Heavy Duty Robot communications

Main Components

1. Raspberry Pi 4 Unit

Connected to:
- 2 × PCA9685 modules (for Servo control)
- 2 × DC-DC Buck converters
- 4 × Feetech Servo motors:
  - Feetech 95kg
  - Feetech 60kg
  - Feetech 35kg (two units)

2. STM32F405RGT6 Unit

Connected to:
- ESP32S module (via UART2)
- 4 × BTS7960 motor drivers
- 4 × Geared DC motors

3. Monitoring System

Laptop connected to monitor system performance

Connection Details

Raspberry Pi 4 Connections

1. PCA9685 Modules

Connected via I2C to Raspberry Pi
Each PCA module controls 2 Servo motors
Servos powered by DC-DC Buck converters

2. DC-DC Buck Converters

Provide appropriate voltage for Servos (typically 5V-7.4V depending on motor specs)
Input from main power source (e.g., lithium battery)

3. Servo Motors

Feetech 95kg: Connected to first PCA, channel 0
Feetech 60kg: Connected to first PCA, channel 1
Feetech 35kg (1st): Connected to second PCA, channel 0
Feetech 35kg (2nd): Connected to second PCA, channel 1

STM32F405RGT6 Connections

1. ESP32S Module

Connected via UART2 for wireless communication
Acts as bridge between STM32 and MQTT system

2. BTS7960 Drivers

Each driver connected to:
- PWM signal from STM32
- Direction signal from STM32
- One DC motor

3. DC Motors

4 DC motors, each connected to separate BTS7960 driver
Powered by appropriate power source (typically 12V)

MQTT Communication System

1. MQTT Broker

Installed on server or laptop (e.g., Mosquitto)
Acts as message broker between components

2. Topics

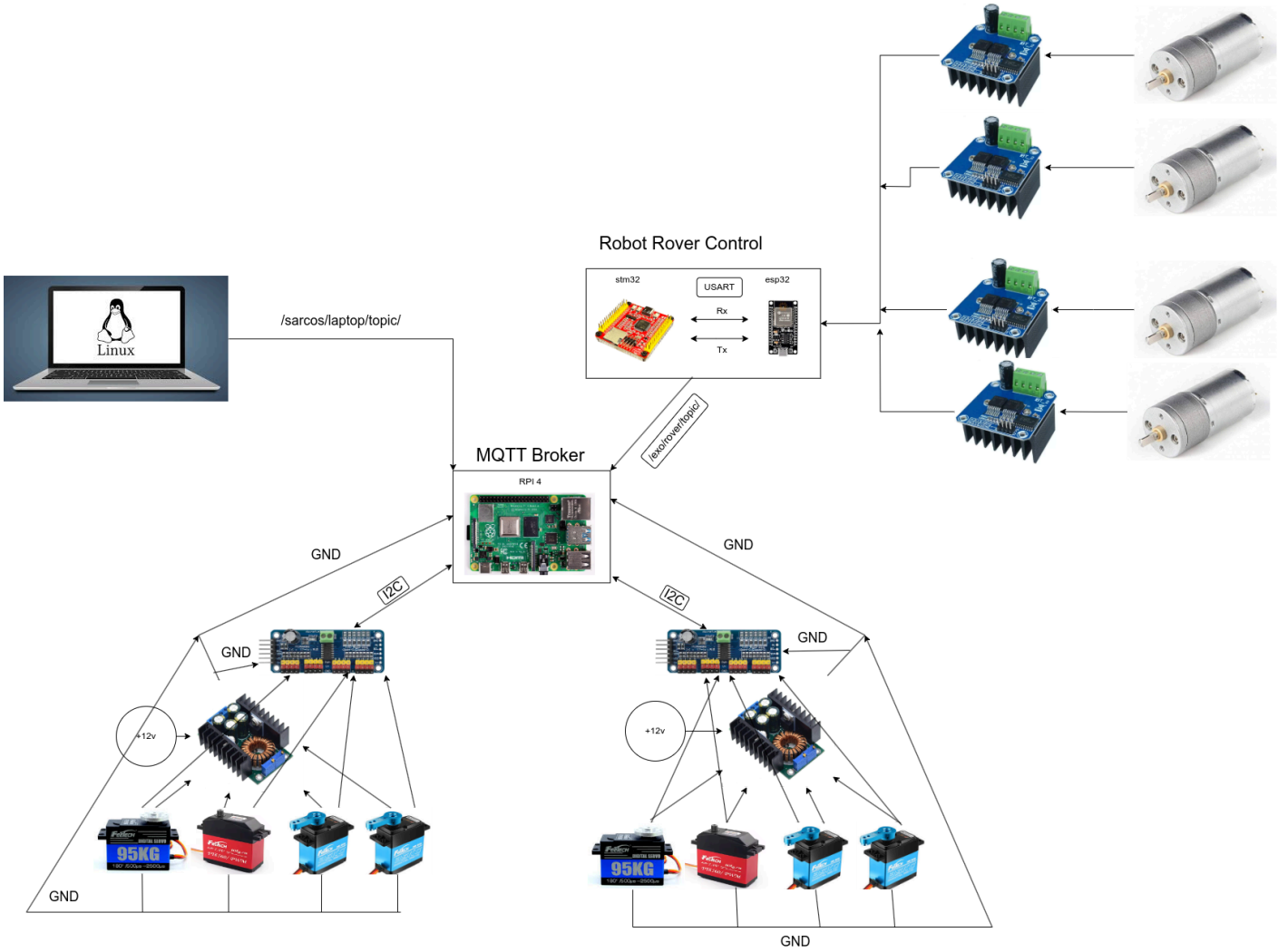
/robot/control: For sending control commands from laptop
/robot/feedback: For receiving performance data from robot
/robot/servos: For Servo motor control
/robot/motors: For DC motor control

3. ESP32S Connections

Connected to WiFi network to access MQTT broker
Receives commands from topics and relays to STM32 via UART
Sends feedback data from STM32 to broker

4. Laptop

Runs MQTT client (e.g., MQTT Explorer or custom application)
Sends control commands and receives monitoring data
Can display real-time system status


Linux
/sarcos/laptop/topic/
Robot Rover Control
stm32
USART
esp32
Rx
Tx
/exo/rover/topic/
MQTT Broker
RPI 4
GND
I2C
GND
GND
I2C
GND
+12v
+12v
95KG
95KG
GND
GND