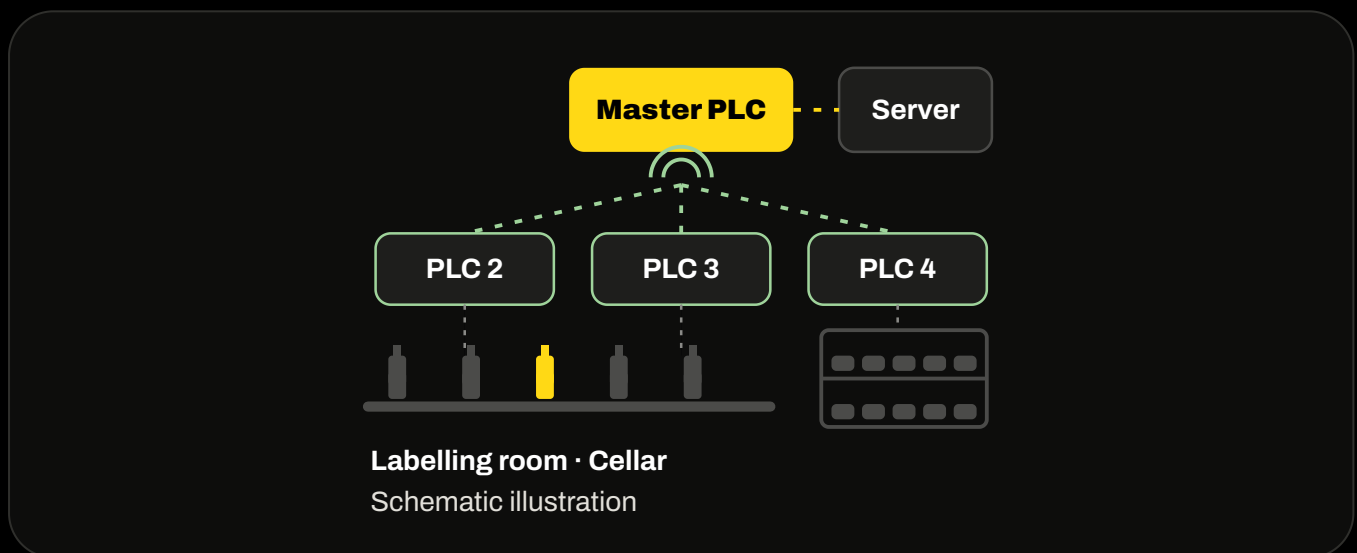


WINERY · M-DUINO PLCS

Four PLCs, one network. From the label to the cellar.

A labelling line and a wine cellar on one network of four Arduino PLCs.

[Read the interactive case study online ›](#)


4

Arduino based PLCs: one master and three slaves

5

ways to talk: LoRa, Ethernet, RS-485, Bluetooth and I2C

5

conveyor belts in the example layout, switched by relays

2

rooms: the labelling line and the cellar

THE CHALLENGE

Two rooms, five belts, two machines and a cellar. One system.

The winery needed to control and monitor two rooms. In the first room, a line labels and engraves the bottles. The second room is the cellar, where the bottles are stored for later sale. Conveyor belts take the bottles from one room to the other and send them to a rack with free space. All the data goes to a server, and a Panel PC is the point of monitoring and control.

01

Label and engrave each bottle

A labelling machine and a laser engraver work on the same line. A PLC gives each machine its job.

02

Send bottles where there is space

Belts take the bottles to the cellar. When a rack is full, the bottles must go to the next one.

03

Keep the cellar right for wine

The customer asked to control the temperature and the humidity of the cellar, so that the wine stays in good condition.

04

See it all from one point

All the process data goes to a server, and a Panel PC shows it in real time.



Many devices, many interfaces

Belt motors, a machine with a serial port, an engraver, sensors, a small display and a server do not talk the same way. The design gives each device the link that suits it, and joins the PLCs with radio instead of cables between the rooms.

HOW IT WORKS

Three loops: the network, the line, the cellar.

Loop 1 · The network

One master on the radio. One door to the server.

The master PLC controls the three slave PLCs over LoRa, a long range radio. It sends the process data through a router to the server over Ethernet, and the server passes it in real time to the Panel PC. The slaves do not need a cable to the server: the master speaks for them. Cut the radio link to one PLC, or the Ethernet, and see what a typical design does. Read [what LoRa is](#).

Loop 2 · The line

Each bottle gets its label. Each rack gets its turn.

PLC 3 runs the labelling station: it talks to the labelling machine over RS-485 and to the laser engraver over Bluetooth, with no cable. PLC 2 switches the motors of the belts with its relays. Belt 1 is in the labelling line, belt 2 takes the bottles to the cellar, and three more belts feed the racks. Photoelectric sensors in the racks go to PLC 4. When a rack is full, PLC 2 stops its belt and starts the next one. Run the line and empty a rack.

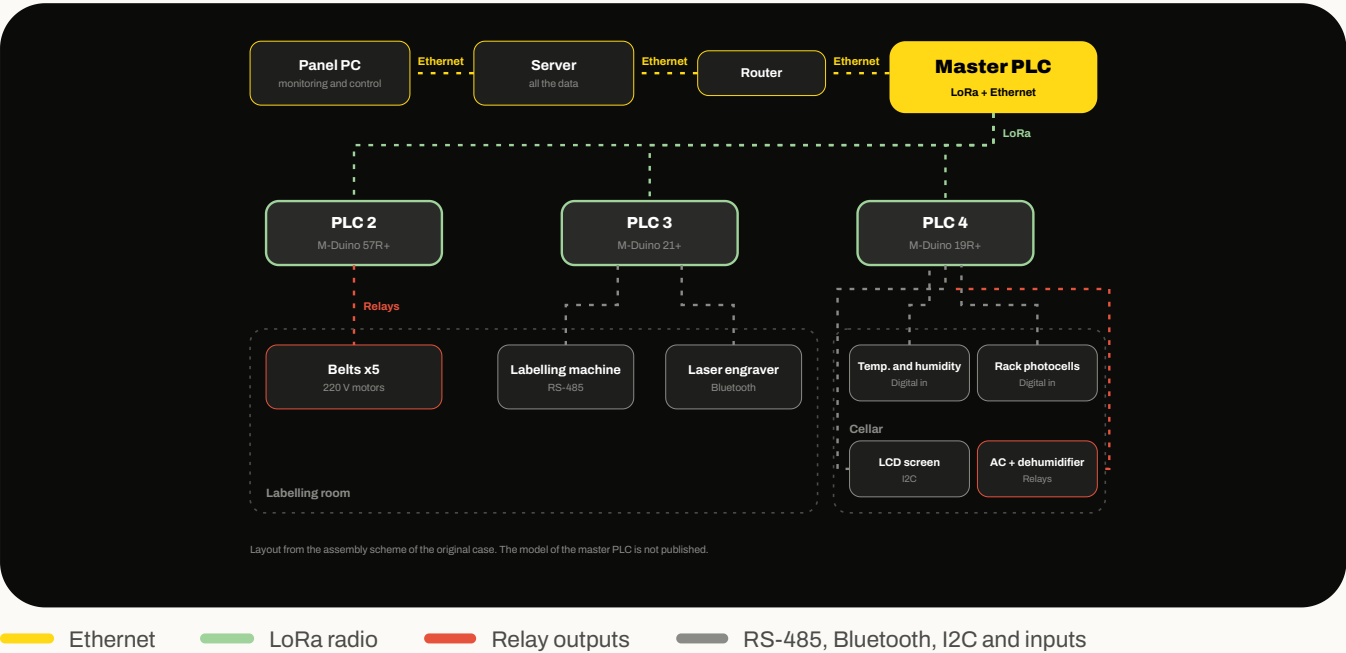
Loop 3 · The cellar

The cellar has its own climate. And its own screen.

PLC 4 reads a temperature and humidity sensor in the cellar. Depending on the selected values, it switches the air conditioning and the dehumidifier with its relays. The values are on the Panel PC and also on a small LCD in the cellar, on the I2C bus of the PLC. Change the weather and watch the relays. To run a full day of climate control in a closed room, open the [Greenhouse climate simulator](#) and choose the mushroom room.

How do four PLCs link a labelling line and a wine cellar?

This diagram follows the assembly scheme of the original case. The master PLC is the only one on Ethernet: router, server, then Panel PC. LoRa links it to PLC 2, 3 and 4. Each slave uses the interface that suits its devices: relays for the belts, RS-485 and a wireless link for the machines, inputs, relays and I2C in the cellar. The text says Bluetooth for the engraver; the scheme draws a Wi-Fi symbol (see the FAQ).



Signals and data

Signal	Between	Type	Purpose
Process data	Master PLC → router → server	Ethernet	All the data of the system in one place
Live view	Server → Panel PC	Ethernet	Point of monitoring and control
Orders and states	Master PLC ↔ PLC 2, 3 and 4	LoRa radio	The master controls the three slaves
Belt motors	PLC 2 → 5 belts	Relay outputs	Start and stop each belt (220 V single-phase motors)
Label jobs	PLC 3 ↔ labelling machine	RS-485	One label for each bottle
Engraving jobs	PLC 3 ↔ laser engraver	Bluetooth (Wi-Fi symbol in the scheme)	Engraving with no cable
Rack full	Photoelectric sensors → PLC 4	Digital inputs	Capacity of the racks
Next belt	PLC 4 → PLC 2	Over the PLC network	Stop the belt of a full rack and start the next one
Temperature and humidity	Sensor → PLC 4	Input (digital in the scheme)	Climate of the cellar
Cellar climate	PLC 4 → air conditioning and dehumidifier	Relay outputs	Switched by the selected values
Local display	PLC 4 → LCD in the cellar	I2C	Temperature and humidity on site

Three M-Duino PLCs named in the case.



M-DUINO ETHERNET PLC ARDUINO 57R

PLC 2, for the belts. An Arduino Mega 2560 based PLC for DIN rail with 49 I/O, 23 of them relays. The case chose it because its relay outputs can switch the 220 V single-phase motors of the belts.

Inputs	18: 12 analog/digital (0-10 V, 10-bit), 6 digital optoisolated (5 to 24 Vdc), 6 with interrupt
Outputs	31: 23 relays (4 A at 230 Vac, 2 A at 24 Vdc, resistive), 8 analog/digital/PWM (0-10 V)
Comms	Ethernet (W5500, 10/100), RS-485, RS-232, TTL serial, I2C, SPI
Power and mounting	12 to 24 Vdc, DIN rail TS35, IP20, 0 to 60 °C

The case does not publish the power of the belt motors. A relay rating is for a resistive load, and a motor is not one. A typical way to do it: the relay switches the coil of a contactor or a motor starter with overload protection, with an RC snubber sized for the coil. On the LoRa network of this case, PLC 2 uses the LoRa version (see the M-Duino LoRa family datasheet).

[See the M-Duino 57R >](#)



M-DUINO ETHERNET PLC ARDUINO 21

PLC 3, for the labelling station. A compact Arduino Mega 2560 based PLC with 21 I/O and RS-485. In this case it talks to the labelling machine over RS-485 and to the laser engraver over Bluetooth.

Inputs	13: 6 analog/digital (0-10 V, 10-bit), 7 digital optoisolated (5 to 24 Vdc), 2 with interrupt
Outputs	8: 5 digital optoisolated (5 to 24 Vdc), 3 analog/digital/PWM (0-10 V)
Comms	Ethernet (W5500, 10/100), RS-485, RS-232, TTL serial, I2C, SPI
Power and mounting	12 to 24 Vdc, DIN rail TS35, IP20, 0 to 60 °C

The case names the M-Duino 21+ WiFi / Bluetooth. The image and the link show the M-Duino 21 with Ethernet. The Wi-Fi and Bluetooth versions are in the M-Duino Wi-Fi & BLE family datasheet. PLC 3 needs LoRa to reach the master and Bluetooth to reach the engraver. The case does not say how the two radios are combined: ask us for the right version.

[See the M-Duino 21 >](#)



M-DUINO ETHERNET PLC ARDUINO 19R

PLC 4, in the cellar. An Arduino Mega 2560 based PLC with 17 I/O, 8 of them relays. In this case it reads the rack sensors and the climate sensor, switches the air conditioning and the dehumidifier, and drives the LCD on I2C.

Inputs	6: 4 analog/digital (0-10 V, 10-bit), 2 digital optoisolated (5 to 24 Vdc), 2 with interrupt
Outputs	11: 8 relays (4 A at 230 Vac, 2 A at 24 Vdc, resistive), 3 analog/digital/PWM (0-10 V)
Comms	Ethernet (W5500, 10/100), RS-485, RS-232, TTL serial, I2C, SPI
Power and mounting	12 to 24 Vdc, DIN rail TS35, IP20, 0 to 60 °C

The case does not publish the number of racks or sensors. Count one input for each rack sensor plus the climate sensor before you choose the model. For the compressor of an air conditioner, use the relay to give a command to its controller or to a contactor. On the LoRa network of this case, PLC 4 uses the LoRa version (see the M-Duino LoRa family datasheet).

[See the M-Duino 19R >](#)

Radio between the rooms

LoRa joins the PLCs without cables between the rooms. It carries short messages (up to 255 bytes), which is enough for orders and states. The original text gives a range of more than 15 km; walls, racks and tanks shorten it, so test the link on site.

Each machine on its own interface

The labelling machine uses RS-485, the usual serial bus for this kind of machine. The engraver uses a wireless link, and the cellar display uses I2C. See [RS-485 with Arduino and ESP32 based PLCs](#).

Two places to read the cellar

The Panel PC shows all the data. The I2C LCD in the cellar shows temperature and humidity to whoever is in the room. See [how to work with an LCD on I2C](#).

LINKING MACHINES AND ROOMS?

Tell us about your line and your cellar. An engineer will answer.

Tell us which machines you have and how they talk (RS-485, Ethernet, wireless), how far apart the rooms are, how many belts and racks you need, and what you want to see on the panel. We will propose the PLCs and the network.

READ IT ONLINE

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