ADLINK
Leading EDGE COMPUTING

# Evolving a New Generation of Robotics: from Automation to Autonomy




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# The Future of Robotic-based Systems

Ongoing advances in robotics are making human-machine collaboration and unmanned vision easier to achieve. Highly-integrated secure environments enable robotic systems to more easily recognize and respond to diverse environments. These systems are becoming more adaptive and flexible, allowing them to access instructions and information more intelligently. AI-enabled real-time, system-wide communications boost performance significantly, such that, as the systems get smarter, a wider variety of complex tasks can be accomplished.

| | | |
|---|---|---|
| Easy-Integration | Scalability | Security |
| Real-time Communication | Intelligence | High Performance |






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**A** **ROScube-X**

- High AI computing
- Low power consumption

**B** **ROScube-I**

- Mainstream architecture for ROS 2 development
- Deal with complex algorithms with CPU

**C** **ROScube-A**

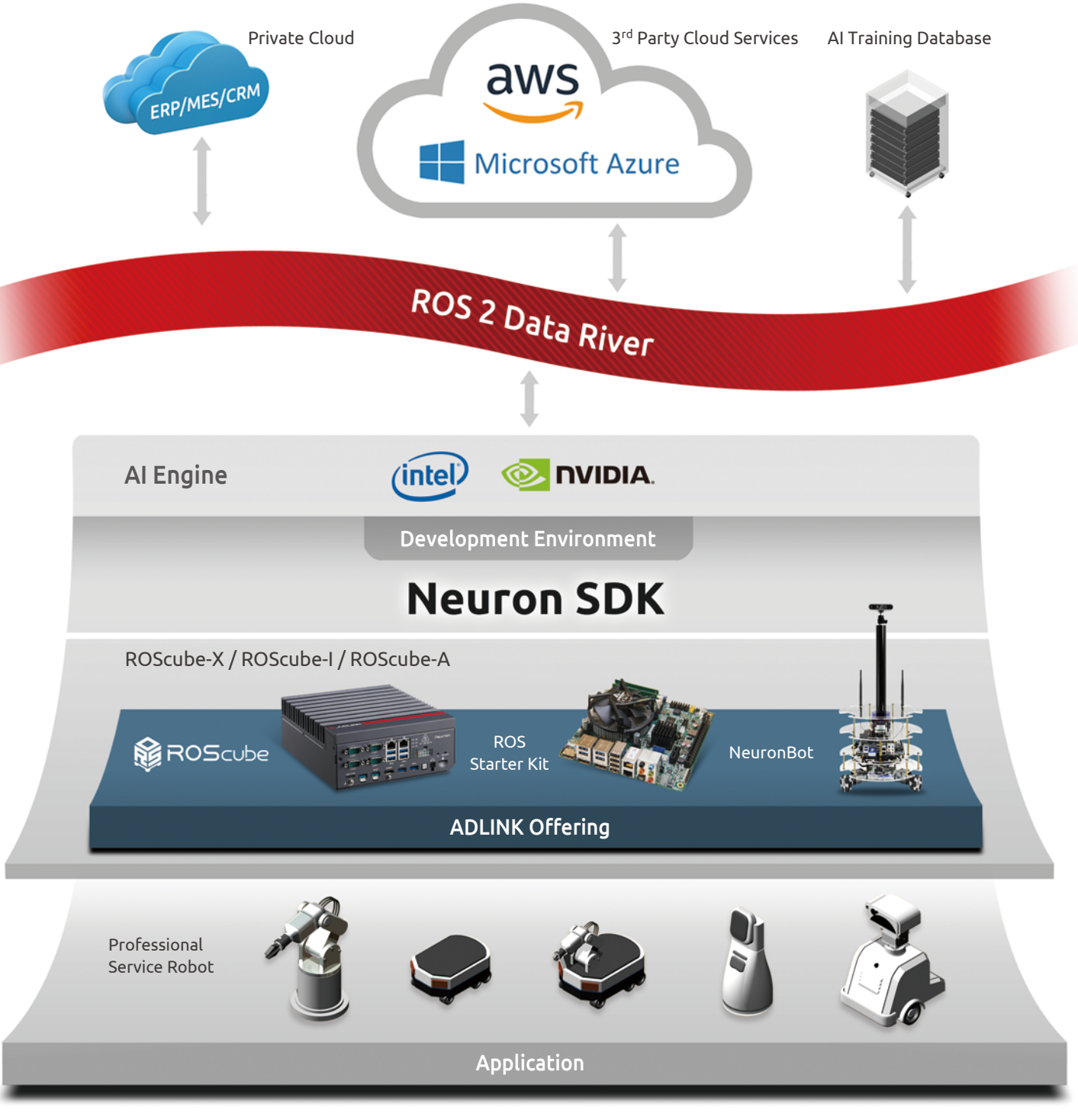
- Cost-efficient for mass production
- Comprehensive I/O for sensors connection



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# ADLINK's ROS 2 Robotics Solutions

ADLINK robotics solutions allow users to develop complex robotic applications with minimal investment outlay, whereby they enjoy the benefits of various AI engines, development environments, flexible hardware systems, and evolving Data Distribution Service.






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## How we can help you?

ADLINK can help create value-added robotic offerings pre-integrated with ROS 2-based tools, architected with modular packages for easy, optimized integration

- **Easy integration**
- **AI-enabled**
- **Optimized ROS environment**
- **Speedy time-to-market**

## Why ADLINK?

### Simplified System Integration

Rich tool/module portfolios and ROS 1/ ROS 2 compatible environment make it easy to integrate application requirements across multiple hardware, software package, and service types.

### Reduced Total Cost of Ownership (TCO)

End-to-end expenditure, from purchase to disposal, including expected costs of service, repair, and warranty can be decreased significantly.

### Enhanced Communications

System-wide communications connect multiple devices via DDS.

## Where can you use this solution?

- **Factory – AGV, AMR, AMIR**
- **Warehouse – AGV, AMR, AMIR**
- **Hotel – Automatic delivery service robot**
- **Hospital – Automatic delivery service robot**
- **Shopping mall – Surveillance service robot**
- **School – Surveillance service robot**






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# ADLINK's Powerful ROS 2 Development Kit

The ADLINK Neuron SDK, delivering powerful development capabilities, is fully compatible with both ROS 1 and 2, featuring an optimized environment providing full access to hundreds of open source robotic algorithms, achieving rapid development for faster time-to-market.

- **Powerful development tool**
- **Six QoS message management Enabled**
- **High performing data delivery with advanced DDS**

### Hardware

LiDar
Motor
Camera
Sensor
Arm
…..



### Tool

Rviz Nodegraph
RQT TF monitor
Catkin

### ROScube BSP

Unified
hardware API

### Optimized ROS 2 Core

QoS
- History
- Depth
- Reliability
- Durability
- Ownership
- Transport Priority

Event handler improvement

## ROS/ROS 2

## ADLINK Neuron SDK

### Simulation

Gazebo
AWS RoboMaker
Microsoft Azure

### Library Tool

OpenNI
OpenSLAM
OpenCV
OMPL
PCL
MoveIt
…..

### Advanced DDS Implementation

- Basic DDS Pub-Sub mechanism
- Internal process speed up
- DDS standard QoS
- Compatible with DDSI-RTPS™ Version: 2.2
- Support multicast communication



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# ADLINK meets every user's needs

## Enterprise Users

### Seeking speedy entry into the robotics-enabled market ADLINK provides:

**ROScube-X**

Powerful AI computing for intelligent robotics development




- High-end AI based autonomous application

**ROScube-I**

Mainstream architecture for Professional Service robotics development



- Mainstream robotics application

**ROScube-A**

Cost-efficient for mass production application of Automated Guided Vehicles (AGV)



- Cost-effective for mass production



## Development Users

### Pursuing development opportunities with open source availability ADLINK provides:

- ROS Starter Kit
- NeuronBot
- Training course





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# ROScube-X

## ROS 2-enabled robotic controller based on NVIDIA® Jetson AGX Xavier™ module

ADLINK's ROScube-X , powered by the Xavier module, features integrated Volta GPU and dual deep learning accelerators, with a wide variety of interfaces for robotic system integration. ROScube-X supports the full complement of resources developed with the NVIDIA JetPack SDK and ADLINK's ROScube-X, and is specifically suited for robotic applications demanding high-AI computing with minimal power consumption.




- Strong AI-based computing with power consumption as low as 20 W
- Compatible with ARM-based ROS 2 environment
- Ruggedized, secure connectivity with locking USB ports

| ROScube-X | |
|---|---|
| **System Core** | |
| Processor | NVIDIA® Jetson AGX Xavier™ |
| Memory | On board 16GB |
| eMMC | 32GB on module |
| **Graphics** | |
| Graphic Output | 1x HDMI |
| **Front Panel I/O Interface** | |
| Ethernet | 2x GbE |
| USB 3.1 GEN2 | 1 |
| USB 3.1 GEN1 | 6 |
| Serial Port | 1x RS232/485 + 3x RS-232 |
| **Side Panel I/O Interface** | |
| GPIO | 20 bit |
| Other control signals | UART, SPI, CAN, I2C, PWM |
| **Storage Device** | |
| M.2 Extension | 1x Key B+M 3042/2280 |
| SD Card | 1x µSD |
| **Optional Expansion** | |
| Expansion I/O | Optional 1x PCIex8 + 1x PCIex4 |
| **Power Requirements** | |
| DC Input | 9-36V |
| AC Input | Optional 280W adapter |
| Fail Reset | Recovery / Reset |
| Power LED Indicator | Storage / WDT |
| **Mechanical** | |
| Dimensions | Core module: 190mm (W) x 210mm (D) x 80mm (H) |
| | With expansion box: 322mm (W) x 210mm (D) x 80mm (H) |
| Weight | 4 / 5 kg |
| Mounting | Wall mount |
| **Environmental** | |
| Operating Temperature | 0°C ~ 50°C |
| Operating Humidity | 95% @40˚C (non-condensing) |
| Storage Temperature | -40°C to 85˚C |
| **Software** | |
| Software Development Kit | ADLINK Neuron SDK |
| Environment | ROS 1/ROS 2 |
| Middleware | ADLINK Opensplice DDS |



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# ROScube-I

## ROS 2-enabled robotic controller based on Intel® Core™ processors

The ADLINK ROScube-I exceptional I/O connectivity enables a wide variety of sensors and actuators for endless robotic applications. Also supported are AI computation platforms like Intel VPU and Nvidia GPU card for AI algorithms and inference. ROScube-I is a perfect platform for development of industrial use service robotic applications such as autonomous mobile robots (AMR) and autonomous mobile industrial robots (AMIR).




- X86/64 mainstream architecture for ROS 2 development
- Comprehensive I/O for unlimited device type connection
- Ruggedized, secure connectivity with locking USB ports

| ROScube-I | |
|---|---|
| **System Core** | |
| Processor | Intel® Core™ i7-8850H/i5-8400H |
| Memory | 4GB /8GB /16GB |
| **Graphics** | |
| Graphic Output | 1x HDMI |
| **Front Panel I/O Interface** | |
| Ethernet | 2x GbE |
| USB 3.1 GEN1 | 6 |
| Serial Port | 1x RS232/485 + 3x RS-232 |
| **Side Panel I/O Interface** | |
| GPIO | 20 bit |
| Other Control Signals | UART, SPI, CAN, I2C, PWM |
| **Storage Device** | |
| M.2 Extension | 1x Key B+M 3042/2280 |
| SD Card | 1x MicroSD |
| **Optional Expansion** | |
| Expansion Cassette | Optional 1x PCIe x16 + 1x PCIe x4 |
| **Power Requirements** | |
| DC Input | 9-36V |
| AC Input | Optional 280W adapter |
| Fail Reset | Recovery / Reset |
| Power LED Indicator | Storage / WDT |
| **Mechanical** | |
| Dimensions | Core module: 190mm (W) x 210mm (D) x 80mm (H) |
| | With expansion box: 322mm (W) x 210mm (D) x 80mm (H) |
| Weight | 4 / 5 kg |
| Mounting | Wall mount |
| **Environmental** | |
| Operating Temperature | 0°C ~ 50°C |
| Operating Humidity | 95% @40°C (non-condensing) |
| Storage Temperature | -40°C to 85°C |
| **Software** | |
| Software Development Kit | ADLINK Neuron SDK |
| Environment | ROS 1/ ROS 2 |
| Middleware | ADLINK Opensplice DDS |



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# ROScube-A

## ROS 2-enabled robotic controller powered by Intel Atom® processors

ADLINK's ROScube-A, supporting full compatibility with ROS 2, is based on Intel® Atom™ processing, resulting in significantly reduced power consumption. The ROScube-A platform utilizes DDS to provide secure real-time connectivity throughout the entire system. Rich I/O connects a wide variety of sensors and actuators to the platform to create a deployed purpose ROS 2 controller or develop a general purpose automated guided vehicle (AGV).

- Cost-efficient
- Efficient deployment for automated guided vehicles (AGV)
- Ruggedized, secure connectivity with locking USB ports




| ROScube-A | |
|---|---|
| **System Core** | |
| Processor | Intel Atom® E3950/E3930 |
| Memory | 4GB /8GB |
| **Graphics** | |
| Graphic Output | 1x HDMI |
| **Front Panel I/O Interface** | |
| Ethernet | 2x GbE |
| USB 3.1 GEN1 | 6 |
| Serial Port | 1x RS232/485 + 3x RS-232 |
| **Side Panel I/O Interface** | |
| GPIO | 20 bit |
| Other Control Signals | UART, SPI, CAN, $I^2C$, PWM |
| **Storage Device** | |
| M.2 Extension | 1x Key B+M 3042/2280 |
| SD Card | 1x MicroSD |
| **Optional Expansion** | |
| Expansion Cassette | - |
| **Power Requirements** | |
| DC Input | 9-36V |
| AC Input | Optional 160W adapter |
| Fail Reset | Recovery / Reset |
| Power LED Indicator | Storage / WDT |
| **Mechanical** | |
| Dimensions | 190mm (W) x 210mm (D) x 80mm (H) |
| Weight | 4 kg |
| Mounting | Wall mount |
| **Environmental** | |
| Operating Temperature | 0°C ~ 50°C |
| Operating Humidity | 95% @40°C (non-condensing) |
| Storage Temperature | -40°C to 85°C |
| **Software** | |
| Software Development Kit | ADLINK Neuron SDK |
| Environment | ROS 1/ROS 2 |
| Middleware | ADLINK Opensplice DDS |



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# ROS Starter Kit

## Mini-ITX and open source software deliver full ROS/ ROS 2 functionality

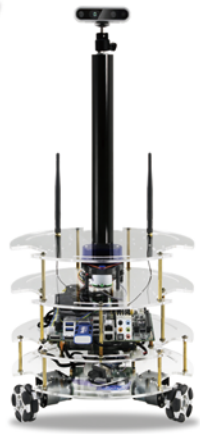
The ADLINK ROS Starter Kit features flexible connectivity with a wide range of I/O ports and support for AI computation platforms. In addition, compatibility with open source ROS 1/ROS 2 supports full access to open-source application libraries for robot control, including vision, navigation, and motion control, for quick realization of ROS 1/ROS 2 function.



# NeuronBot

## Integrated ROS starter kit and robotic module enabling smart robotic development

The NeuronBot constitutes an assembly of 4 different modules, each fulfilling vision, control, AI or motion functions. Users can quickly learn to code by controlling the robot with powerful open source ROS libraries and packages.



| ROS Starter Kit | |
|---|---|
| **System Core** | |
| Processor | 6th/7th generation Intel® Core™ i7/i5/i3 processors |
| | Intel® Pentium®/Celeron® processors |
| Memory | 4GB /8GB /16GB/32GB |
| **Display** | |
| DisplayPort | 3 ports with resolution up to 4096 x 2160 pixels resolution |
| **Front Panel I/O Interface** | |
| Ethernet | 2x GbE |
| USB 3.0 | 4x USB 3.0 on rear I/O |
| | 2x USB 3.0 onboard header |
| | 1x USB 3.0 on vertical connector with keep out area for dongle |
| USB 2.0 | 4x USB 2.0 on rear I/O |
| Serial Port | 1x RS-232/422/485 via onboard header |
| | 3x RS-232 via onboard headers |
| **Side Panel I/O Interface** | |
| GPIO | 10 GPIO via onboard feature connector |
| Other Control Signals | $I^2C$ |
| **Storage Device** | |
| Serial ATA | 64GB/128GB/256GB |
| **Optional Expansion** | |
| Expansion Slots | 1 PCIe x16 Gen3 |
| | 1 PCIe x1 Gen2 |
| | 1 Mini PCIe (full size slot) supporting PCIe + USB or mSATA |
| | 1 Mini PCIe (half size slot) supporting PCIe + USB |
| **Power Requirements** | |
| DC Input | 24V ±5% |
| AC Input | Optional 160W adapter |
| **Mechanical** | |
| Dimensions | 170mm (W) x 170mm (D) |
| Weight | 500 g |
| **Environmental** | |
| Operating Temperature | 0˚C~ 60˚C |
| Operating Humidity | 10%~95% (non-condensing) |
| Storage Temperature | -20˚C~80˚C |
| **Software** | |
| Environment | ROS 1/ROS 2 |
| Middleware | ADLINK Opensplice DDS |

| NeuronBot | |
|---|---|
| **ADLINK ROS Starter Kit** | |
| Processor | Intel® Celeron® processor |
| Memory | 4GB |
| Storage | 64GB |
| **Vehicle Dynamics and Motor Controller** | |
| MCU | Cortex M3 |
| IMU | MPU6050 6-axis IMU: Gyro / Accelerometer |
| **Sensor** | |
| LiDAR | EAI YDLidar-X4 |
| **Depth camera** | |
| Camera | Intel RealSense D435 |
| **Power Requirements** | |
| Battery capacity | 4200 mAh |
| **Mechanical** | |
| Base plate diameter | 33 mm |
| Height | 265 mm |
| Weight | 5 kg |
| Actuators | 4.32 watt DC motor |
| **Software** | |
| Environment | ROS 1/ROS 2 |
| Middleware | ADLINK Opensplice DDS |



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ADLINK ROS 2 development platform is an Intel® IoT RFP Ready Kit. Intel® IoT RFP Ready Kits are focused technology offerings that solve a class of market problems, have been deployed and tested in the field, and provide bundled hardware, software, and support. The technology is scalable, and designed to grow with customer requirements-enabling accelerated development and time to market. Intel is working with partners including ADLINK to develop and deliver these innovative RFP Ready Kit Solutions so that we can empower businesses to achieve real results, today.


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