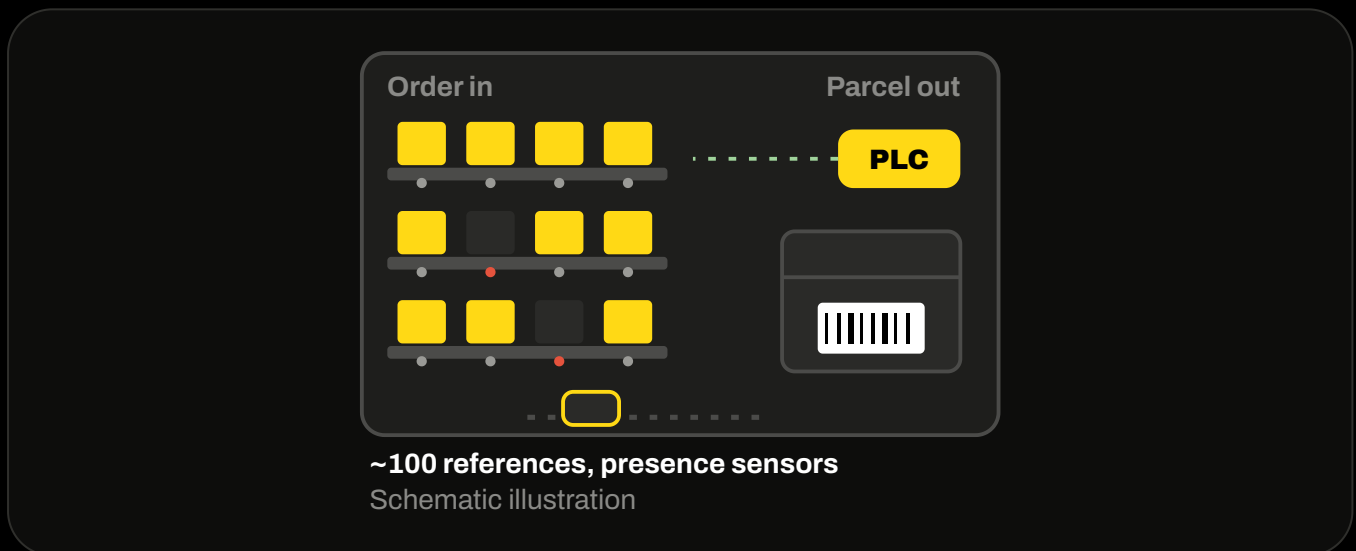


ONLINE SHOP WAREHOUSE · ESP32 PLC

An order comes in. A labelled parcel goes out.

Pick, pack and ship for an online beauty shop, run by an ESP32 PLC.

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

~100

product references on modular shelves

3

areas: orders, storage and packing

2

scans for a grouped order: each product, then the group

3

ERP tasks per parcel: label, collection, tracking

THE CHALLENGE

Receive the order, pick the products, send them to packing.

The company needed an automated warehouse to manage its inventory and to make its operations more efficient. The system had to receive the customer orders, pick the products from the warehouse and send them to the packing area. An ESP32 PLC controls the movement of the products.

01

From the web to the shelf

When a customer places an order online, the system records it and sends it to the storage area. The PLC looks up the location of every product in the inventory.

02

About a hundred references

The warehouse is made of modular shelves with about a hundred product references. Presence sensors on each rack detect where there is product.

03

Single items and grouped orders

Most products that ship on their own are packed in a fully automatic process. When an order groups several products, an operator usually works in a semi-automated process.

04

Every parcel registered

Barcode scanners register the products and send the data to the shipment tracking system. Grouped products are scanned twice: each product, then the group.



Synchronised with the ERP

The data saved during the process labels every parcel, single or grouped. The ERP prints the label, requests the collection from the parcel company and sends the tracking to the customer.

HOW IT WORKS

Three steps: pick, pack and ship.

Step 1 · Find and pick

Look up the location, then send the robot.

The order arrives from the online shop. The PLC searches the inventory for the location of each product and sends the orders to the mobile robots that pick them. Each rack has presence sensors. A typical way to use them: check the sensor before the pick job, and hold the order if the location is empty. Place an order, then empty a location.

- The order is recorded and sent to storage
- The PLC looks up the location of every product
- The robots pick and carry the products to packing

Step 2 · Pack

One product goes straight through. A group waits for the operator.

Most products that ship on their own go into the fully automatic process. Grouped orders usually go to an operator station, in a semi-automated process. Barcode scanners register every product, and a grouped order is scanned twice: first each product, then the group.

- Single items: automatic packing
- Groups: operator station, semi-automated
- Groups scanned twice: products, then group

Step 3 · Ship with the ERP

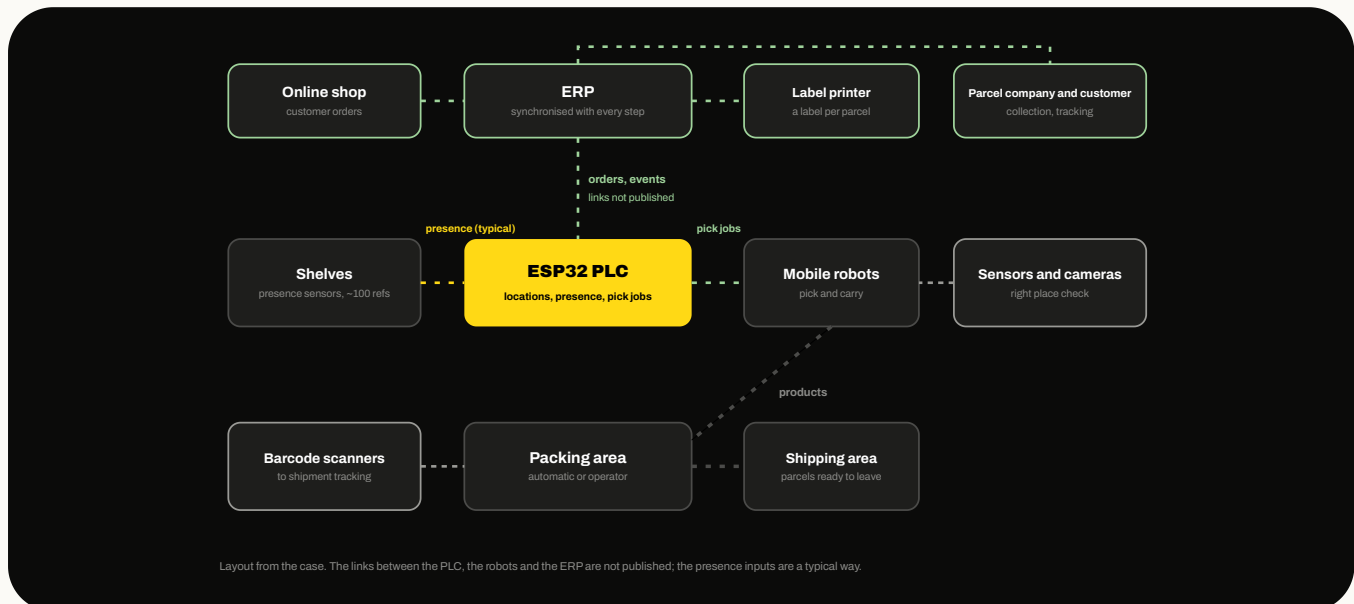
Label, collection, tracking.

The packed parcel goes to the shipping area. With the data saved during the process, the ERP prints the label, requests the collection from the parcel company and sends the tracking to the customer. Close a parcel, then cut the ERP link and bring it back.

- The ERP prints the label
- The ERP requests the collection
- The ERP sends the tracking to the customer

How does an online order become a parcel?

The online shop sends the order to the ERP and to the warehouse. The ESP32 PLC reads the presence sensors of the racks, looks up the location of each product and sends the pick jobs to the mobile robots. Sensors and cameras check that the products reach the right place. In the packing area, barcode scanners register each product and feed the shipment tracking system. The ERP prints the label, requests the collection and sends the tracking. The case does not publish the links between the PLC, the robots and the ERP.



— PLC and its inputs — Orders, jobs and ERP data — Scans and checks — Product flow

Signals and data

Signal	Between	Type	Purpose
Customer order	Online shop → ERP and warehouse	Order data	The products to pick
Product presence	Rack presence sensors → ESP32 PLC	Digital input (typical)	There is product at a location
Pick job	ESP32 PLC → mobile robots	Message (link not published)	The location of each product of the order
Delivery check	Sensors and cameras → system	Not published	The products reach the right place
Product scan	Barcode scanners → shipment tracking	Barcode read	Registers each product
Group scan	Scanner at the operator station → shipment tracking	Barcode read	Second scan for a grouped order
Parcel	Packing area → shipping area	Product flow	Packed and ready to leave
Label	ERP → label printer	Print job	The label of every parcel, single or grouped
Collection and tracking	ERP → parcel company and customer	Message	Collection request and tracking of the parcel

The PLC of the warehouse.



ESP32 PLC 21 FLEX

The case does not publish the exact ESP32 PLC model. The image of the original case shows an ESP32 PLC 21.

Role in this case	Controls the movement of the products: locations, presence and pick jobs
Processor	ESP32 dual core, up to 240 MHz, 16 MB flash, 520 KB SRAM
Inputs	13: 6 analog/digital (0-10 V, 11-bit) and 7 digital optoisolated, 5 to 24 Vdc, 2 with interrupt
Outputs	8: 3 analog/digital/PWM (0-10 V, 12-bit) and 5 digital optoisolated, 5 to 24 Vdc
Communications	Ethernet 10/100, Wi-Fi 2.4 GHz, Bluetooth LE, RS-485, RS-232, TTL, I2C, SPI
Power and mounting	12 to 24 Vdc, DIN rail TS35, IP20; real-time clock with backup battery

The case does not publish how many presence sensors there are. The ESP32 PLC 21 FLEX has 13 inputs.

[See the ESP32 PLC 21 FLEX ›](#)

Open solution

The ESP32 PLC is programmed in C++ with the Arduino IDE. There are no licence fees for the software, and the code belongs to the project.

Modular

In this project, a solution whose specification can grow in the future was one of the reasons to choose it. The ESP32 PLC family adds I/O modules over I2C, remote I/O over Modbus RTU and one optional communication board: LoRa, 4G or CAN.

Network built in

Ethernet, Wi-Fi and Bluetooth LE are on board. A warehouse controller can join the plant network and talk to a server or an ERP. The case does not publish which link it used.

AUTOMATING A PICK AND PACK WAREHOUSE?

Tell us your orders, your shelves and your ERP. An engineer will answer.

Tell us how many references and locations you have, how products move from the shelf to packing, how you scan them and which ERP prints your labels. We will tell you which controller fits and how to connect it.

READ IT ONLINE

industrialshields.com/case-study-e-commerce-order-picking-packing-esp32-plc

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