

Here's a clean **Bill of Materials (BOM)** for a **2-wheel main robot + 1 SIMA**, with quantities and the reason/purpose for each choice.

Bill of Materials — Eurobot MVP (Main Robot + 1 SIMA)

1) Power & Protection (Main Robot)

Qty	Item	Spec	Reason/Purpose	Notes
1	Main battery pack	8S LiFePO₄ ≈ 25.6 V, 5–10 Ah (CE)	24 V headroom for torque; safer chemistry	24 V architecture > 12.8 V from PDF.
1	DC-DC buck	24 V→5 V, ≥ 5 A	Stable logic/sensor rail	Adjustable module OK
1	DC-DC buck	24 V→12 V, ≥ 5 A	Servos/LEDs rail if needed	Optional (can use 6–7.4 V BEC instead)
1	Main fuse + holder	25–30 A automotive	Protects main feed	Close to battery
1	Per-driver fuse	15–20 A blade	Protects motor branch	Size to stall current
1	E-stop (NC mushroom)	Panel mount	Cuts motor power only	Logic stays on to halt safely
1	Power switch	High-current	Convenience & safety	Upstream of distribution
1	Panel voltmeter	5–60 V	Battery monitoring	Avoid over-discharge
4	XT60/XT90 pairs	High-current	Safe, polarized power links	Main + branches
1 set	Wiring kit	Silicone AWG14–18 (power), AWG22–26 (signal)	Reliable wiring	Include ferrules & heat-shrink
1	Distribution board/PCB	Custom or prefab	Neat power branching	Mount fuses & bucks

2) Compute & Control

Qty	Item	Spec	Reason/Purpose	Notes
1	SBC	Raspberry Pi 4 (4–8 GB) + microSD 32–64 GB	ROS 2 strategy, timer, optional vision	5 GHz/Ethernet for debug
1	Microcontroller	STM32 Nucleo F401RE (<i>or Arduino Mega 2560</i>)	Deterministic motor/sensor control	UART/CAN ↔ Pi
3	Level- shifter/opto	Assorted	Protect logic, handle 24 V interfaces	Encoders/limits/driver I/O
1	USB-UART + cables	FTDI/CP2102	Debug & flashing	Keep spares

3) Drive & Actuation (Main Robot)

Qty	Item	Spec	Reason/Purpose	Notes
2	DC gearmotors w/ encoders	24 V, ~300 rpm, metal gears	Torque + odometry	Match wheel size/ratio
1	Motor driver (dual)	Sabertooth 2×25	Robust 24 V dual- channel control	Alt.: 2× Cytron MD30C (one per wheel)
2	Metal-gear servos	MG996R / DS3218	Thermometer pusher + gripper	6–7.4 V BEC or 12 V buck→BEC
1 set	Mech hardware	Mounts, couplers, screws	Secure assembly	Per CAD

Why not TB6612FNG/L298N for main drive? They're **undersized** for 24 V & higher torque; keep them for SIMA only. The DOC's higher-current driver approach is safer/more reliable.

4) Sensors (Main Robot — MVP stack)

Qty	Item	Spec	Reason/Purpose	Notes
1	IMU	BNO055 / MPU6050	Heading & pose stabilization	I ² C
5	ToF distance sensors	VL53L0X/L1X	Obstacle/wall distance, alignment	Front L/C/R + two sides
1	Reflectance array	QTR-8A / TCRT5000 bar	Edge/line detection near nest/thermo	Analog/digital
3	Limit switches	Lever microswitch	Gripper present / end-stops	NO/NC as needed
1	(Opt.) Color sensor	TCS34725	Confirm team-color crate at pickup	Mount near gripper
1	(Opt.) Camera	Pi Cam v2 / USB	Future ArUco/vision	Phase 2 upgrade
—	(Deferred) LiDAR	—	Not needed for MVP on 3×2 m field	Add only if tests show blocking

5) Safety & UI

Qty	Item	Spec	Reason/Purpose	Notes
4	LEDs + resistors	Red/Green 5 mm	Power / OK / Fault	Panel-mount helpful
1	Buzzer (quiet)	5 V piezo	Feedback (under 80 dB @1 m)	Fun “SIUUU” possible via MP3 module

6) SIMA (Phase 2 add-on)

Qty	Item	Spec	Reason/Purpose	Notes
1	MCU	Arduino Nano (or STM32 F103 “Blue Pill”)	Simple autonomy	Lightweight
1	Motor driver	TB6612FNG	Dual small motors	Efficient vs L298N
2	Mini DC gearmotors	6–12 V	SIMA propulsion	Low current

Qty	Item	Spec	Reason/Purpose	Notes
1	Battery	2S–3S Li-ion/LiFePO ₄	SIMA power	Switch + JST
1	ToF / line sensor	VL53L0X or line module	Simple nav	Front mount
1	Micro-servo	SG90	“Eating” animation	End of match
1	Power switch + LED	Mini toggle + LED	On/Off + status	—

Why this BOM (in one breath)

- **24 V LiFePO₄ + robust drivers** → torque headroom, lower currents, reliability (DOC).
- **Pi 4 + MCU split** → ROS 2 on SBC; deterministic I/O on MCU (both files align here).
- **IMU + ToF + reflectance + limits** → MVP-ready sensing without LiDAR; camera optional (PDF listed LiDAR; we defer).
- **SIMA with TB6612FNG** → right scale driver for tiny actuators (keep heavy drivers for main robot).