

MODAL  
ROBOTIC PERCEPTION

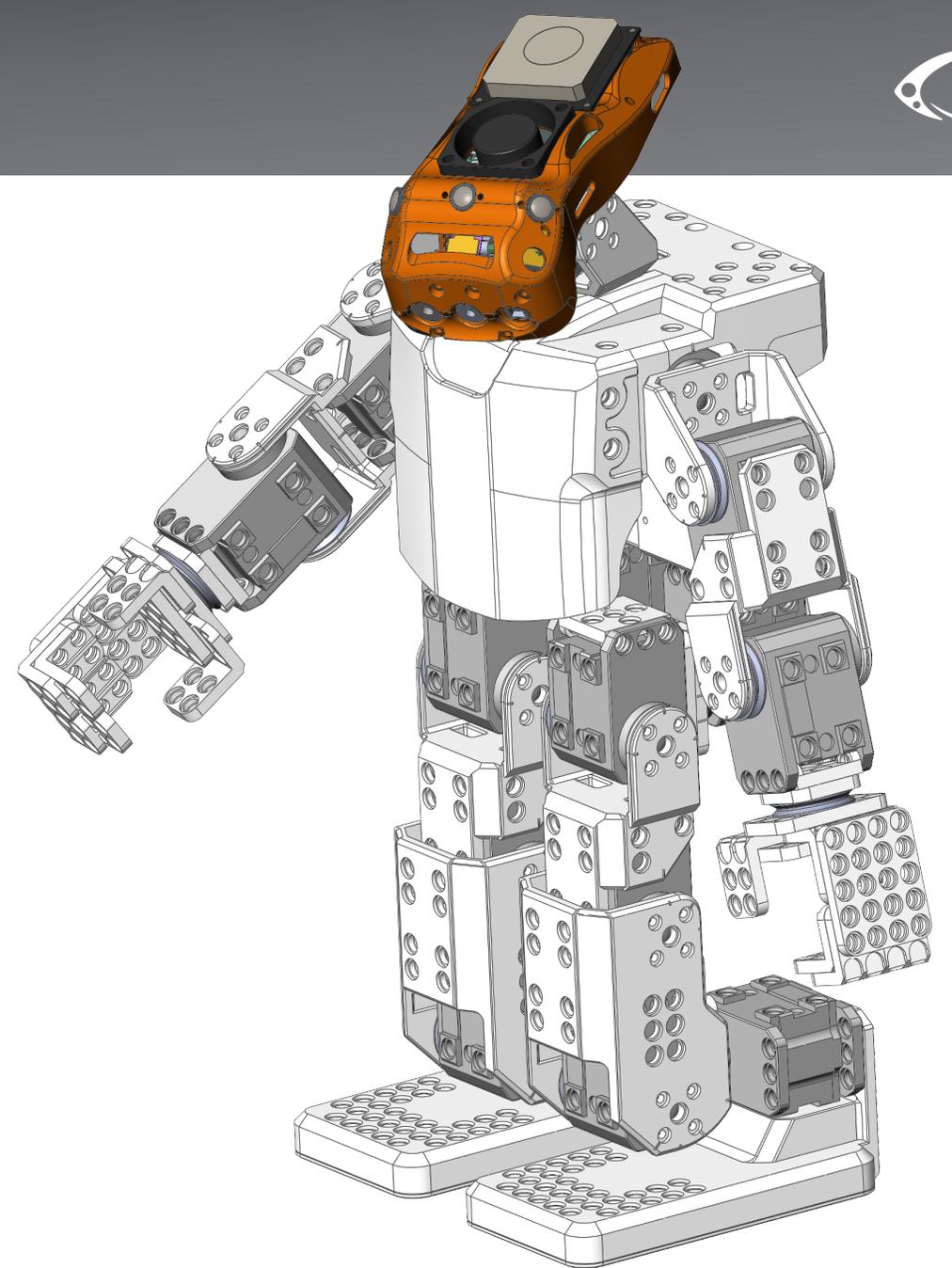


# About ModalAI



ModalAI, Inc. spun out of Qualcomm in June 2018. The team drove Qualcomm's drone R&D efforts (Snapdragon Flight, etc).

Accelerating safe autonomy with compact, light-weight, and powerful robot and drone perception and communication systems





Defense Innovation Unit (DIU) selected ModalAI to design and build an advanced UAS Autopilot and Private, Handheld 4G Data link around its VOXL technology

R&D in San Diego

Field testing at MCAS Miramar AV Test Center



# VOXL Flight Group 1 Advanced Autopilot

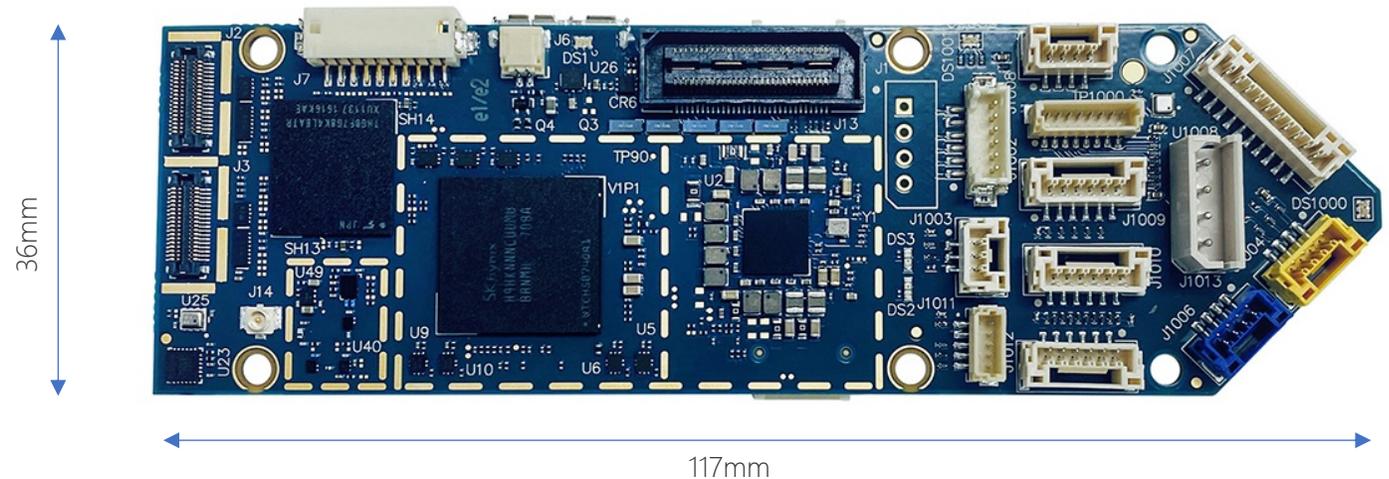


Perception and communications of Snapdragon 821, flexibility of Pixhawk (PX4)

Autonomous navigation with LTE, ROS, PX4/MAVLink 28g

On-board Autonomous Decision Making in GPS-denied environments

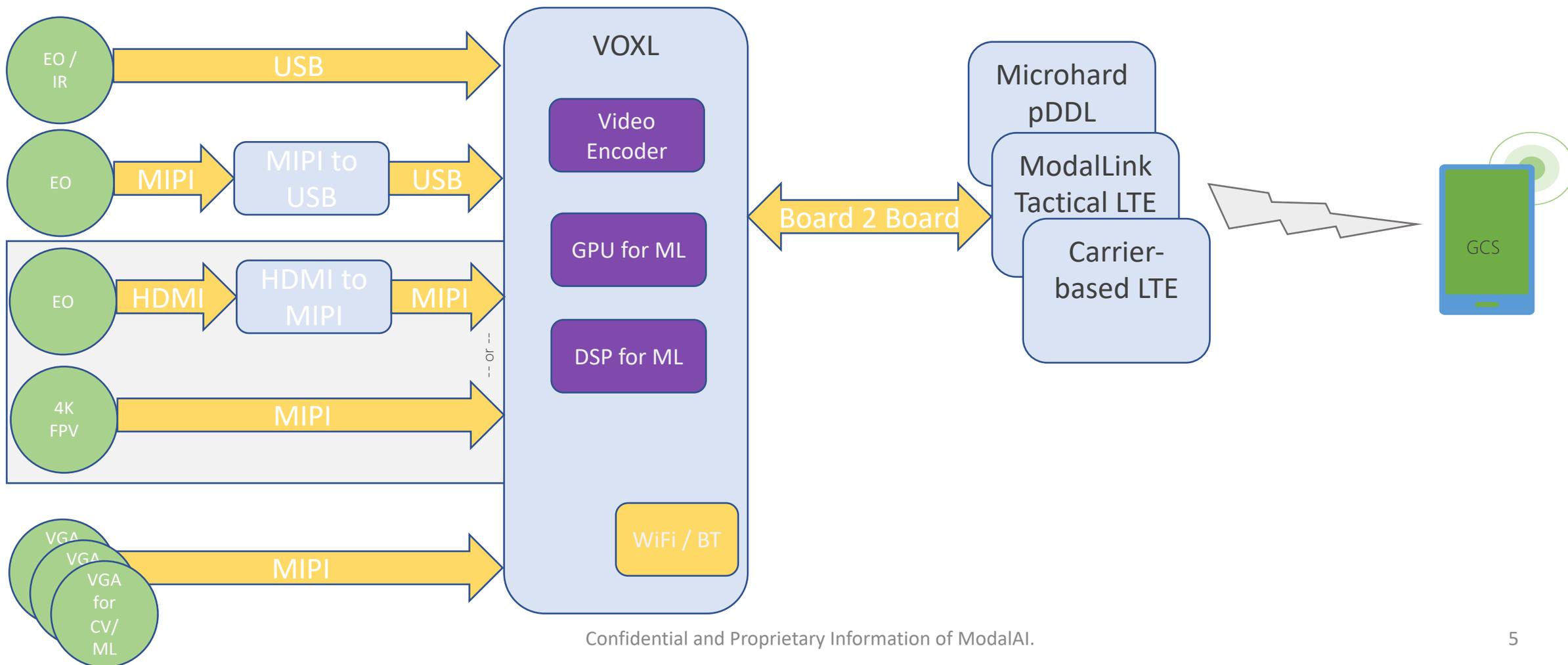
Commercially launched October 2019 ([www.modalai.com](http://www.modalai.com))



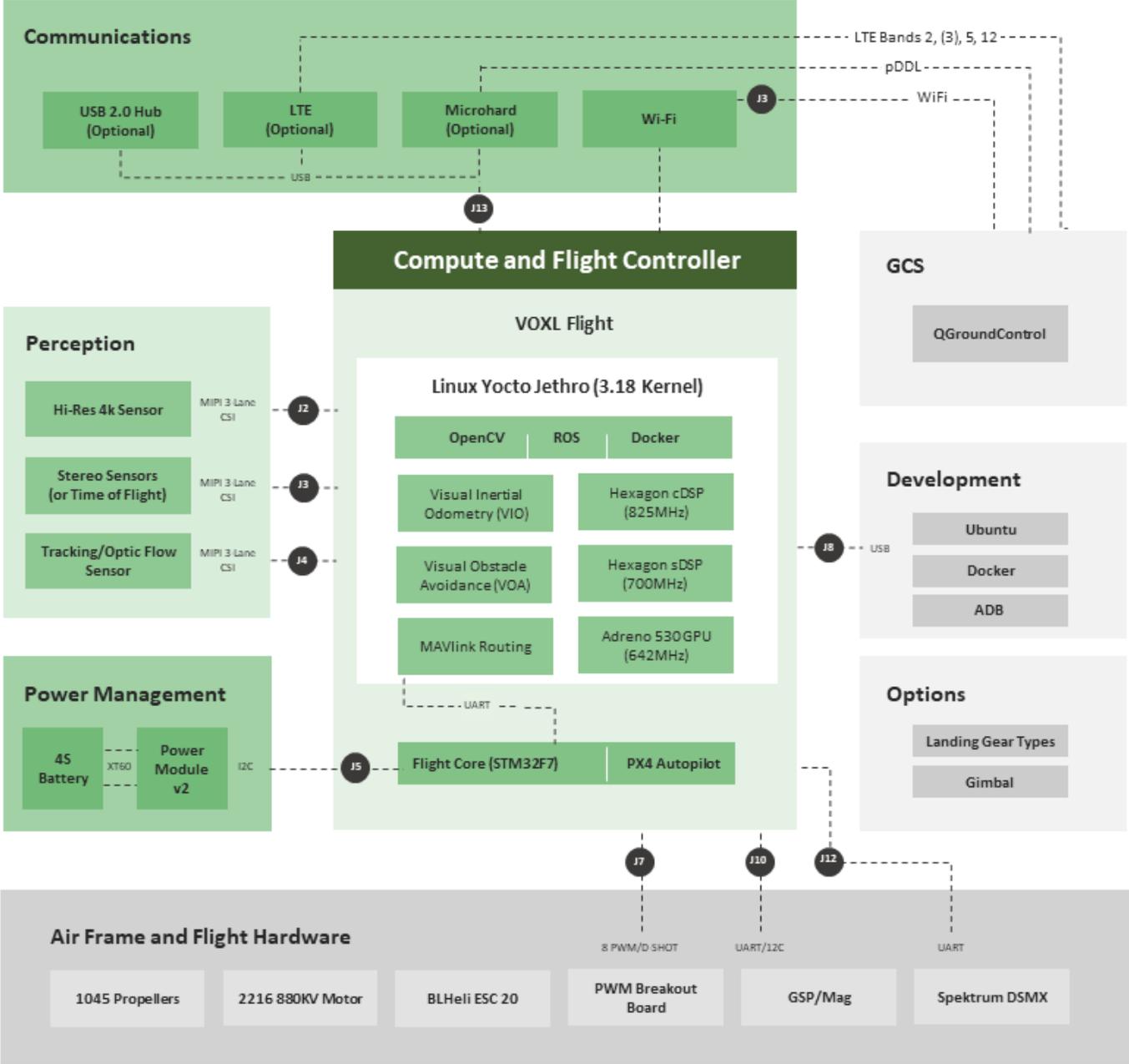
# Payload and Communication Options



VOXL supports many payload configurations



# VOXL m500 Reference Drone for the Group 1 sUAS Architecture



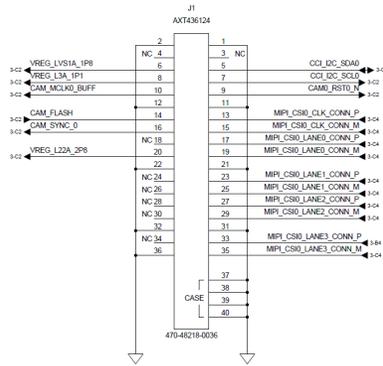
# VOXL Obstacle Avoidance Sensor Payloads



Passive Stereo  
Stereo Cameras: 3g  
VIO Camera: 2g  
MIPI-CSI2 Interface



Active ToF (PMD)  
ToF Camera: 6g  
VIO Camera: 2g  
MIPI-CSI2 Interface





# Documentation and Support



ModalAI Technical Docs

Home Support Developer Resources Store

## Developing with VOXL

This section contains instructions on how to use, install and configure components of the VOXL system along with other technical information aimed at helping users.

For reference, manifest of Qualcomm opensource code used in the VOXL system image:  
<https://source.codeaurora.org/quick/le/le/manifest/tree/LE.UM.1.3.r4-06300-8x96.0.xml?h=release>

### 1 SOFTWARE STACK

## Software Stack

The diagram illustrates the software stack layers:

- ROS Indigo**, **VOXL Vision PX4 (VIO VOA)**, **TensorFlow**, **ROS Melodic or ROS2**
- Ubuntu 18.04**
- Yocto Jethro**, **Docker**
- Linux Kernel 3.18**
- FastRPC**, **HAL3**, **OpenCL**
- Snappdragon 821**
- Apps DSP**, **Sensors DSP**, **PX4**, **SNAV**, **ISP**, **Quad-core ARMv8**, **Adreno GPU**
- VOXL Hardware**
- WiFi**, **i2c, UART, SPI**, **Board to Board Connector**

Interconnections include: FastRPC, HAL3, Linux Kernel 3.18, OpenCL, DspAL, i2c, UART, SPI, and USB.

### TABLE OF CONTENTS

- [Build Environments](#)
- [VOXL IO Guides](#)
- [Camera and Video Guides](#)

code.modalai.com

Projects Groups More

## voxl Details

Group ID: 4192281 | [Leave group](#)

### Subgroups and projects

Project Name	Description	Stars	Last Updated
<a href="#">microhard-config</a>	Command line utility for Microhard Modem configuration	0	1 month ago
<a href="#">esc-driver</a>	Examples for communicating with ModalAI-supported electr...	0	1 month ago
<a href="#">voxl-docker-opencv-opencl</a>	Example of how to use OpenCV with OpenCL support in a 64...	0	1 month ago
<a href="#">voxl-docker-opencl</a>	Example of how to use OpenCL in a 64-bit Docker container ...	0	1 month ago
<a href="#">voxl-docker-images</a>	Repository to store the .Dockerfile for VOXL Docker images.	0	2 months ago
<a href="#">mavros_test</a>	Demo showing how to use mavros on VOXL with PX4	0	3 weeks ago
<a href="#">roskinetic-docker</a>	Here are the Dockerfiles, supporting scripts, and instructions ...	0	2 months ago
<a href="#">snap_imu</a>		0	3 months ago
<a href="#">adsp-proc-examples</a>		0	3 months ago
<a href="#">voxl-rtsp</a>	A simple application to stream video from a voxl camera usin...	0	1 month ago

# VOXL Roadmap



PMD Time of Flight available commercially

- 220x170 resolution, 6m indoor distance

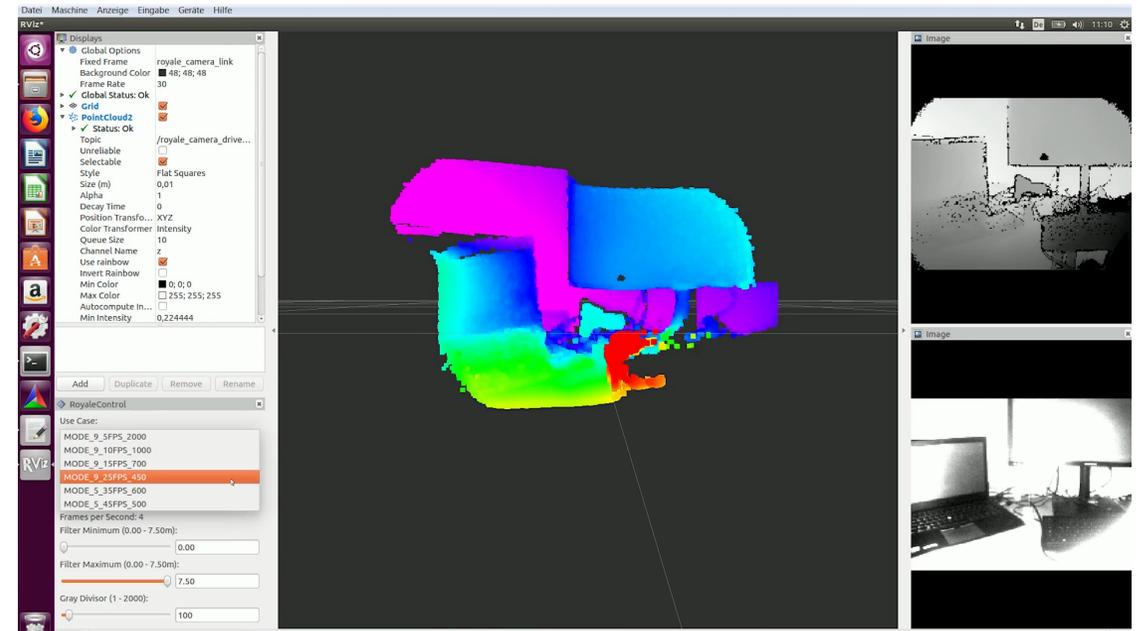
US made multi-input, multi-I/O ESC that enables full electronics redundancy

- 2x UART bi-directional
- PWM input
- i2c optional

Socketed LTE module add-on board with stand-alone mode to enable multiple carriers and scenarios throughout the world

Flight Core w/ LTE

VOXL2 based on Snapdragon 865



# Fully Redundant Flight Control System

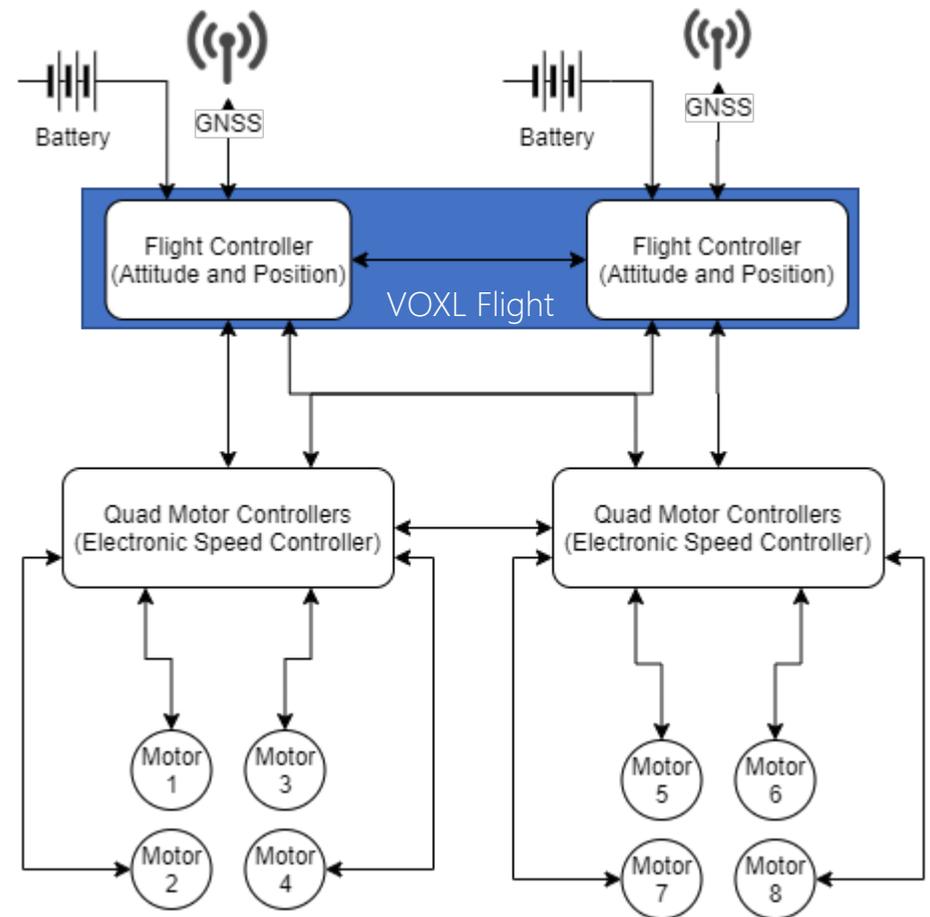


Each **Flight Controller** runs independently and monitors communication from GNSS and ESCs:

- If GNSS is lost, the GNSS from the other flight controller is used.
- If ESC is lost, flight controller transitions to using half of the motors. X8 to X4 for example.

Each **ESC** runs independently and monitors communication from each flight controller:

- If a flight controller is lost, the ESC notifies the other ESC.
- If a motor is lost, the ESC notifies the flight controller to transition to using half of the motors. X8 to X4 for example.



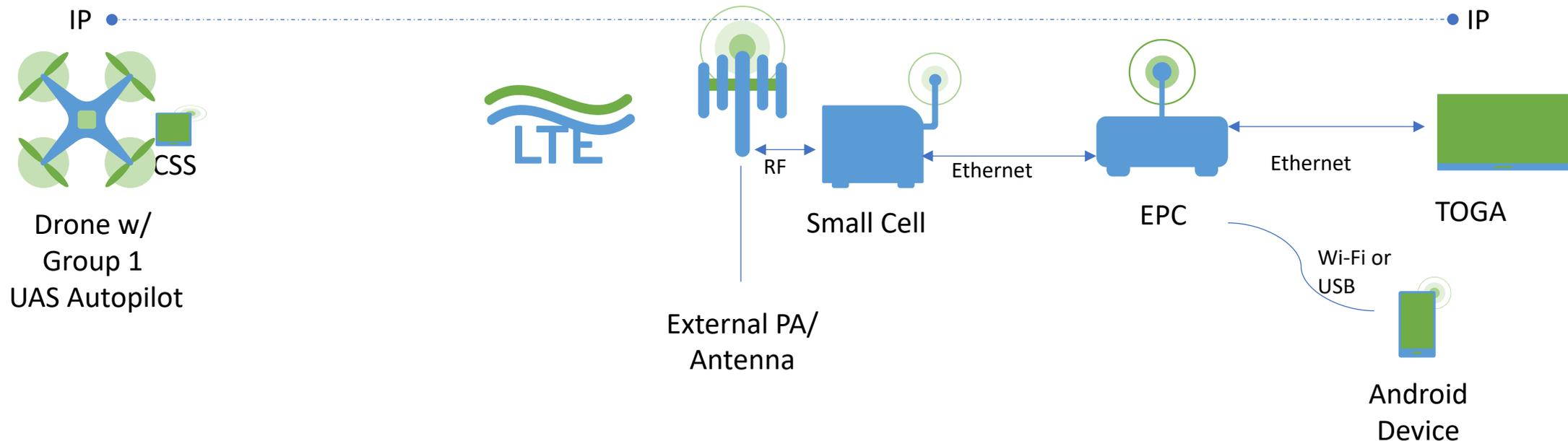
# Group 1 Data Link



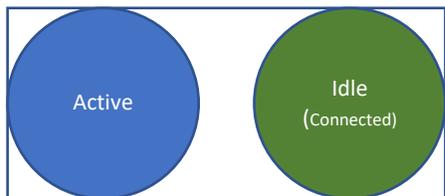
4G/LTE-based sUAS ground station, using a commercial femtocell, with an evolution to 5G

Multiple vehicle control, in same 5MHz FDD channel

Standards compliant, commercial components drives interoperability, which in turn reduces cost



# Cellular Network in the Field



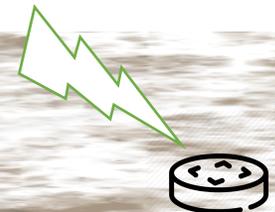
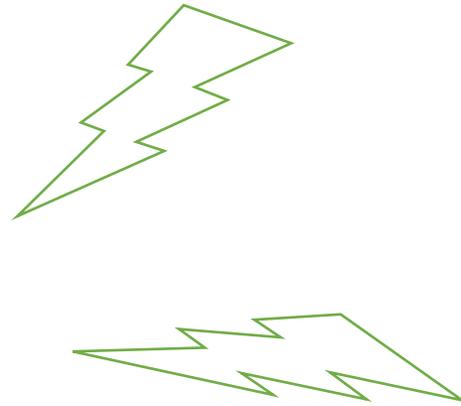
# ModalAI DIU 4G/LTE Datalink



Robust communication using COTS equipment between:

- UAS
- Soldiers
- Sensors

Light enough to fly on a drone







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