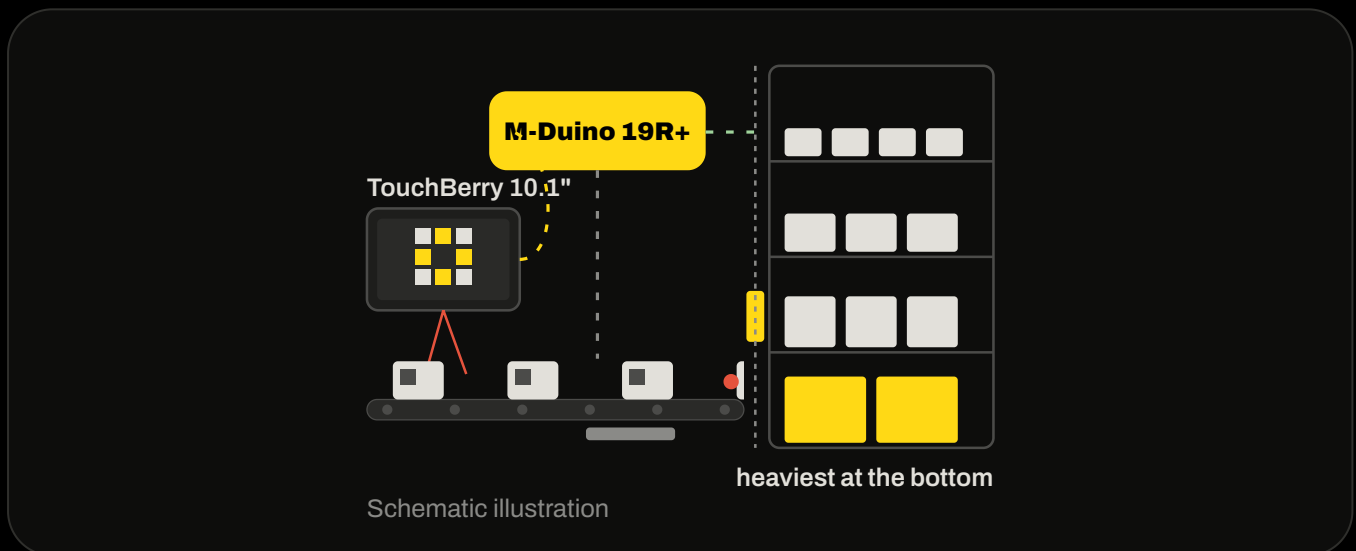


AUTOMATED WAREHOUSE · M-DUINO 19R+

Heavy boxes go low. Every box finds its dock.

Automated warehouse: weighing, 3-axis storage and dock dispatch.

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



1

M-Duino PLC manages every motor

3

motor axes move the load: X, Y and Z

2

conveyors on drives: check-in and shipping

QR

read at check-in and at every dock

THE CHALLENGE

Store, track and ship boxes of different weights.

The warehouse keeps boxes of different weights on a group of shelves. It must also send any stored box to its line at the loading docks. And the people who run it must know the state of the warehouse at all times.

01

Automatic storage

A stock of boxes is stored with no forklift and no manual placing. A conveyor brings each box in, and a three axis system puts it on a shelf.

02

Every package tracked

A QR code identifies each box when it enters. The system records the tracking of every package, from check-in to dock.

03

Less energy to lift

Lifting a heavy box high costs energy. One goal of the case is to optimise the energy consumed when the system raises loads.

04

Several docks

The warehouse ships through several docks. Each box must leave on the conveyor of its own area, not the next one.



Managed from the office

The state of the warehouse must be visible and manageable from another place. A server connects every process over WiFi, and the scheme shows remote control from the office through a VPN or an intranet.

HOW IT WORKS

Three loops: check in, store, ship.

Loop 1 · Check in

A QR code opens the record. A load cell gives the weight.

At check-in, a QR reader on the USB port of a TouchBerry screen reads the code that identifies the box. The M-Duino turns on the check-in conveyor through a drive. An IR sensor at the end of the conveyor tells the PLC that the box has reached the warehouse location. A strain gauge (load cell) weighs the load.

Loop 2 · Store by weight

The heaviest boxes go to the bottom of the shelf.

Three servomotors move the load on the X, Y and Z axes. The case says servomotors, and the scheme draws stepper type drivers (A+, A-, B+, B-). Each one has a driver that gets three digital signals from the PLC: pulse, direction and enable (PUL, DIR, ENA). The application sorts the loads by weight in ascending order and places the heaviest boxes at the bottom. The case gives two reasons: less energy to raise loads, and a better structural load on the shelves. A typical way to do it: weight bands per shelf level and a table of free slots, as in the panel.

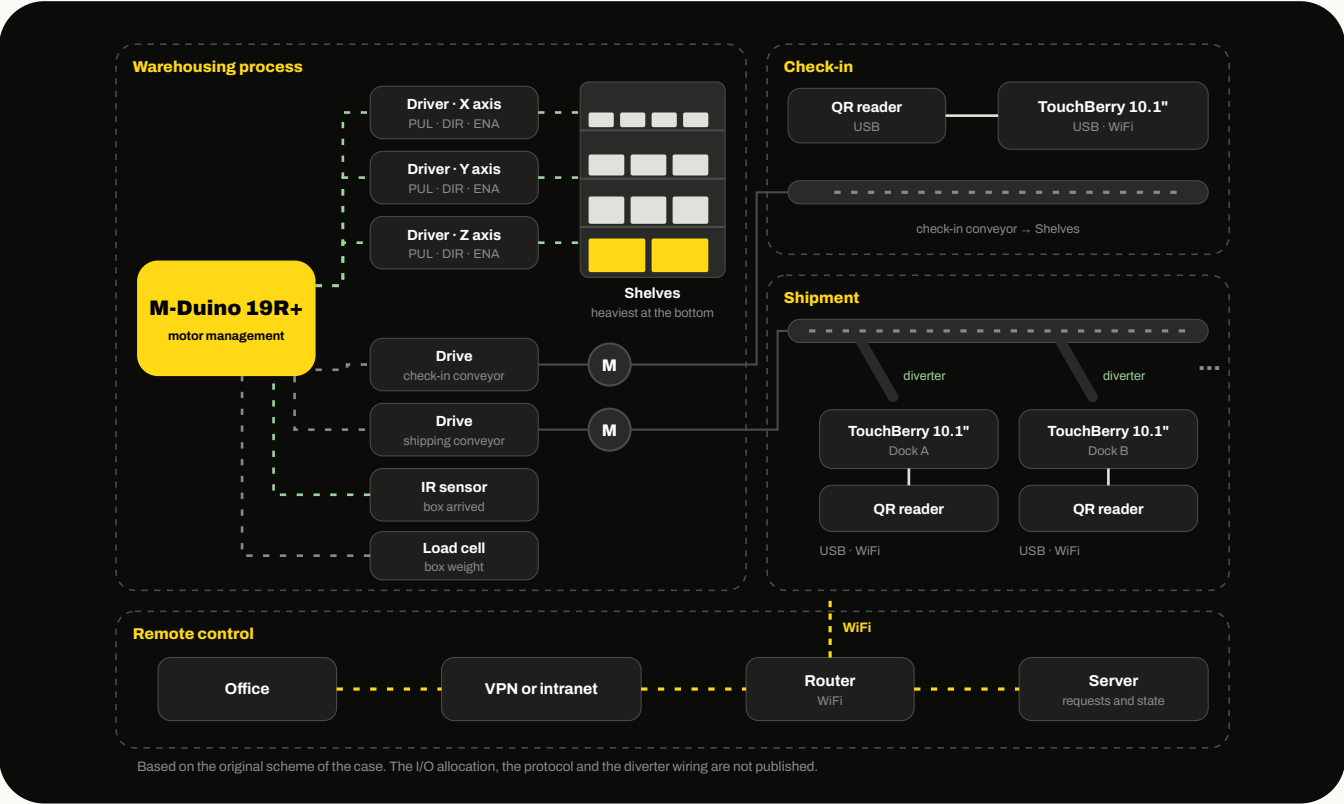
Loop 3 · Ship

Request a box. The dock screen takes it off the line.

Someone requests a box from a TouchBerry screen, or an external server sends the request. The PLC sends the collection of the box, brings it to the shipping conveyor and runs that conveyor through its drive. Each dock has a QR reader on the USB port of its own TouchBerry screen. When the dock screen detects that the box is for its position, the box is diverted to the conveyor of that area.

How does one M-Duino run 3-axis storage and dock dispatch?

One M-Duino does the motor management: three axis drivers, two conveyor drives, an IR sensor and a load cell. TouchBerry screens with USB QR readers work at check-in and at every dock. A server connects every process over WiFi, and the office controls the warehouse through a VPN or an intranet. This diagram follows the original scheme of the case.



— Digital signals — Analog signals — WiFi network — USB

Signals and data

Signal	Between	Type	Purpose
X, Y and Z axes	M-Duino → 3 drivers → 3 servomotors	Digital: PUL, DIR, ENA	Move the load to its place on the shelf
Check-in conveyor	M-Duino → drive → motor	Analog	Brings the box from check-in to the shelves
Shipping conveyor	M-Duino → drive → motor	Analog	Takes the box past the docks
Box at the shelves	IR sensor → M-Duino	Digital input	Tells the PLC that the box has arrived
Box weight	Load cell → M-Duino	Analog input	Decides the shelf level of the box
Box identity	QR reader → TouchBerry	USB	Check-in, and dock detection on the shipping line
Diverter	At each dock	Digital	Sends the box to its dock conveyor. Switching device not published
Requests and state	TouchBerry screens, server, M-Duino	WiFi	Requests from a screen or an external server. Protocol not published
Remote control	Office ↔ VPN or intranet ↔ router	Network	Remote management of the warehouse

HARDWARE USED

One M-Duino for the motors. TouchBerry screens for the people.



M-Duino Ethernet PLC Arduino 19R+

The PLC named in the case, built around an original Arduino Mega 2560. It manages the motors: the three axes, the two conveyor drives, the IR sensor and the load cell.

Inputs	6: 4 analog/digital (0-10 V), 2 digital isolated with interrupt
Outputs	11: 3 analog/digital/PWM (0-10 V), 8 relays
Communications	Ethernet, 2 x RS-485, RS-232, TTL, I2C, SPI
Built in	Real-time clock, microSD slot
Programming	Arduino IDE, over USB or Ethernet
Power and mounting	12 to 24 Vdc, DIN rail

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



TouchBerry Pi Panel PC 10.1"

The screens of the system: at check-in, in the shipping area and at every loading dock. Each one reads QR codes through a USB reader, shows the package information and the tasks to do, and connects over WiFi.

Role	Check-in, requests, dock detection
Screen	10.1" touch screen
Computer	Raspberry Pi 4B, Linux
Links	WiFi to the server, USB to the QR reader

The case names the TouchBerry Pi 10.1" with a Raspberry Pi 4B and does not publish the exact version. The image and the link show the current TouchBerry Pi Panel PC 10.1" FLEX.

[See the TouchBerry Pi 10.1" >](#)

One PLC for every motor

The three axes and the two conveyors run in one program, on one M-Duino. Storage, retrieval and dispatch share the same state.

The rule lives in the code

Heaviest boxes at the bottom, in ascending order. If your rule changes, for example a new weight band or a reserved level, you change the program, not the rack.

A screen at every point of work

TouchBerry screens at check-in, in the shipping area and at every dock show the package information and the tasks to do. Each one reads QR codes on its own USB port.

Open tools on both sides

You program the M-Duino in C++ with the Arduino IDE. The TouchBerry runs Linux on a Raspberry Pi 4B, so your team can build the check-in and dock applications with standard Linux tools.

SIMILAR WAREHOUSE?

Tell us your racks and your docks. An engineer will answer.

Tell us how many shelf positions and axes you have, how you identify boxes (QR, barcode or RFID), how many docks you ship to and where the requests come from. We will tell you which controller fits and how to connect your drives.

READ IT ONLINE

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