NXP Mobile Robotics

NavQ95 RevB vehicle computer, based on NXP i.MX 95

Proof of concept NavQ95 RevB running Zephyr / ROS2 / Cognipilot or Nuttx / PX4 opensource software

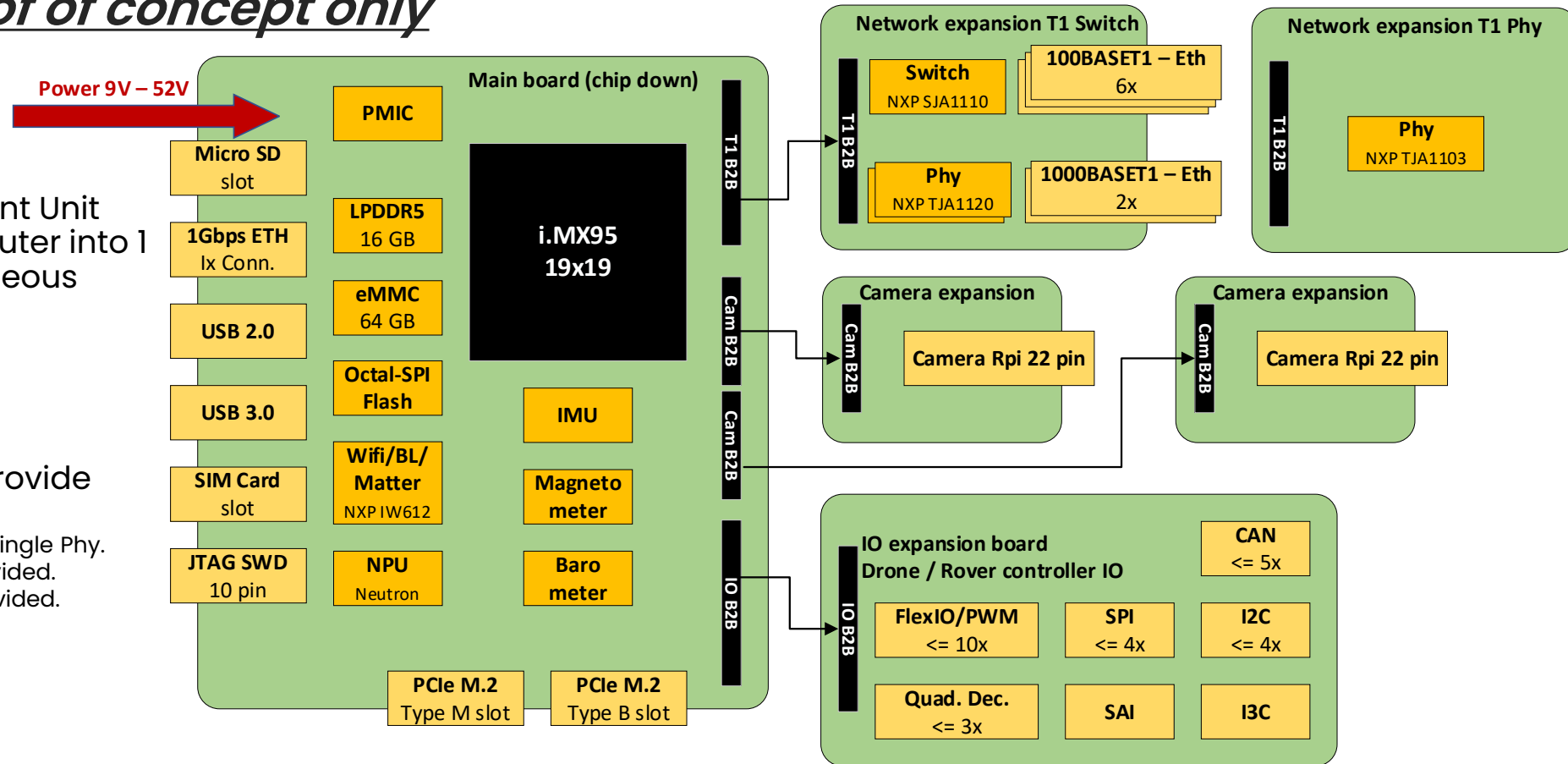Joost van Doorn
Mobile Robotics, CTO System Innovations.

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NavQ95 RevB *Proof of concept only*

- Combining Vehicle Management Unit and Vehicle Companion Computer into 1 Vehicle Computer, a heterogeneous MCU/MPU combination.

- Single main board:
  - Small form factor, ready to use.
  - Low cost.

- Multiple expansion boards to provide flexibility in:
  - Network capabilities: T1 Switch or T1 Single Phy.
  - Camera connections: Rpi 22 pin provided.
  - IO connections: Drone / Rover IO provided.

- Running opensource software:
  - Zephyr, Ubuntu, ROS2 & Cognipilot
  - Nuttx & PX4

Main board (chip down)

Power 9V – 52V

- PMIC
- Micro SD slot
- 1Gbps ETH 1x Conn.
- LPDDR5 16 GB
- USB 2.0
- eMMC 64 GB
- USB 3.0
- Octal-SPI Flash
- SIM Card slot
- Wifi/BL/Matter NXP IW612
- JTAG SWD 10 pin
- NPU Neutron
- i.MX95 19x19
- IMU
- Magneto meter
- Baro meter
- PCIe M.2 Type M slot
- PCIe M.2 Type B slot

T1 B2B / Cam B2B / Cam B2B / IO B2B

Network expansion T1 Switch

T1 B2B
- Switch NXP SJA1110
- 100BASET1 – Eth 6x
- Phy NXP TJA1120
- 1000BASET1 – Eth 2x

Network expansion T1 Phy

T1 B2B
- Phy NXP TJA1103

Camera expansion

Cam B2B
- Camera Rpi 22 pin

Camera expansion

Cam B2B
- Camera Rpi 22 pin

IO expansion board
Drone / Rover controller IO

IO B2B
- FlexIO/PWM <= 10x
- SPI <= 4x
- CAN <= 5x
- I2C <= 4x
- Quad. Dec. <= 3x
- SAI
- I3C

Zephyr™   ROS2   COGNIPILOT   NuttX RTOS   PX4 autopilot

NavQ95 RevB _Proof of concept only_

- The heterogeneous vehicle computer is based on:
  - 6x Arm Cortex-A55 cores, to execute compute intense functions.
  - 1x Arm Cortex-M7 core, to execute real-time control.
  - 1x Arm Cortex-M33 core, to execute NXP System Manager.

- Mobile robotics interfaces, using DroneCode connectors:
  - CAN/CAN-FD.
  - 1 Gbps ethernet (RJ45), with Precision Time Protocol (PTP).
  - 100BaseT1 and 1000BaseT1 Automotive ethernet (PTP).
  - PWM headers.
  - Camera connectors, CSI/DSI 22 pin Rpi.
  - GPS connector.

- High bandwidth M.2 PCIe interfaces, targeting:
  - Kinara ARA-2 NPU.
  - Cellular modem.
  - Storage (SSD).

- Onboard mobile robotics sensors:
  - IMU.
  - Magnetometer.
  - Barometer.

- AI capabilities:
  - Onboard NXP Neutron NPU.
  - Possibility to connect up to 3 NXP Kinara ARA-2 NPUs.
  - Cloud based AI through Wifi6 or 5G connectivity.

- Software:
  - Zephyr / Cognipilot or Nuttx / PX4 running on M7 core.
  - Ubuntu 24.04 with ROS2 Jazzy running on A55 cores.
  - High speed inter core communication using shared memory and ROS.

- Other:
  - Battery voltage between 9V and 52V, accommodating 12S batteries.
  - Quality components that can be source internationally.
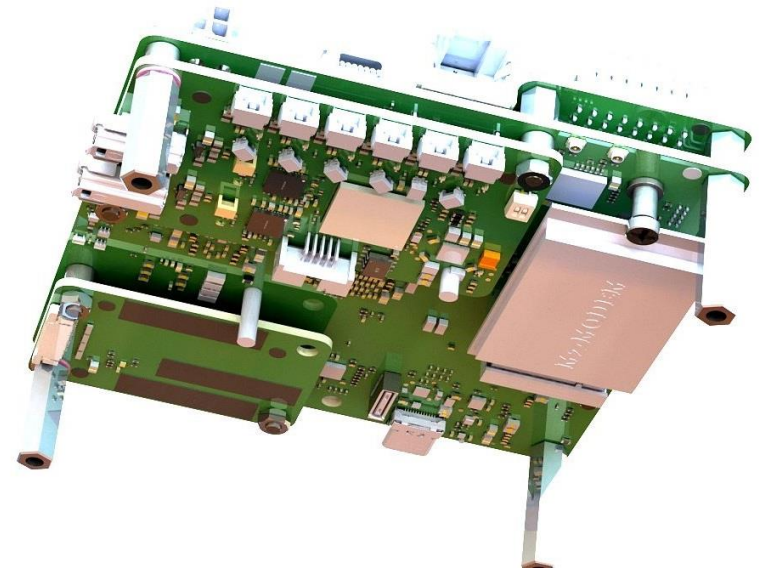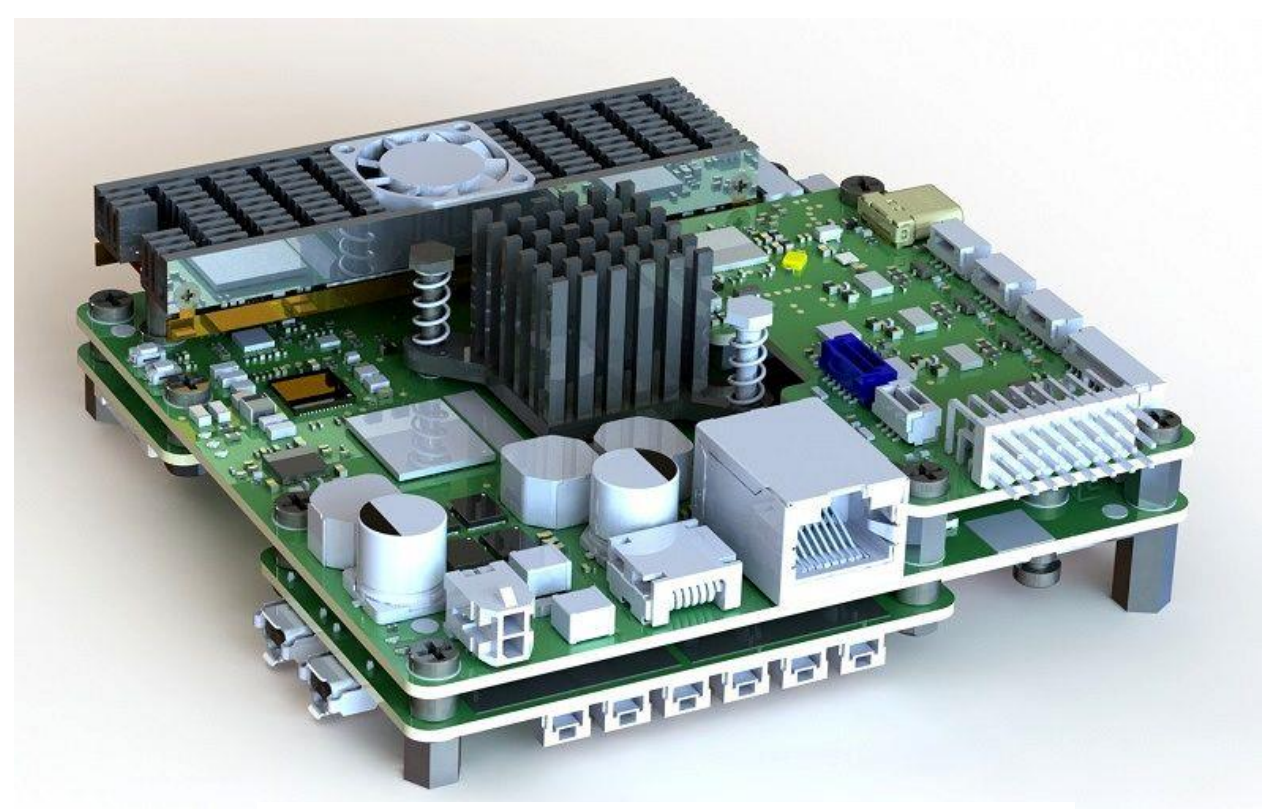
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