

Architecture specification file

Robulab 10 - Santiago de Compostela

Reference:

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A01	11/07/2022	Antoine Triaux	Version #1
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Summary

The Universidad de Santiago de Compostela has contracted Kompai Robotics to make updates on the Robulab 10 platform they have been using for some years.

There are software and hardware updates:

- Hardware: adding an embedded PC, replacing the battery
- Software: adding a ROS interface

At reception, Kompai robotics will evaluate the robot's working order. Kompai robotics will not be responsible for fixing/replacing non working components, unless otherwise specified by this document.

1.1 Purpose of the document

This document's purpose is to specify the software and hardware updates on the Robulab 10 platform.

1.2 Status

This document details all the modifications that will be made to the platform at the project's completion. Some aspects may change all along the technical study.

1.3 Reference documents

- DOSSIER_ARCHI_ELECTRIQUE_ROBULAB10_KOMPAI

1.4 Abbreviations

Acronym	Définition
PURE	Professional Universal Robotic Engine
SLAM	Simultaneous Localization And Mapping
KomNav	Kompaï proprietary high level software (navigation and more)

2. Hardware updates

2.1 Battery replacement

Kompai will replace the aging battery with a Li Ion battery with similar specifications, Kompai will not provide the charger.

Designation	Photo	Ref. (supplier/internal)	Brand	Supplier	Qty	Appendix
7S 4P 20AH Li-Ion battery	 <small>Save My Battery</small>	/	savemy battery	savemybattery	1	ATF01

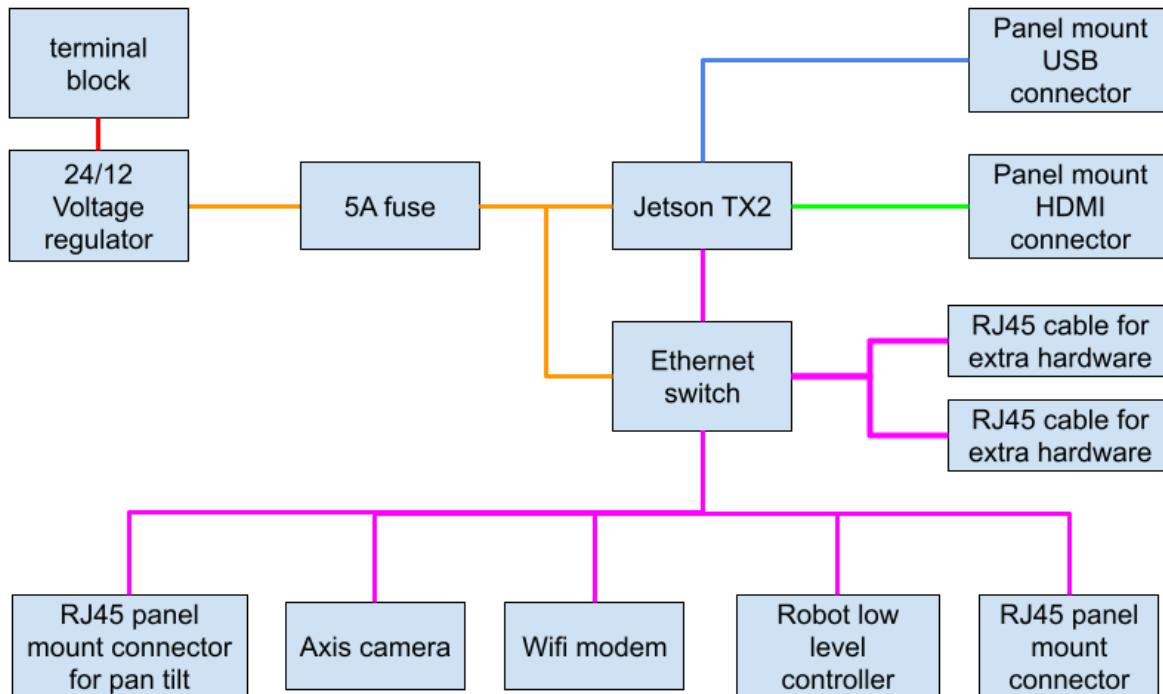
2.2 Adding embedded PC

Kompai will add a Nvidia Jetson TX2 embedded PC. A more powerful 12V power regulator needs to be added. To provide better network performance, the onboard 100Mb ethernet switch will be replaced with a 1Gb one. And the wifi module will also be replaced with a wifi/GSM modem.

Designation	Photo	Ref. (supplier/internal)	Brand	Supplier	Qty	Appendix
Carrier board		ACE-N622 /	Aetina	Equipements scientifiques	1	ATF02
Nvidia Jetson TX2 module		Jetson TX2	Nvidia	Equipements scientifiques	1	
SWITCH ETHERNET 8 PORTS 1Gbps		GS108 / D50072	NetGear	Amazon	1	ATF03
24V to 12V 10A power regulator		Orion-Tr 24 12 - 10 /	Victron Energy	RADIOSPARES	1	ATF04

Wireless modem		RUT240	Teltonika	Amazon	1	ATF05
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Using the available terminal blocks inside the robot, the hardware architecture will be wired as below.



2.3 User interfaces

The Jetson computer will be accessible via the already available RJ45 connector at the 192.168.1.10 IP address of the local network. A second RJ45 connector will be installed.

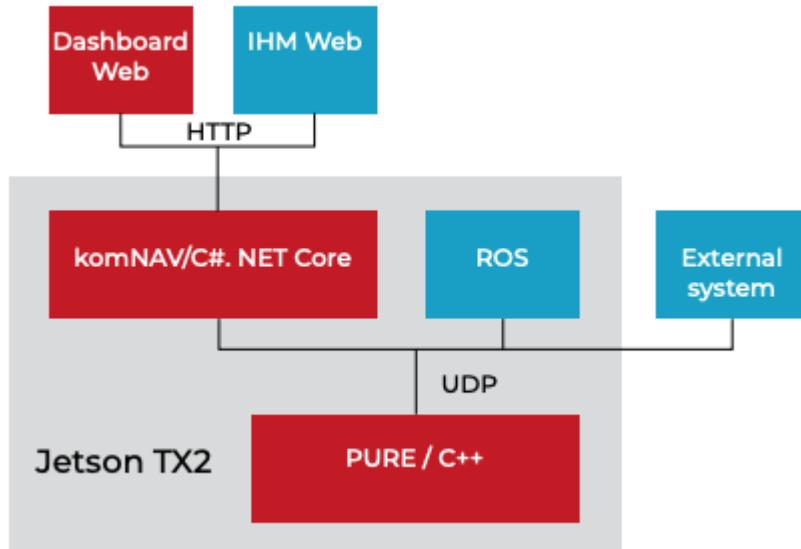
USC also asks that 1 HDMI and 1 USB port be made conveniently accessible. The USB connector will provide USB 3.0 access.

Designation	Photo	Ref. (supplier/internal)	Brand	Supplier	Qty	Appendix
HDMI panel mount connector		143-8921 / D70038	RS Pro	RadioSpares	1	ATF06
USB panel mount connector		916-0215 / D70035	RS Pro	RadioSpares	1	ATF07
RJ45 panel mount connector		765-9034 / D70126	Harting	RadioSpares	1	ATF08

3. Software updates

Kompai develops its own middleware (Pure) and robotic navigation software (KomNav). They can both be interfaced with via their respective APIs.

USC asks that ROS(1) and ROS2 be both installed on the Jetson. A ROS(1) will first be put in place, followed by the ROS2 interface later on.

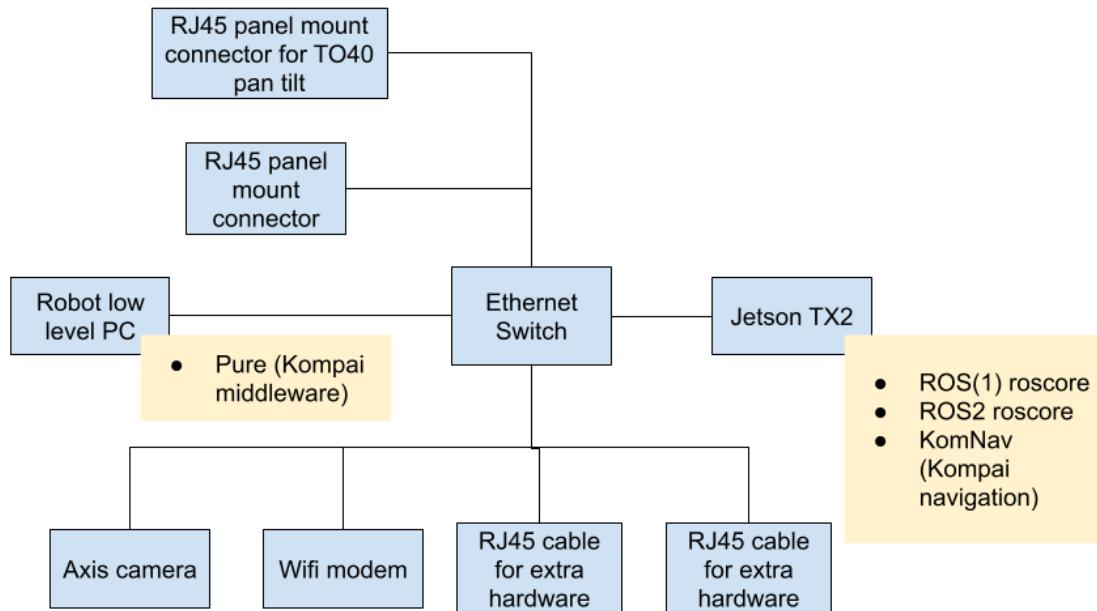


The hardware updates described in the previous paragraph should be made compatible with the way USC uses the robot platform:

- USC needs the robot to be available via wifi

- USC needs a ROS interface

3.1 Software architecture



- All data communications are done via ethernet.
- Kompaï uses instances of the Pure middleware to allow the different machines to communicate with each other via UDP. This is transparent for USC.
- Kompaï will install KomNav on the Jetson TX2
- Kompaï will install a ROS(1) and a ROS2 roscore and the below interfaces will be set up

3.2 ROS interface

Designation	Interface name	Interface type	Message type	Comment
Linear and angular command	/cmd_vel	Subscriber	geometry_msgs::Twist	Currently ROS1
Lidar data	/scan	Publisher	sensor_msgs::LaserScan	ROS1
Odometry data	/vel	Publisher	geometry_msgs::Twist	ROS1
Pan-tilt camera control	/pan_command /tilt_command /left_command /right_command	Subscriber	pure_ros::MotorComm and	Custom message
Pan-tilt camera state	/pan_state /tilt_state /left_state /right_state	Publisher	pure_ros::MotorState	Custom message
IR sensor	/ir_range	Publisher	sensor_msgs/Range	One topic per sensor
Axis camera	/front_camera/image_raw	Publisher	sensor_msgs/Image	Per ROS package http://wiki.ros.org/axis_camera

3. List of appendices

Document	Document name	Designation
ATF01	ATF01-7S4P 20AH LiIon battery.pdf	7S 4P 20AH Li-Ion battery
ATF02	ATF02-Aetina_ACE-N622_User+manual_V2.pdf	Nvidia Jetson TX2
ATF03	ATF03-Netgear GS108.pdf	SWITCH ETHERNET 8 PORTS
ATF04	ATF04-victron-energy-orion-tr-2412-10-convertisseur-cccc-24-vdc-125-vdc12-a-120-w.pdf	24V to 12V 10A power regulator
ATF05	ATF05-RUT240_Datasheet-v1.2.pdf	Wireless modem
ATF06	ATF06-HDMI panel mount connector.pdf	HDMI panel mount connector
ATF07	ATF07-USB panel mount connector.pdf	USB panel mount connector
ATF08	ATF08-RJ45 panel mount connector.pdf	RJ45 panel mount connector