

ADLINK Neuron: An industrial oriented ROS2-based platform

ROS-Industrial America Annual Meeting

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Building Forward Together














ADLINK Overview



ADLINK Overview

Over 20 Years of Embedded Experience

 <p>Established August 1995</p>	 <p>CEO Jim Liu CTO Angelo Corsaro</p>	 <p>Headquarters in Taipei, Taiwan</p>
 <p>Publicly Traded Since 2002</p>	 <p>Taiwan Stock Exchange Listing TAIEX: 6116</p>	 <p>Revenue (USD) \$301M (Y2016) \$340M (Y2017, F)</p>
 <p>>1800 Employees</p>	 <p>USA • Germany (2) France • Singapore India • China (3) Korea • Japan Israel • UK</p>	 <p>Capital (USD) \$67.5M Market Cap (USD) \$500M</p>

Vertical Markets & Key Customers



**Industrial
Automation**



**Test &
Measurement**



**Medical /
Healthcare**



Transportation



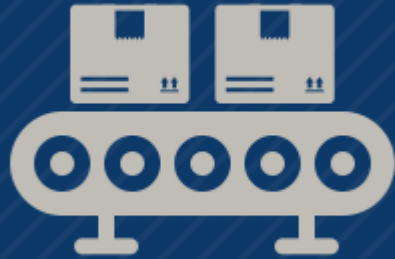
**Telecom &
Networking**



**Military &
Aerospace**



← **Customers Across Vertical Markets** →



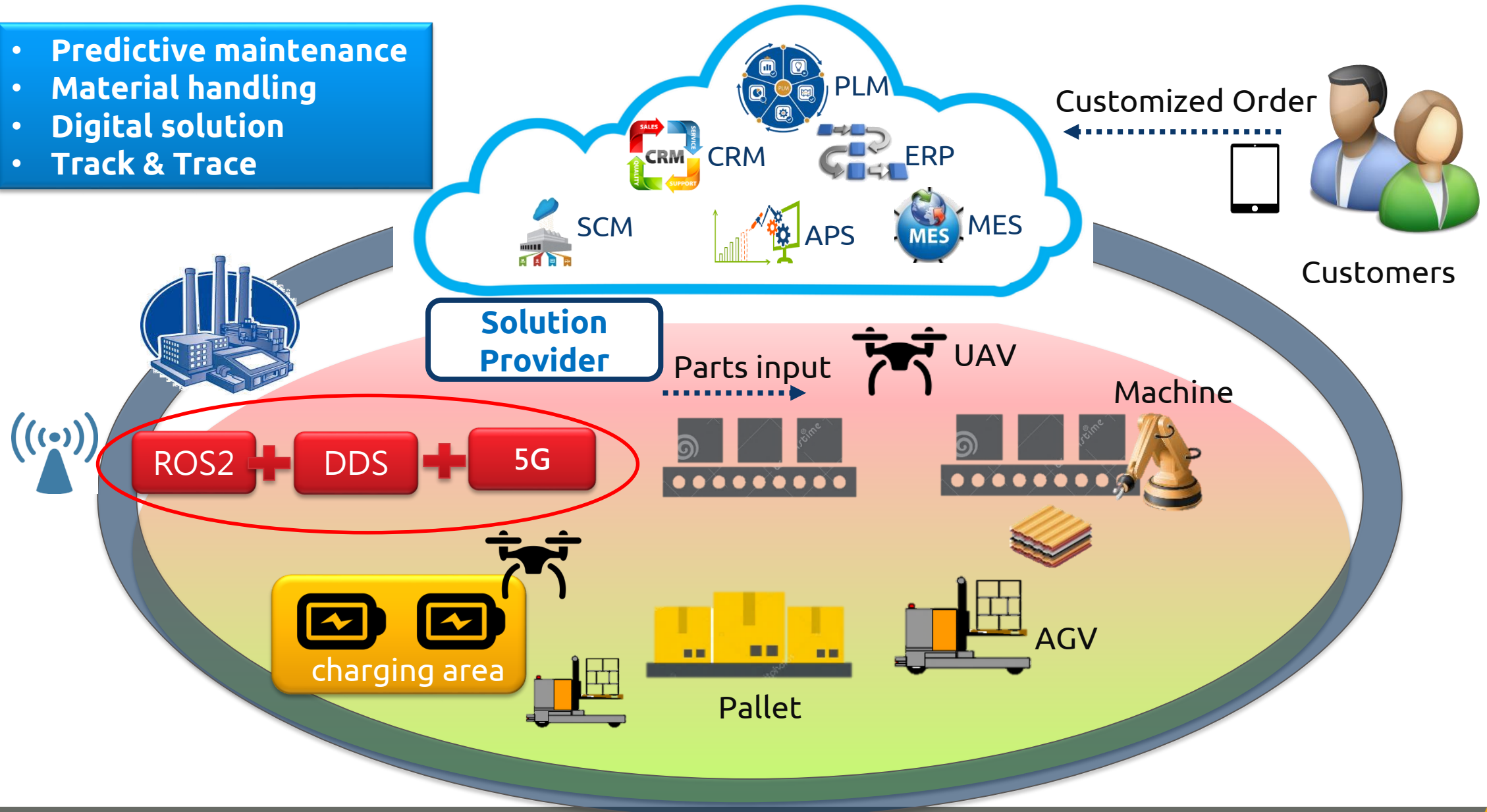
Massive Production



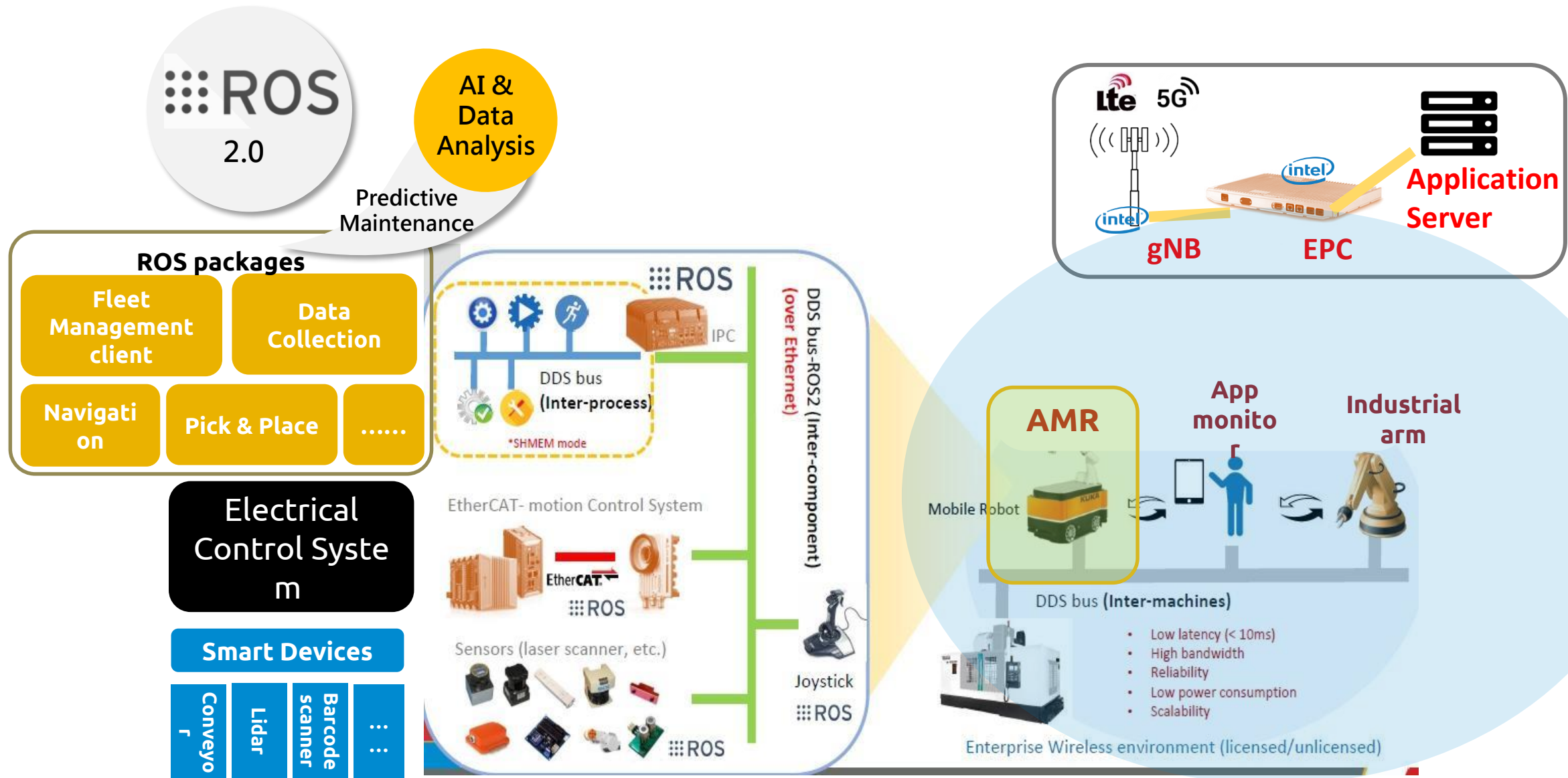
Individual Production

Factories of the Future (FoF)

- Predictive maintenance
- Material handling
- Digital solution
- Track & Trace



Autonomous Mobile Robot in FoF



ROS 2 with OpenSplice DDS



Application



....



ROS client library (& drivers)

3D data
processing

Localization
and mapping

Computer
Vision

Robot control

Motion
planning

ROS abstract middleware layer (RMW)



DDS

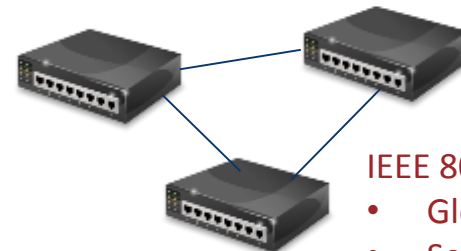
Vortex OpenSplice
Commercial version

Vortex OpenSplice
Community version

Vortex
XRCE

Time Deterministic Network

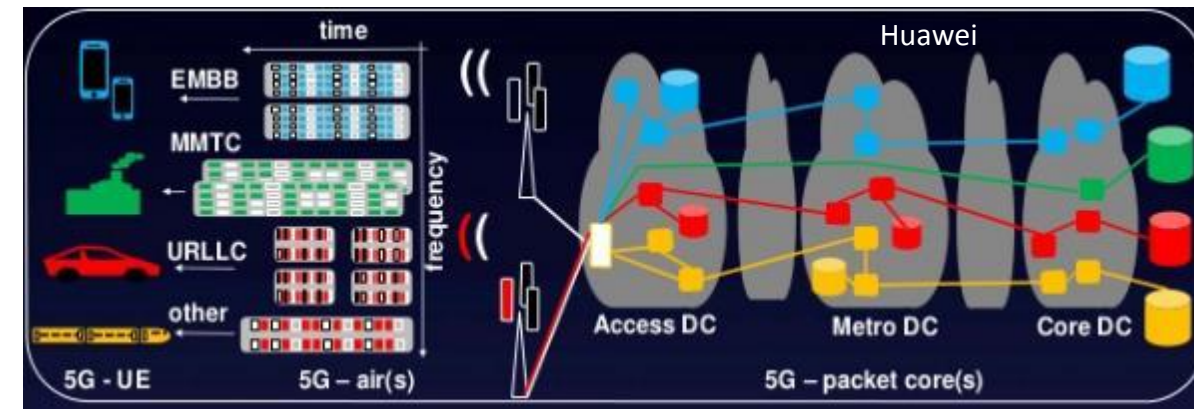
(Guaranteed Latency)



IEEE 802.1

- Global time
- Schedule

TSN (Ethernet)

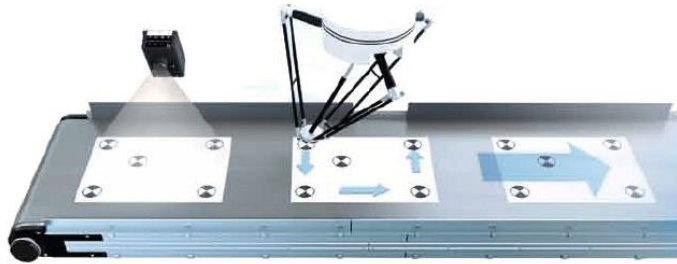


5G (Wireless)

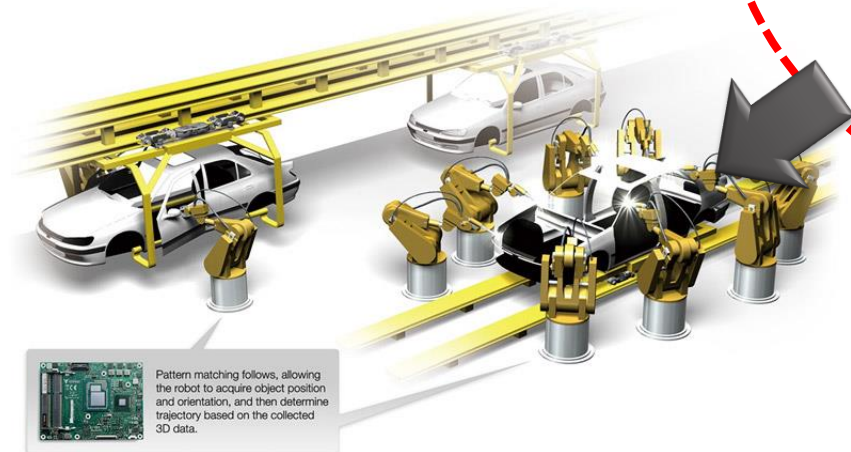
ADLINK ROS-2 Industry-Grade Products



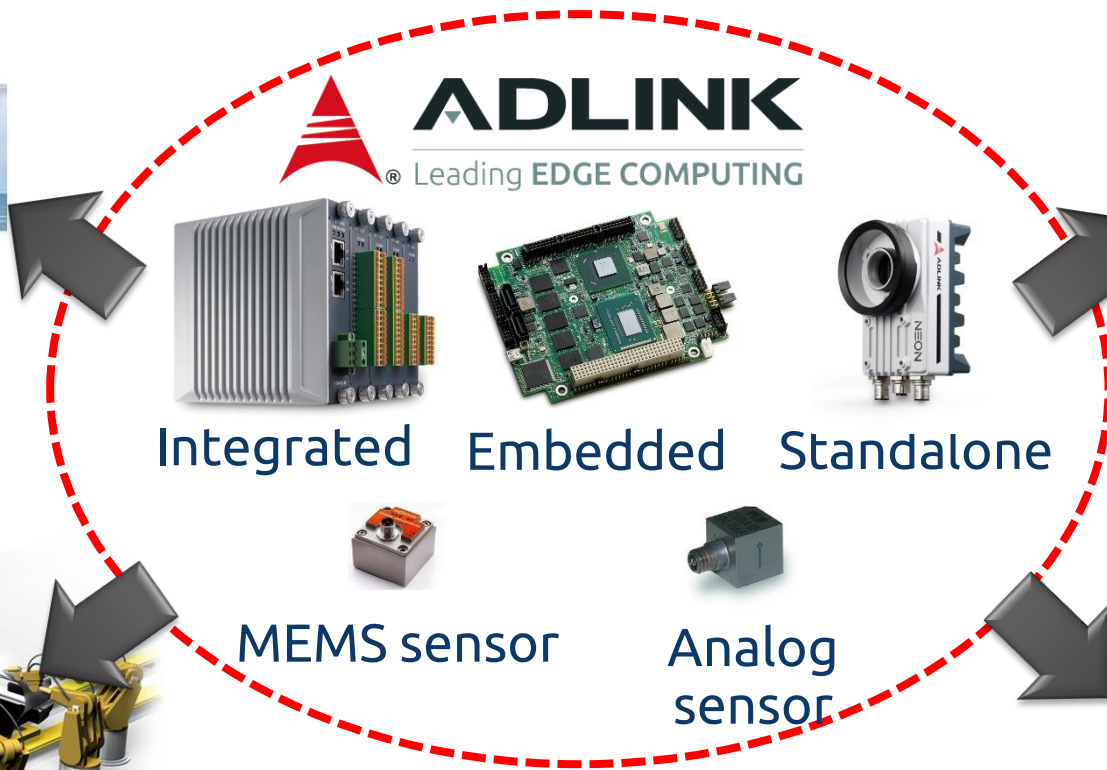
Motion, Vision, Measurement



ROS-based arm and camera for inspection and picking



Embedded ROS-based PC for industrial arms



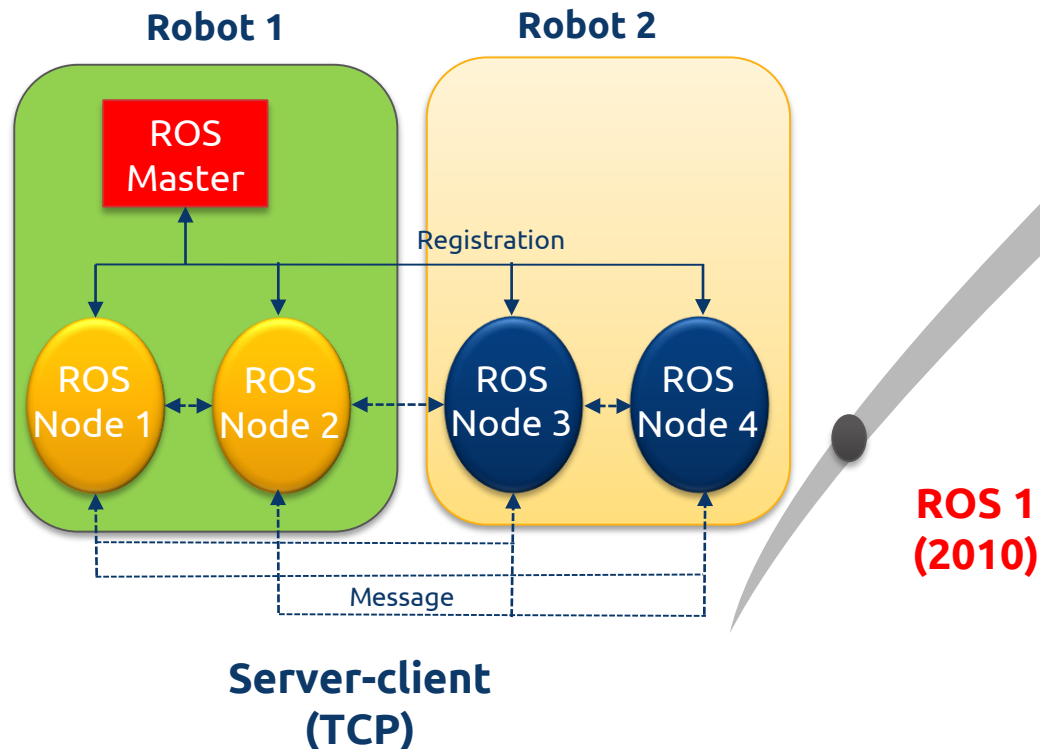
Machine condition monitoring robots



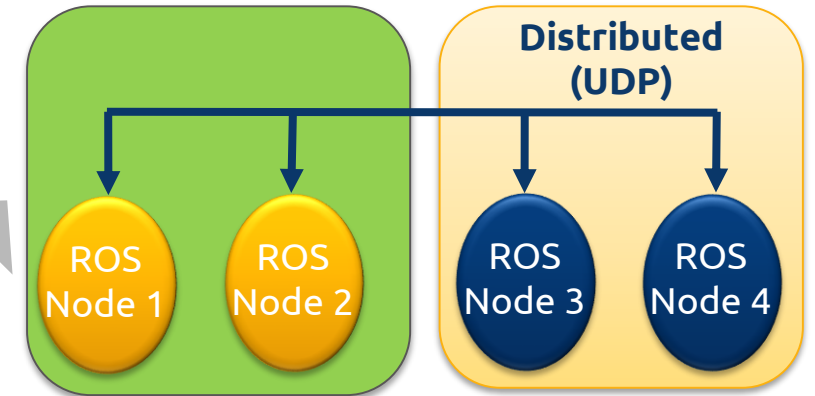
ADLINK ROS-based PC for AMR

Toward Distributed, Autonomous Way !

- ROS 1 Standalone
- ROS 2 coordination among machines, adopt **DDS (pub-sub)**



ROS 2
(2014)



ROS 2 removes the Master Node

- Real-time
- Powerful QoS
- Standard tech.
- Dynamic discovery)

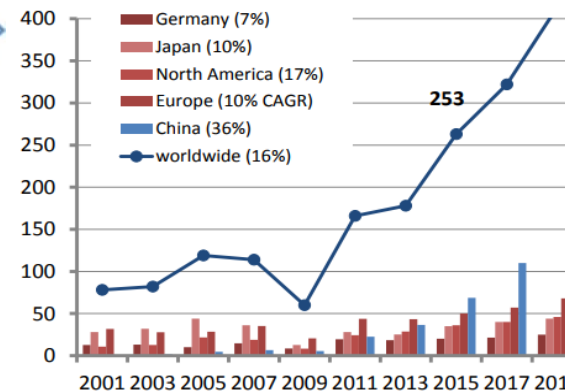
ROS 2
Merit

ADLINK Neuron

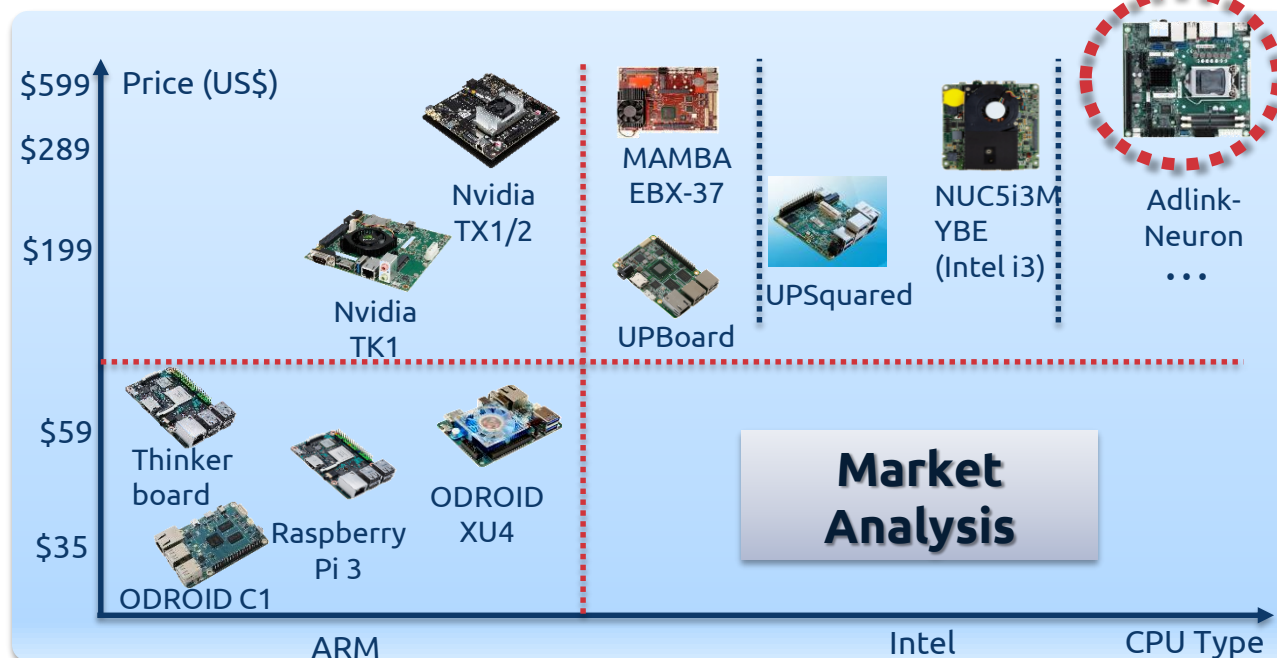


ADLINK Neuron

An industrial oriented ROS2-based platform



www.worldrobotics.org, September 2016



CPU: i7/5/3, **Celeron**
 RAM: 4~32G (DDR4)
 SSD: 32G ~ (mSATA)
 PCIe x16 gen3 * 1
 PCIe x1 gen2 * 1

RS232 * 3, RS485 * 1, GPIO * 10, USB 3/2 * 4 (both)
 GbE port * 2, miniPCIe * 2, Input: 12 or 5 Volt

- **OpenSplice DDS fine tuning (shared memory)**
- **Real-time kernel (Xenomai)**
- **ROS supported sensors integration/testing**
- **ROS 1(Kinetic) & ROS 2 (GPIO control node)**

ADLINK Neuron



An industrial oriented ROS2-based platform

Hardware

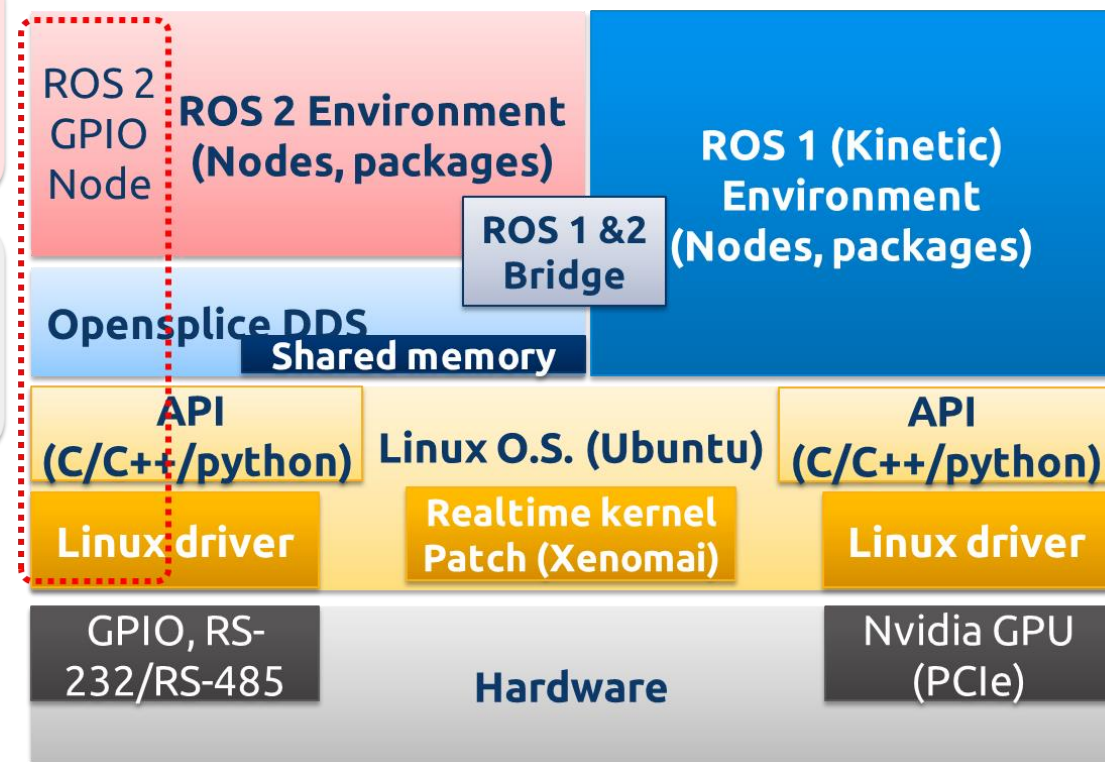
- Replaceable CPU & Extensible RAM
- RS-232 x4 & RS-485 x2★
- PCIe x16 Gen3.0 (Nvidia GPU)★
- Two standalone USB 3.0 ports
- GPIO 10 pins & I2C, SPI★

Kernel & Middleware

- Realtime OS (Xenomai)★
- Linux drivers maintenance (Nvidia GPU)
- GPIO integration/testing (API for users)
- PrismTech DDS fine tuning (**shared memory**)★
- ROS supported sensors integration/testing

Software

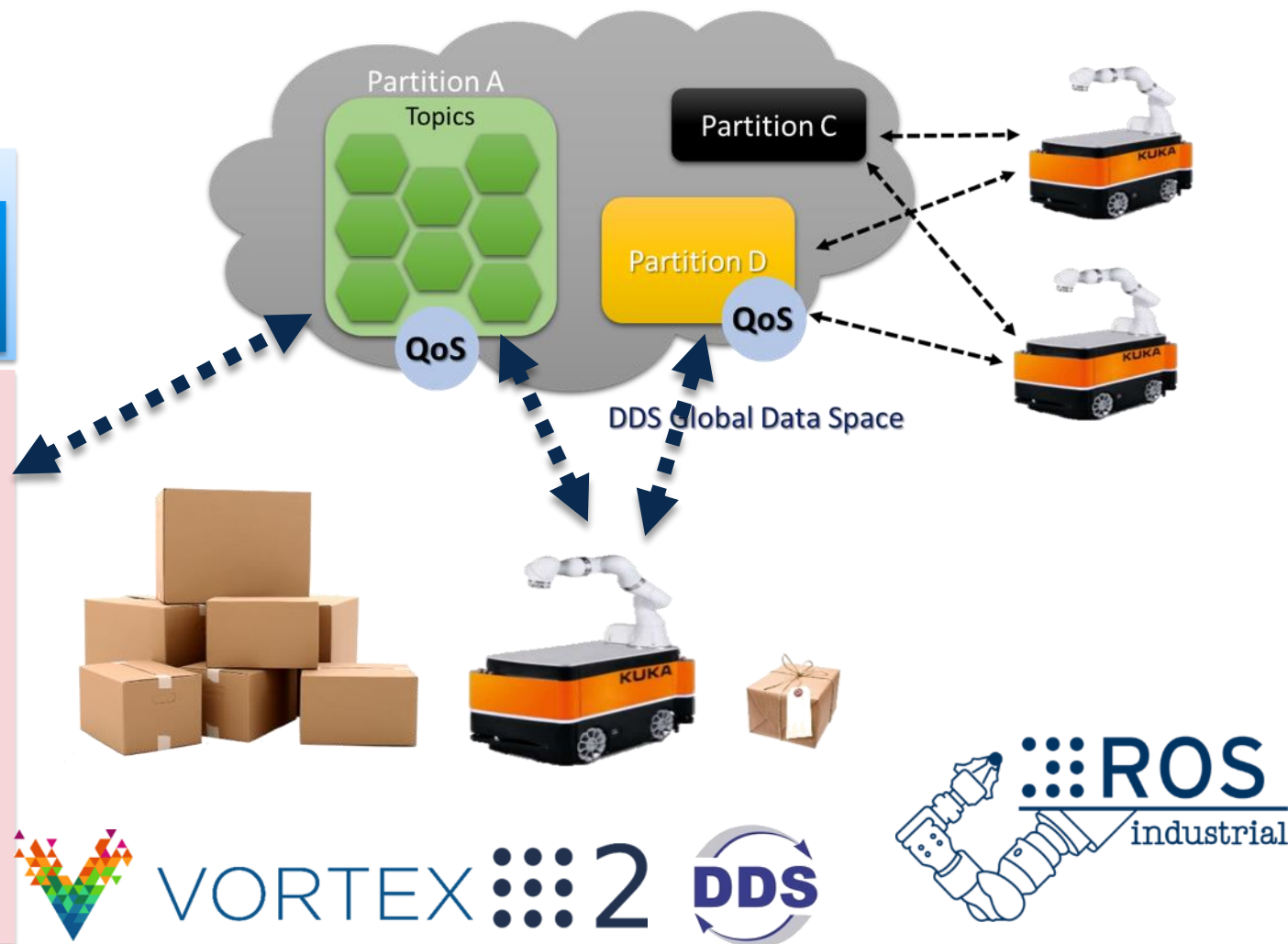
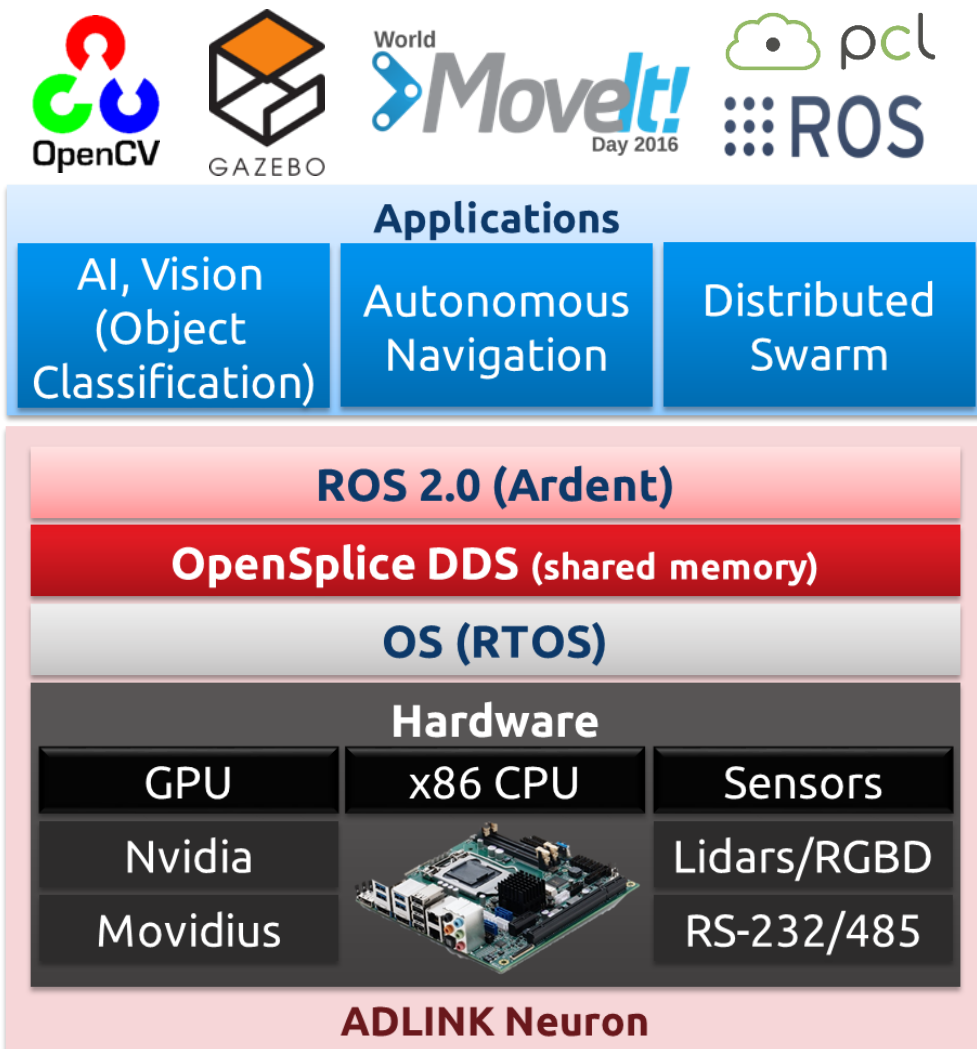
- Pre-configured OS image (Ubuntu)
- ROS 1(Kinetic) & ROS 2 (released)
- ROS 2 nodes for I/O control★
- ROS demo scripts (VSLAM, Navigation...) ★



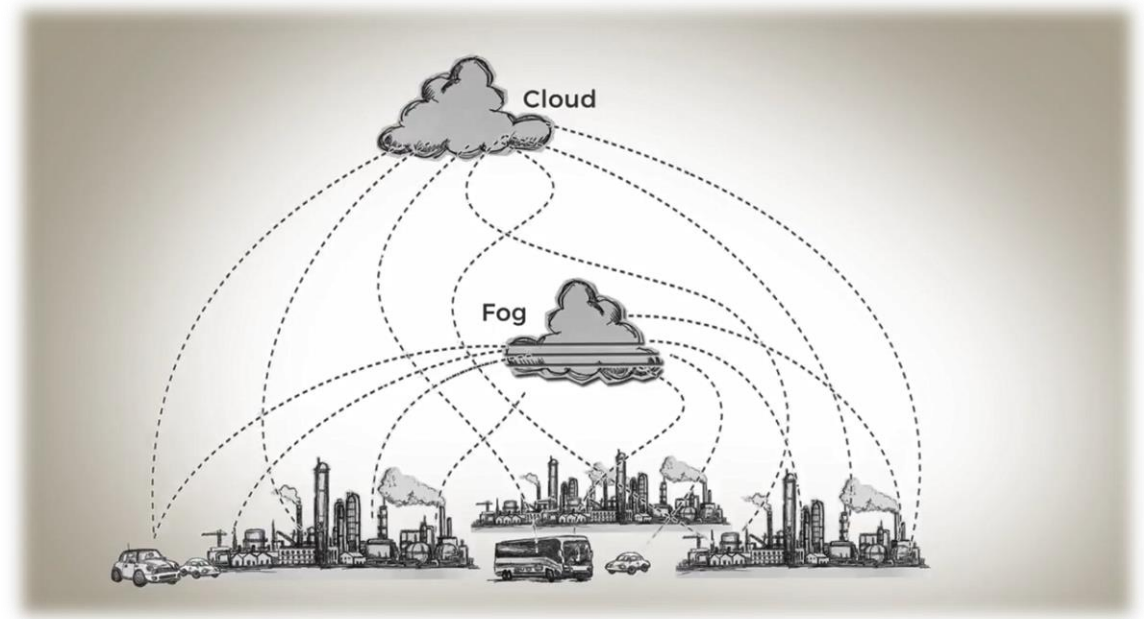
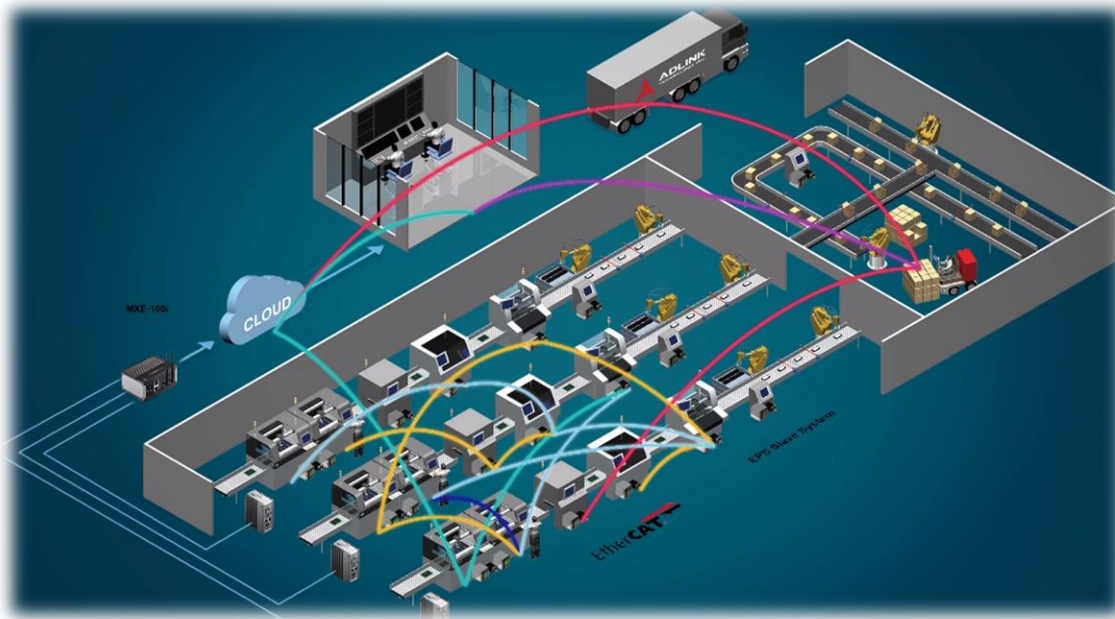
ADLINK Neuron



An industrial oriented ROS2-based platform



Cases & Demo: DDSBot



ADLINK Neuron Use Cases



Real Implementation/Cases

- **Fog/Edge Computing Test-bed**
(ROS2/DDS for cooperative SLAM)
- **AMR/AGV onboard computer**
(ROS2/DDS for multi robots collaboration)
(Realtime implementation & robotic arm manipulator)
- **Smart Grid**
(DDS node for each Electric Tower)
- **Agriculture Factory**
(ROS2/DDS node for each industrial machine)

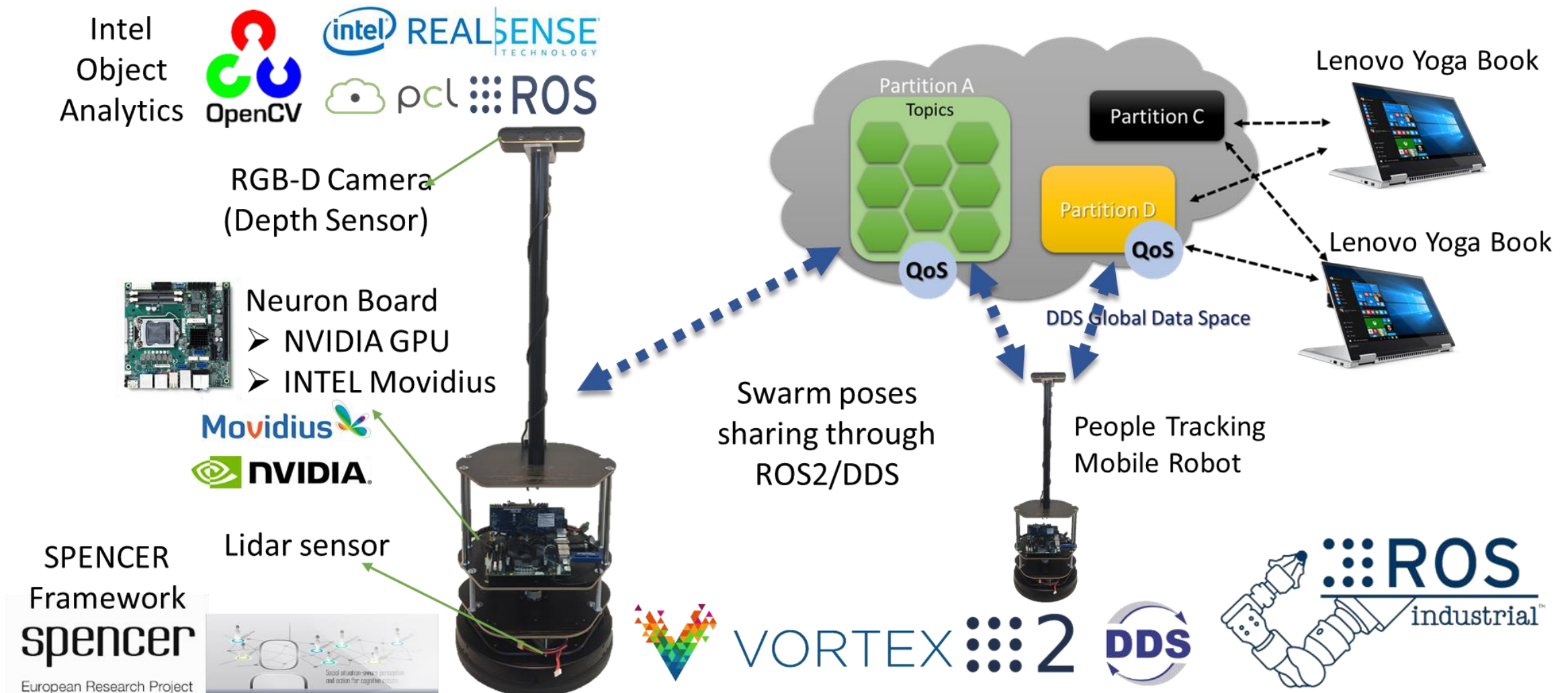


ADLINK NeuronBot



ROS 1.0/2.0 based swarm robots architecture

Architecture Overview

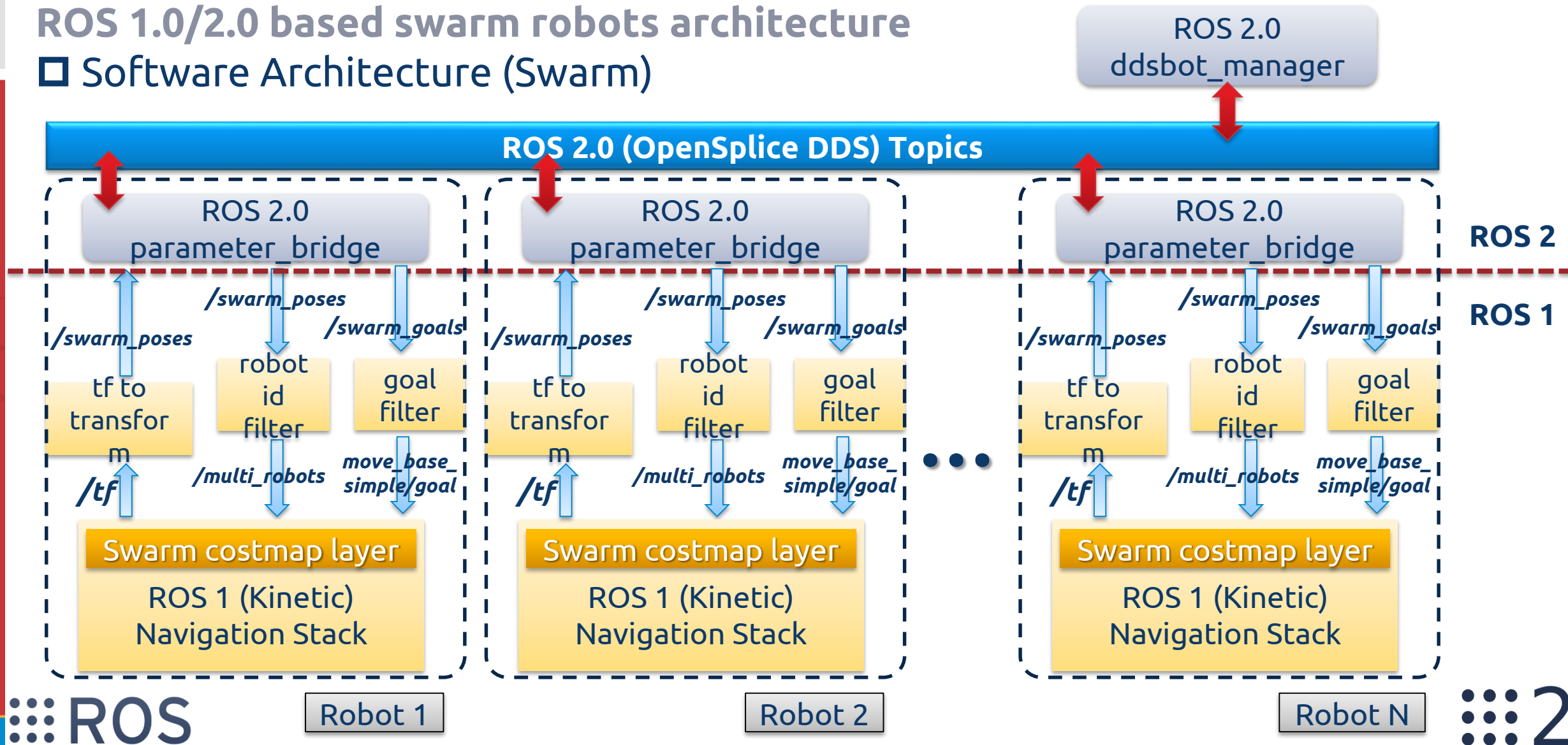


ADLINK NeuronBot



ROS 1.0/2.0 based swarm robots architecture

❑ Software Architecture (Swarm)



ROS

2

ADLINK NeuronBot



Demo Video in Embedded World Conference 2018

Summary



- **The source codes of Vortex OpenSplice will be fully opened by March!**
- **Vortex OpenSplice has been successfully tested with ROS2 (shared mem)**
- **ADLINK Neuron will be officially released by Q2 2018**
 - Offer reliable/robust ADLINK ROS2/DDS Industrial Developer Kit
 - Easy, abstract, reliable, rea-time ROS platform (DDS-based)
 - Speed up developing cycle
 - Enable ROS2 ecosystem in Asia
 - Increase ROS2 adoption for AMR/Arm/Smart factory

