jtop is a system monitoring utility for Jetson that can be run on a terminal to view and control the status of NVIDIA Jetson in real time.

Installation steps:

1. Installing the pip3 tool

```
1 | sudo apt-get install python3-pip
```

2. Installing jtop packages with pip3

```
1 | sudo -H pip3 install -U jetson-stats
```

3. Restart to run jtop

```
1 | jtop
```

## 1.4.3 Developer Tools

### 1.4.3.1 [JetPack](#)

NVIDIA JetPack SDK is the most comprehensive solution for building AI applications. It bundles Jetson platform software including TensorRT, cuDNN, CUDA Toolkit, VisionWorks, GStreamer, and OpenCV, all built on top of L4T with LTS Linux kernel.

JetPack includes NVIDIA container runtime, enabling cloud-native technologies and workflows at the edge.

[JetPack SDK](#) [Cloud-Native on Jetson](#)

### 1.4.3.2 [L4T](#)

NVIDIA L4T provides the Linux kernel, bootloader, NVIDIA drivers, flashing utilities, sample filesystem, and more for the Jetson platform.

You can customize L4T software to fit the needs of your project. By following the [platform adaptation and bring-up guide](#), you can optimize your use of the complete Jetson product feature set. Follow the links below for details about the latest software libraries, frameworks, and source packages.

### 1.4.3.3 [DeepStream SDK on Jetson](#)

NVIDIA's DeepStream SDK delivers a complete streaming analytics toolkit for AI-based multi-sensor processing, video and image understanding. DeepStream is an integral part of [NVIDIA Metropolis](#), the platform for building end-to-end services and solutions that transform pixel and sensor data to actionable insights. Learn about the latest 5.0 developer preview features in our [developer news article](#).

### 1.4.3.4 [Isaac SDK](#)

The NVIDIA Isaac SDK makes it easy for developers to create and deploy AI-powered robotics. The SDK includes the Isaac Engine (application framework), Isaac GEMs (packages with high-performance robotics algorithms), Isaac Apps (reference applications) and Isaac Sim for Navigation (a powerful simulation platform). These tools and APIs accelerate robot development by making it easier to add artificial intelligence (AI) for perception and navigation into robots.

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## 1.5 KEY FEATURES IN JETPACK

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OS	<p>NVIDIA L4T provides the bootloader, Linux kernel 4.9, necessary firmwares, NVIDIA drivers, sample filesystem based on Ubuntu 18.04, and more.</p> <p>JetPack 4.6.1 includes L4T 32.7.1 with these highlights:</p> <p>Support for Jetson AGX Xavier 64GB and Jetson Xavier NX 16GB</p>
TensorRT	<p>TensorRT is a high performance deep learning inference runtime for image classification, segmentation, and object detection neural networks. TensorRT is built on CUDA, NVIDIA' s parallel programming model, and enables you to optimize inference for all deep learning frameworks. It includes a deep learning inference optimizer and runtime that delivers low latency and high-throughput for deep learning inference applications.</p>
cuDNN	<p>CUDA Deep Neural Network library provides high-performance primitives for deep learning frameworks. It provides highly tuned implementations for standard routines suchas forward and backward convolution, pooling, normalization, and activation layers.</p>
CUDA	<p>CUDA Toolkit provides a comprehensive development environment for C and C++ developers building GPU-accelerated applications. The toolkit includes a compiler for NVIDIA GPUs, math libraries, and tools for debugging and optimizing the performance of your applications.</p>
Multimedia API	<p>The Jetson Multimedia API package provides low level APIs for flexible application development.</p> <p>Camera application API: libargus offers a low-level frame-synchronous API for camera applications, with per frame camera parameter control, multiple (including synchronized) camera support, and EGL stream outputs. RAW output CSI cameras needing ISP can be used with either libargus or GStreamer plugin. In either case, the V4L2 media-controller sensor driver API is used.</p>
Computer Vision	<p>VPI (Vision Programing Interface) is a software library that provides Computer Vision / Image Processing algorithms implemented on PVA1 (Programmable Vision Accelerator), GPU and CPU</p> <p>OpenCV is a leading open source library for computer vision, image processing and machine learning.</p> <p>VisionWorks2 is a software development package for Computer Vision (CV) and image processing.</p> <p>JetPack 4.6.1 includes VPI 1.2</p>



Developer Tools	<p>CUDA Toolkit provides a comprehensive development environment for C and C++ developers building high-performance GPU-accelerated applications with CUDA libraries. The toolkit includes Nsight Eclipse Edition, debugging and profiling tools including Nsight Compute, and a toolchain for cross-compiling applications.</p> <p>NVIDIA Nsight Systems is a low overhead system-wide profiling tool, providing the insights developers need to analyze and optimize software performance.</p>
Supported SDKs and Tools	<p>NVIDIA DeepStream SDK is a complete analytics toolkit for AI-based multi-sensor processing and video and audio understanding. DeepStream SDK 6.0 supports JetPack 4.6.1</p> <p>NVIDIA Triton™ Inference Server simplifies deployment of AI models at scale. Triton Inference Server is open source and supports deployment of trained AI models from NVIDIA TensorRT, TensorFlow and ONNX Runtime on Jetson. On Jetson, Triton Inference Server is provided as a shared library for direct integration with C API.</p>
Cloud Native	<p>Jetson brings Cloud-Native to the edge and enables technologies like containers and container orchestration. NVIDIA JetPack includes NVIDIA Container Runtime with Docker integration, enabling GPU accelerated containerized applications on Jetson platform.</p> <p>NVIDIA hosts several container images for Jetson on NVIDIA NGC. Some are suitable for software development with samples and documentation and others are suitable for production software deployment, containing only runtime components. Find more information and a list of all container images at the Cloud-Native on Jetson page.</p>

### 1.5.0.5 Sample Applications

JetPack includes several samples which demonstrate the use of JetPack components. These are stored in the reference filesystem and can be compiled on the developer kit.

JetPack component	Sample locations on reference filesystem
TensorRT	/usr/src/tensorrt/samples/
cuDNN	/usr/src/cudnn_samples_/
CUDA	/usr/local/cuda-/samples/
Multimedia API	/usr/src/tegra_multimedia_api/
VisionWorks	/usr/share/visionworks/sources/samples/ /usr/share/visionworks-tracking/sources/samples/ /usr/share/visionworks-sfm/sources/samples/
OpenCV	/usr/share/OpenCV/samples/
VPI	/opt/nvidia/vpi/vpi-/samples

## 1.5.0.6 Developer Tools

JetPack includes the following developer tools. Some are used directly on a Jetson system, and others run on a Linux host computer connected to a Jetson system.

- Tools for application development and debugging:
  - NSight Eclipse Edition for development of GPU accelerated applications: Runs on Linux host computer. Supports all Jetson products.
  - CUDA-GDB for application debugging: Runs on the Jetson system or the Linux host computer. Supports all Jetson products.
  - CUDA-MEMCHECK for debugging application memory errors: Runs on the Jetson system. Supports all Jetson products.
- Tools for application profiling and optimization:
  - NSight Systems for application multi-core CPU profiling: Runs on the Linux host computer. Helps you improve application performance by identifying slow parts of code. Supports all Jetson products.
  - NVIDIA® Nsight™ Compute kernel profiler: An interactive profiling tool for CUDA applications. It provides detailed performance metrics and API debugging via a user interface and command line tool.
  - NSight Graphics for graphics application debugging and profiling: A console-grade tool for debugging and optimizing OpenGL and OpenGL ES programs. Runs on the Linux host computer. Supports all Jetson products.