NXP® SOLUTIONS FOR MOBILE ROBOTICS, INCLUDING DRONES AND ROVERS

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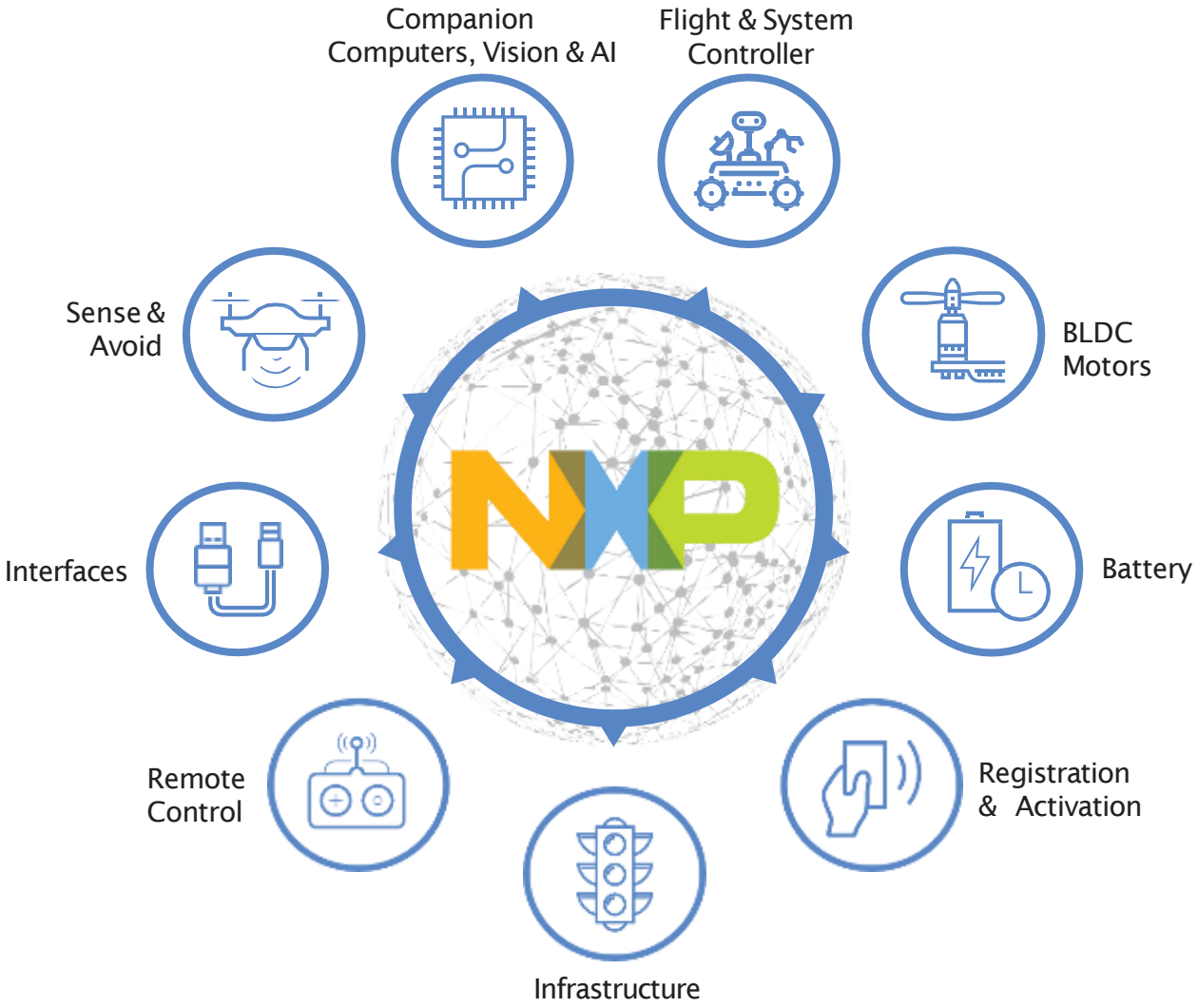
SECURE CONNECTIONS FOR A SMARTER WORLD

AGENDA

- Mobile Robotics applications
- NXP technologies for mobile robotics
- Systems block diagram
- NXP software mobile robotics
- NXP solutions and reference designs
- Videos
- Summary

NXP TECHNOLOGIES FOR MOBILE ROBOTICS



- With decades of experience in automotive, radar, aerospace, RF, security, motor control and battery management systems, NXP provides semiconductor solutions for many aspects of drones and rovers, providing a broad technology portfolio.

- Ready to design an industrial drone or rover?
  - Use our technology guide as ideal starting point
  - Additional information on more products can be found at www.nxp.com/uav

MOBILE ROBOTICS APPLICATIONS



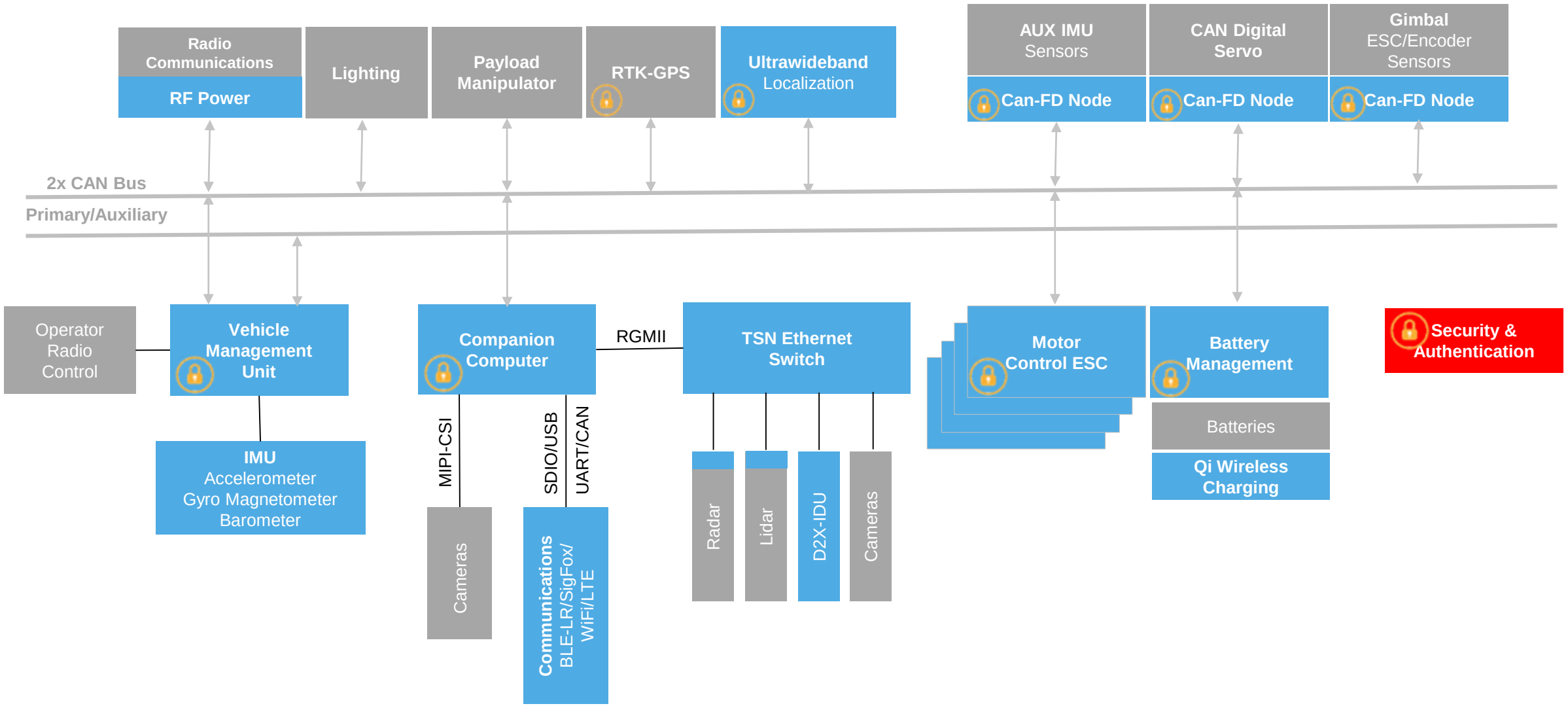





Source: https://www.shutterstock.com

SYSTEMS BLOCK DIAGRAM: MOBILE ROBOTICS

www.nxp.com/uav



NXP SOFTWARE FOR MOBILE ROBOTICS SOLUTIONS

Traditional NXP

- Yocto Linux BSP
- MCUXpresso
- S32K design studio
- Libraries
- FreeRTOS
- Zephyr RTOS

Open Source

nxp.gitbook.io

- Ubuntu Demo image. GStreamer, OpenCV
- ROS/ROS2
- FMU, NavQ, BMS, UCAN

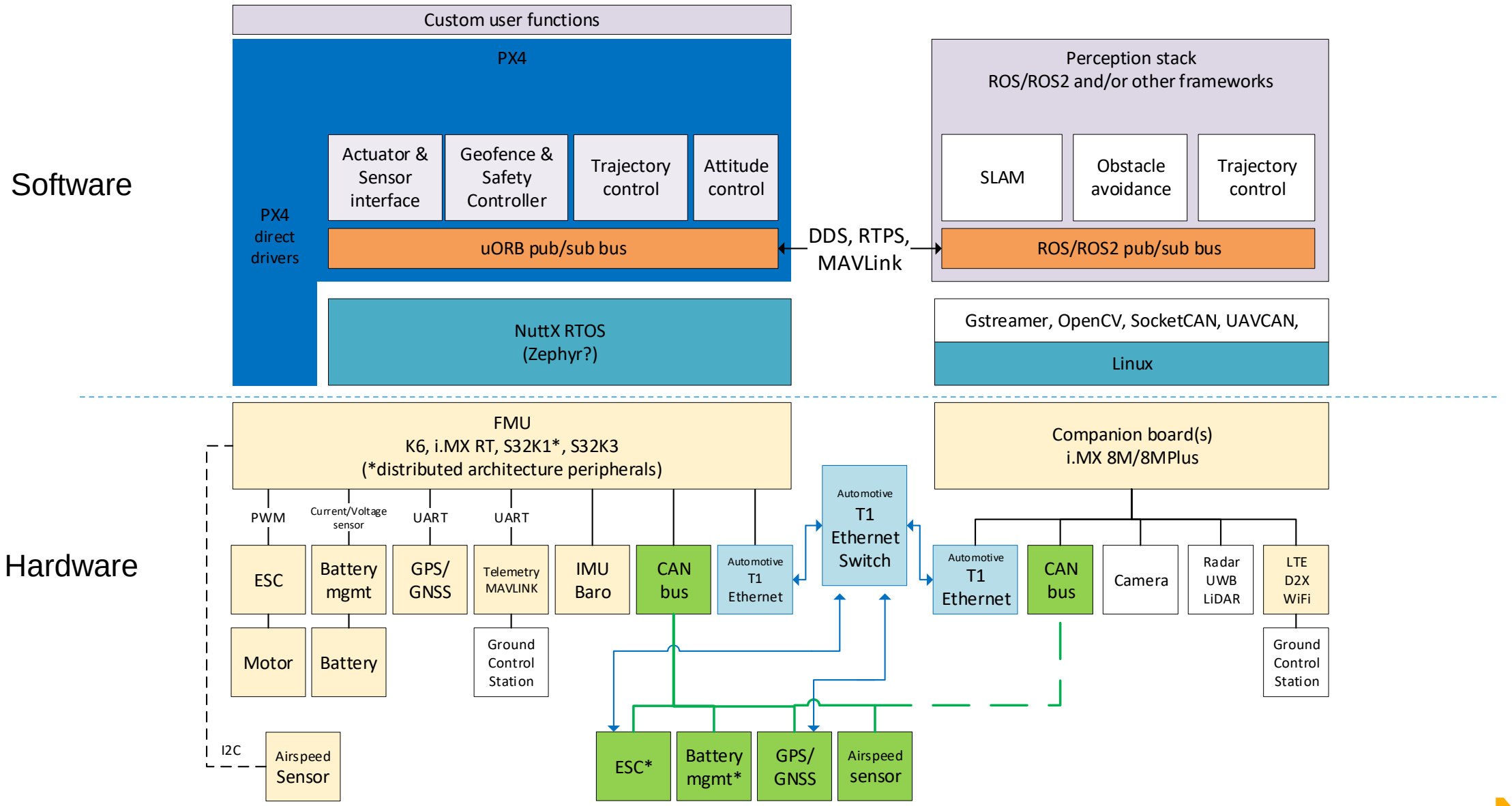
www.github.com/PX4/
www.dronecode.org/projects/

- PX4 Autopilot
- PX4 Bootloader
- PX4 SITL_Gazebo
- PX4 NuttX
- Documentation, MAVLINK, MAVSDK,
- QGroundControl

Enterprise Solutions

- Auterion / Auterion GS
  - Enterprise PX4
  - Global Fleet management tools
  - Logging and expert systems
- FETTEC
  - Motor controls
- NscDG
  - Low level FMU hardware driver support

DRONECODE SOFTWARE SYSTEM DIAGRAM

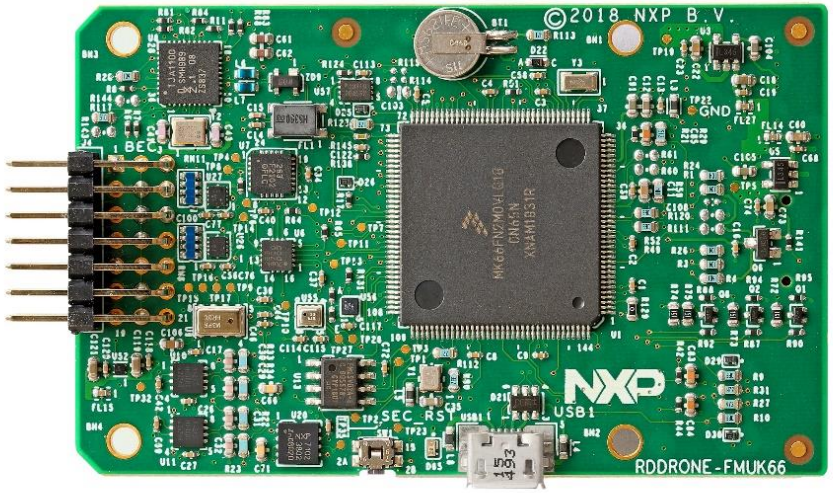


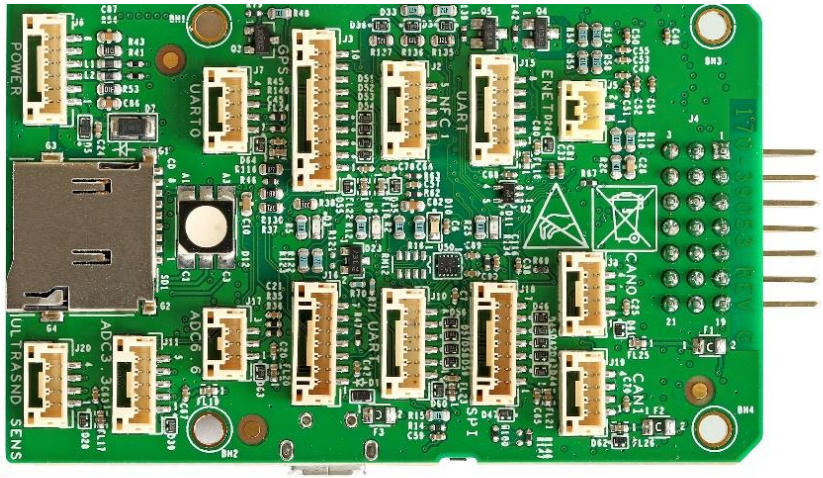
WHAT IS PX4?

- An open-source flight control software for drones, aircraft and other unmanned vehicles such as rovers. Adopted by many commercial products as their low-level vehicle management solution.
- PX4 is part of Dronecode, a Linux Foundation non-profit organization to foster the use of opensource software on flying vehicles. NXP is an active Dronecode gold member
- Is free to use and modify under the terms of the permissive BSD 3-clause license. Which means the software also allows proprietary use and allows the releases under the license to be incorporated into proprietary products
- Provides a well maintained, flexible set of tools for developers to share technologies to create tailored solutions for applications.
- Provides active standards to deliver hardware support and software stack, allowing an ecosystem to build and maintain hardware and software in a scalable way.

  Dronecode also hosts QGroundControl, MAVLink & other tools.
  https://px4.io/software/software-overview/

VEHICLE MANAGEMENT UNIT RDDRONE-FMUK66

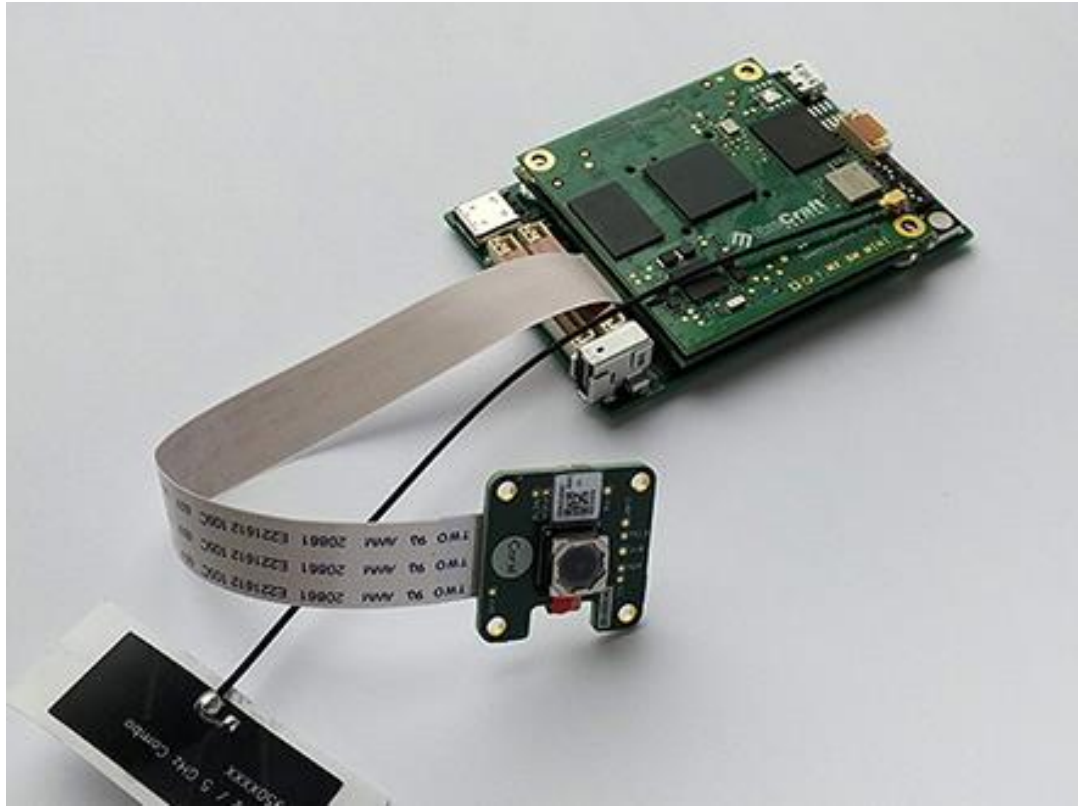




- Robotic vehicle controller running PX4 Autopilot software
  - K Series K66 @180MHz Arm M4, 2M Flash
    - PX4 also ported to i.MX RT1060 @ 600MHz Arm M7, external encrypted QSPI Flash
  - Industry standard PX4 Software
  - Business friendly opensource BSD3
  - 100BaseT1 2-Wire Ethernet
  - Dual CAN BUS
  - Edgelock secure element

Available from [NXP.com](NXP.com)

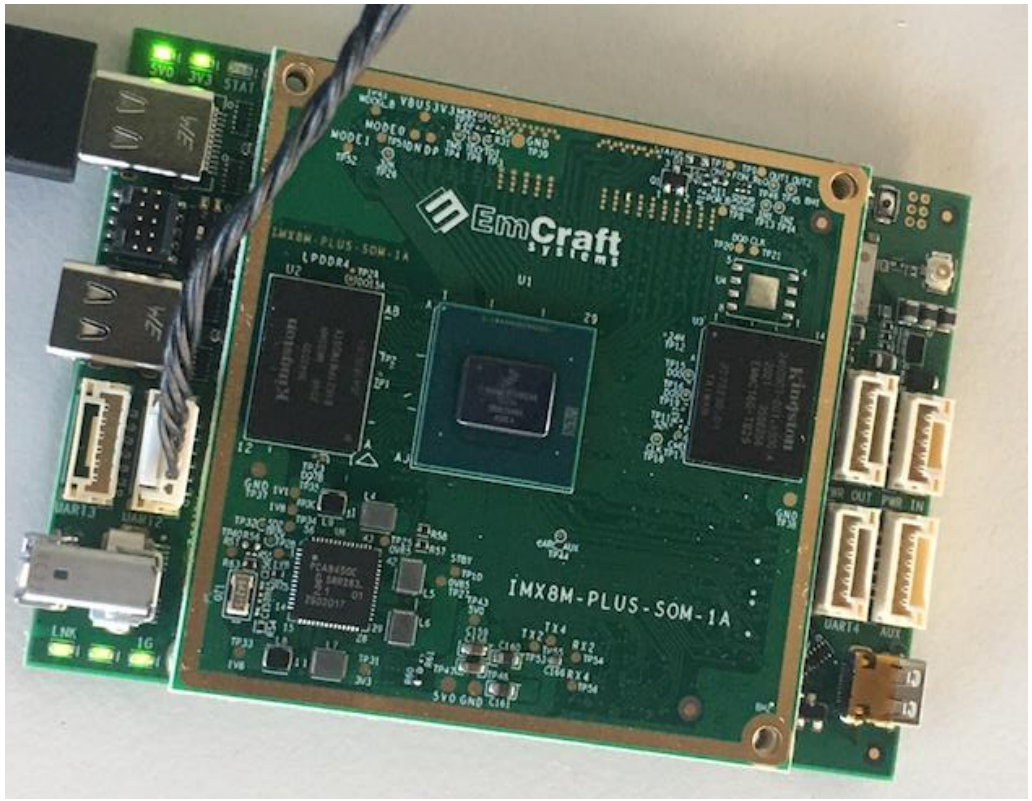
NavQ i.MX8 COMPANION COMPUTER



- i.MX 8M Mini powered edge compute board
  - Linux distribution
    Yocto BSP & Ubuntu evaluation version
    ROS/ROS2 and other tools
  - Dronecode connector standard JST-GH
  - PMD TOF camera available
  - Wi-Fi 5 / Bluetooth 5.0
  - SE050 edgelock secure element with NFC interface

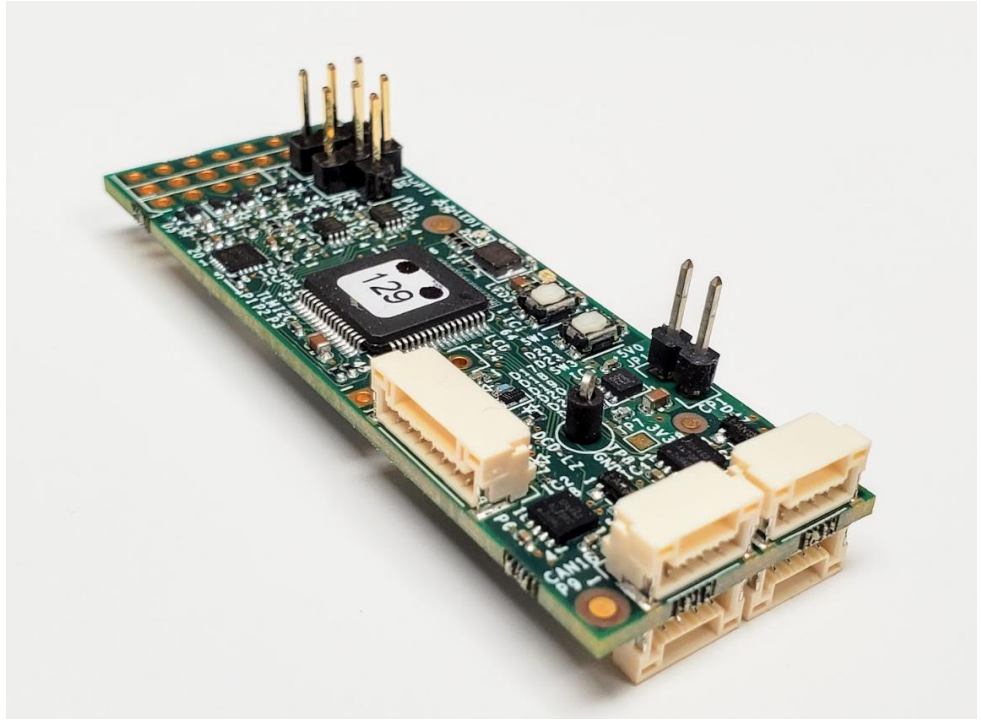
Available from EMCraft 8MMNavQ Kit / TOF Kit Gitbook documentation.

NavQPlus i.MX 8M PLUS COMPANION COMPUTER



- i.MX 8M Plus powered edge compute board
  - Neural Processing Unit (NPU) operating at up to 2.3 TOPS
  - Hardware accelerated multimedia (incl h.265)
  - SE050 Edgelock secure element with NFC interface
  - Dronecode connector standard JST-GH
  - Dual MIPI-CSI camera port
  - Dual Ethernet
    - “IX industrial” Gigabit Ethernet
    - “Two wire” 100base-T1 Ethernet
  - Dual CAN-FD
  - Wi-Fi 6 / Bluetooth 5.1

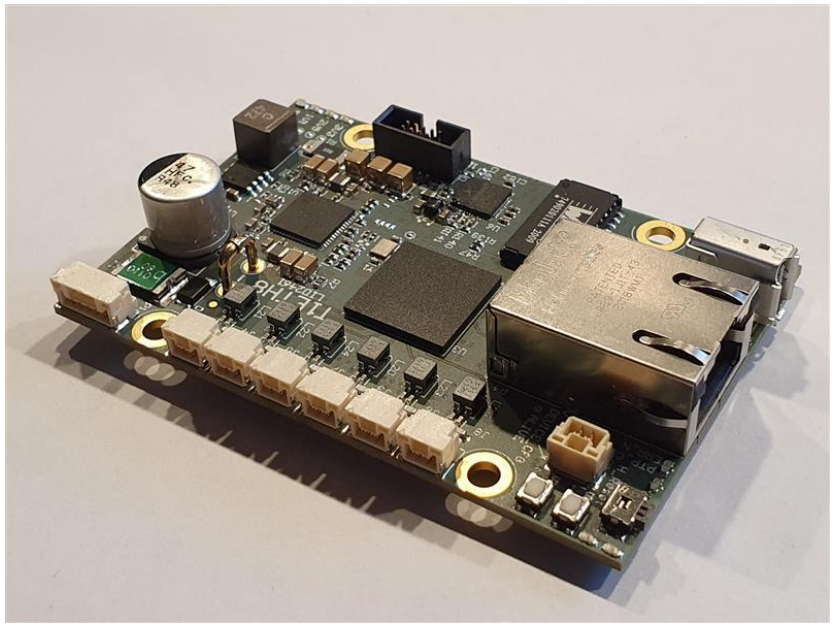
CAN NODE BOARD UCANS32K146_01



- Low cost dual CAN-FD developer node-board for UAVCAN (and other protocols)
- DroneCode standard connectors with easily accessed on-chip interfaces.
  - PX4 ported for distributed architecture.
  - Bridge between existing sensors and UAVCANv1
  - S32K146 Automotive MCU
  - TJA1044GTK CAN PHY
  - SE050 Edgelock secure element with NFC interface
  - UART, SPI, I2C sensor connectivity
  - RGB LED

Available from NXP.com

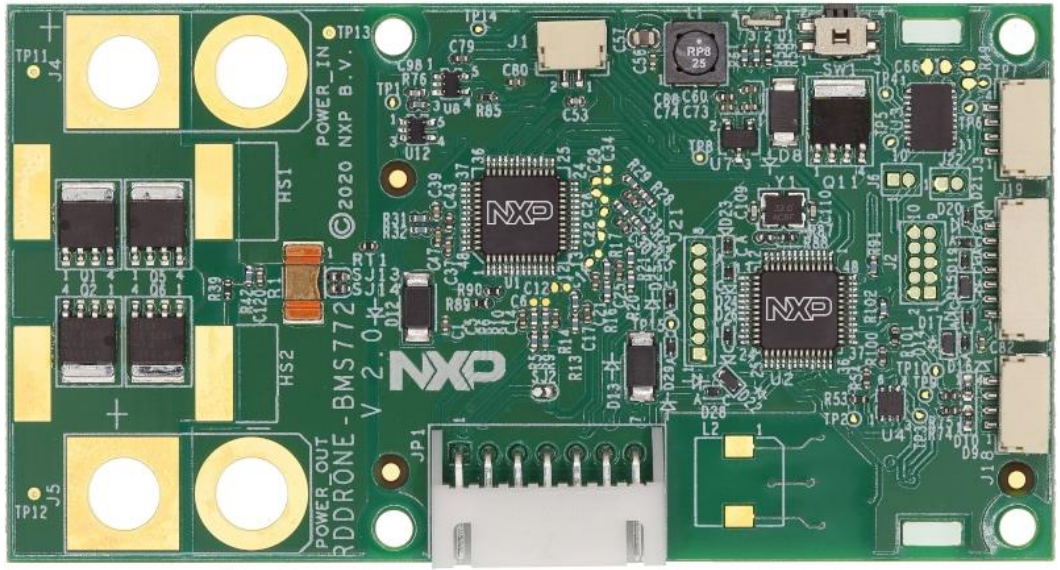
8 PORT 100 BASE-T1 ETHERNET SWITCH RDDRONE-T1ETH8



- Stand alone T1 Ethernet switch reference design for mobile robotics.
  - Based on SJA1110 Ethernet switch IC with integrated 100base-T1 PHY's
  - Supports IEEE1588 and TSN*
  - 6x 100base-T1
  - 1x 100base-TX / 1x Gbit ETH
  - Small form factor 75x50mm.

Available in 2021H1.

BATTERY MANAGEMENT BOARD RDDRONE-BMS772



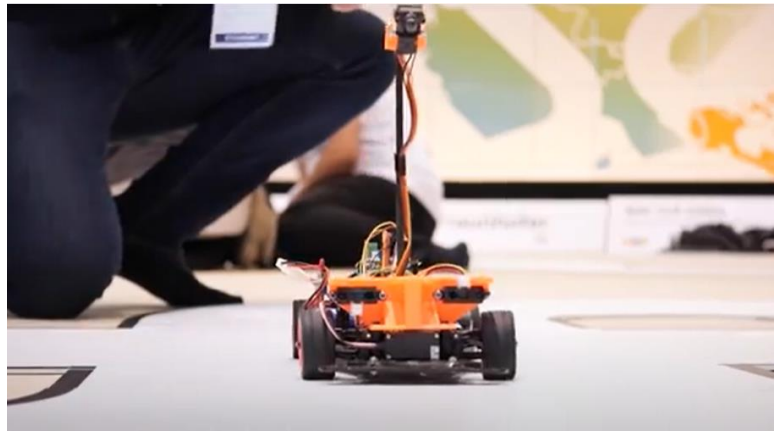
- Development board 6-cell battery management system with dual CAN-FD
  - Based on MC33772 BMS IC
  - S32K144 Automotive MCU
  - A7001 Secure Element for authentication
  - NTAG5 NFC, I2C(SMBus) and CAN interface
  - Dronecode JST-GH connector standard
  - NuttX RTOS, PX4 Target, BMS libraries/applications

Available from NXP.com
Gitbook documentation.

VIDEOS - INSPIRATIONAL, INFORMATIVE, AND EDUCATIONAL

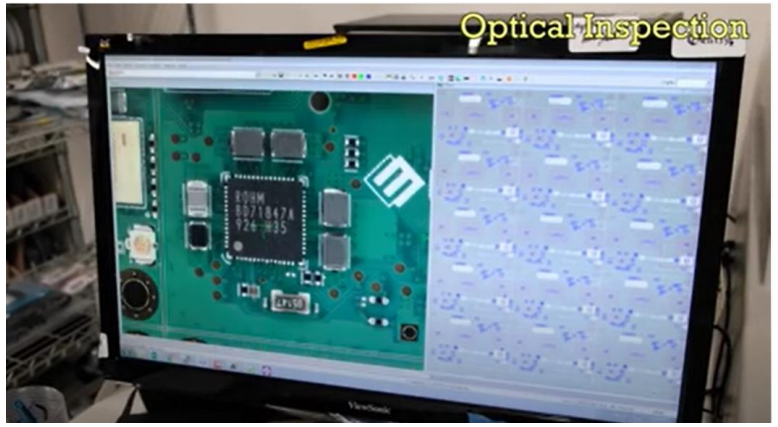
HoverGames 2 Coding Challenge

HoverGames 1 Coding Challenge



NXP-CUP Autonomous Car Challenge

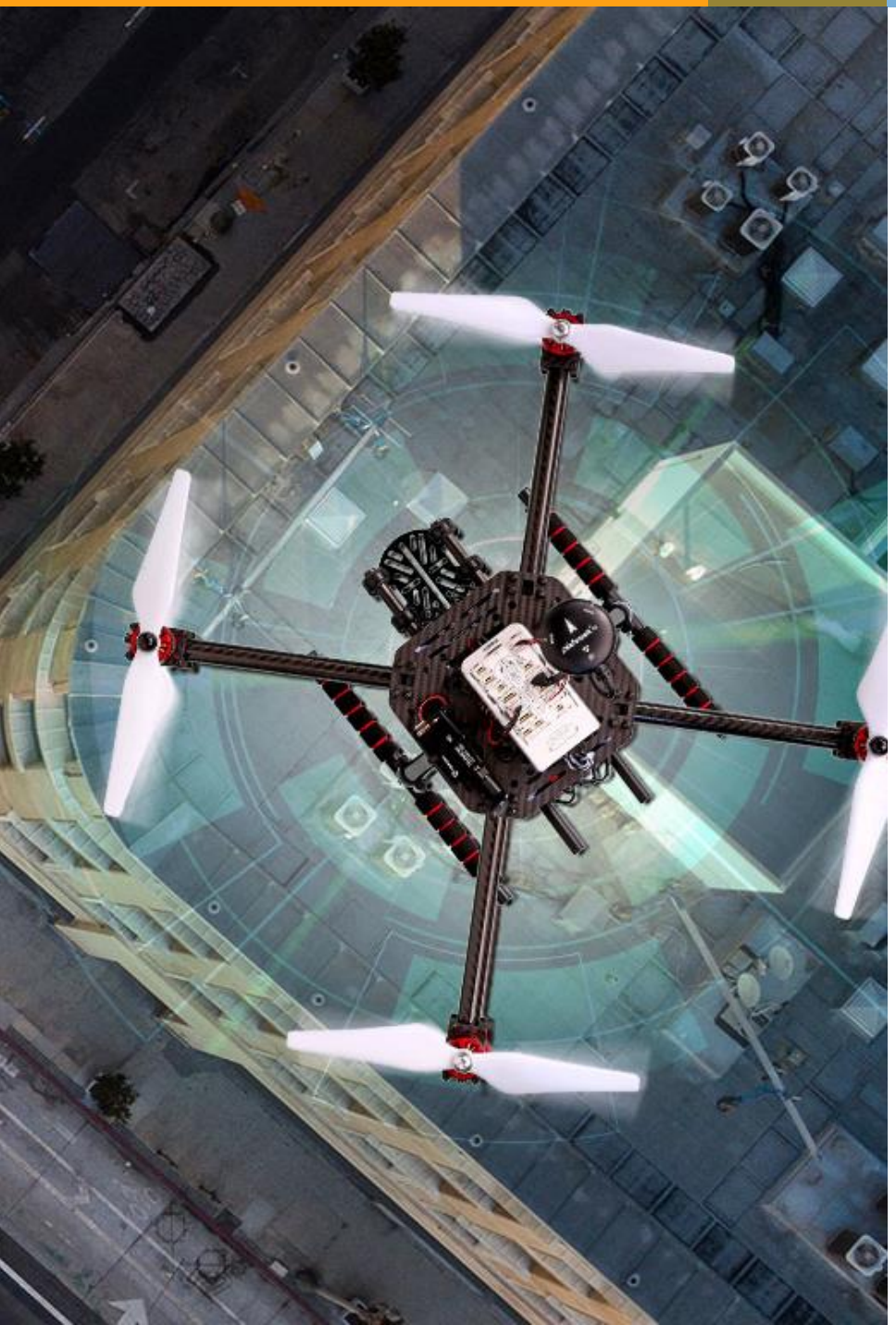
Getting Started with NXP Drone Kit



NavQ Production manufacturing

FMU Programming

YouTube Keyword search “NXPHoverGames”



SOLUTION SUMMARY

NXP has long history of supplying solutions for the industrial, avionics and automotive markets

Wide range of MCU's to support a range of processing requirements for real-time control in vehicle management

Broad range of MPU's supporting machine vision, AI/ML and high-performance compute capabilities

Solutions for Security and Authentication, Motor control, Battery Management, Sensor as well as wired and wireless communications

For more detailed presentation on NXP solutions visit https://www.nxp.com/docs/en/brochure/Brochure-NXP-Suggested-Components-Drones-Rovers.pdf

For details on reference design visit www.nxp.com/uav and documentation https://nxp.gitbook.io/hovergames/

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