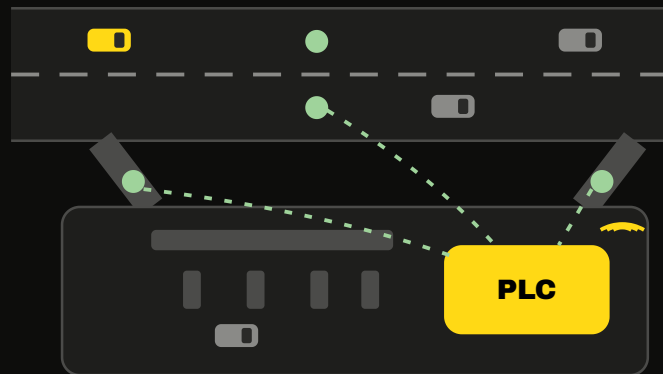


SERVICE STATION · ESP32 PLC 21 CORE

Count the cars on the road. Know who stops.

Sensors in the road count every vehicle. A WiFi PLC sends the data.

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


Schematic illustration

3

kinds of detection point:
lanes, entrance, exit

1

radio receiver for all the
transducers

1h

time slot of the road traffic
count

Wi-Fi

from the PLC to the station
network, with Modbus TCP

THE CHALLENGE

A station sells fuel, food and services. When do the customers come?

A service station today is more than a place to refuel. It has a restaurant, a car wash, a workshop or a shop. Many stations now try to adjust their prices to the behaviour of their customers. This operator wanted a real-time study of the vehicle traffic at the station and on the road in front, to base its market strategy on solid data.

01

How long vehicles stay

The average stay of the vehicles. It helps to forecast when queues form at the pumps and when to change the price of fuel.

02

Who enters and does not refuel

The rate of vehicles that enter and do not refuel, and those that stop at the bar or the shop. It shows the best time to promote the shop, the cafeteria or the station.

03

Traffic on the road

The volume of traffic on the road in front of the station, every hour, to compare it with the consumption of the customers.

04

Offers at the right moment

With behaviour by period and by date, the managers plan the offer, launch special promotions or adapt the fuel price at key moments, such as weekends or the busiest hours of holidays.



Wireless, in the existing station

The solution adapts to the place. The sensors report each vehicle by radio, and the PLC joins the local network of the station over WiFi.

HOW IT WORKS

Three stages: detect, compute, compare.

Stage 1 · Detect

Each detection point reports by radio.

Electromagnetic transducers sit in each lane of the road in front of the station, and at the entrance and the exit of the service area. Each time a transducer detects a vehicle, it sends the data by radio to one receiver: an OpenMote B module that receives from all the transducers.

- A transducer in each lane, at the entrance and at the exit
- A radio message on each detection

Stage 2 · Compute

Counts become stay time and stop rate.

The counts answer the questions of the operator: how many vehicles pass, how many stop, how long they stay and how many do not refuel. A typical way to compute the stay with anonymous detectors: the vehicles inside are the entries minus the exits, and the average stay is the average number inside divided by the entries per hour.

- Stop rate: entries over road traffic
- A typical way to do it: average stay from the vehicles inside and the entries

Stage 3 · Compare

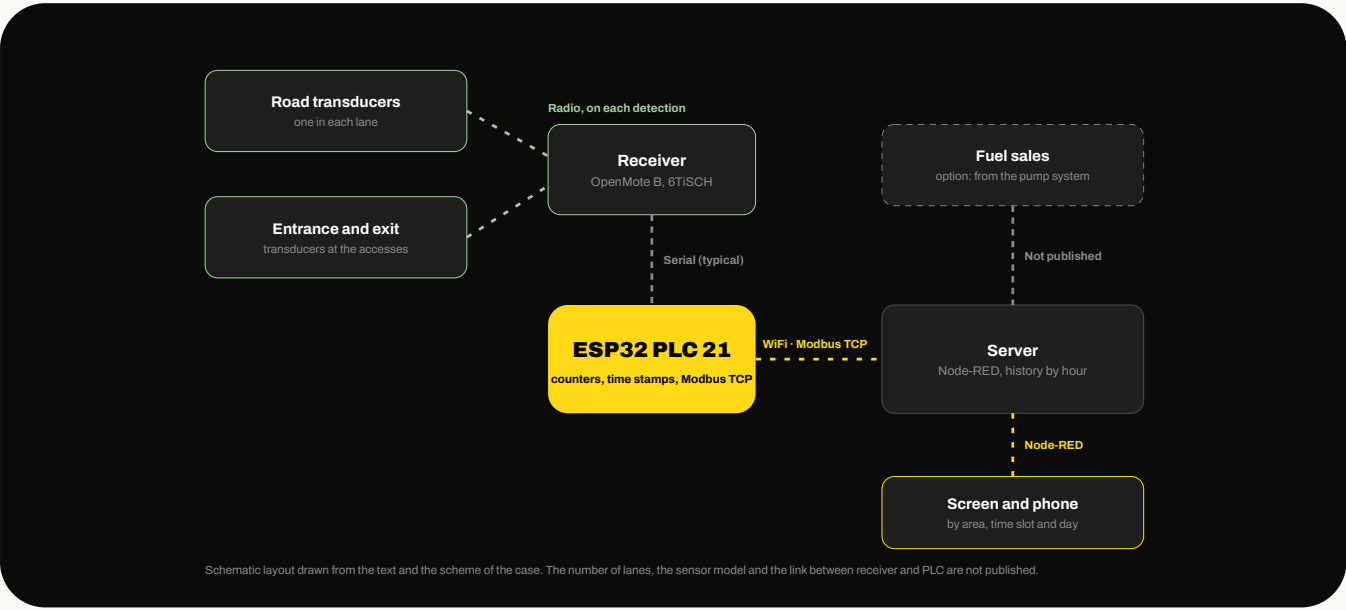
The server keeps every hour. Node-RED shows it.

The PLC joins the local network of the station over WiFi and sends the data with Modbus TCP. The data is stored on the server and monitored with Node-RED.

- Data stored on the server, by hour
- Views by area and by time slot

How do you count the traffic of a service station with a PLC?

Electromagnetic transducers in each lane of the highway in front, and at the entrance and the exit of the service area, send each detection by radio. An OpenMote B receiver collects them and passes them to a WiFi PLC. The PLC joins the local network of the station over WiFi and sends the data with Modbus TCP to a server, where Node-RED stores it and shows it on a screen or a phone.



Radio (6TiSCH) WiFi, Modbus TCP Typical link or option

Signals and data

Signal	Between	Type	Purpose
Vehicle on a road lane	Transducer in each lane → receiver	Radio	Traffic on the road, every hour
Vehicle at the entrance	Transducer → receiver	Radio	Entries, start of the stay
Vehicle at the exit	Transducer → receiver	Radio	Exits, end of the stay
Detections	OpenMote B receiver → PLC	Serial (typical)	Counters for each point
Counters and times	PLC → server	WiFi, Modbus TCP	Stored by hour
Views	Server → screen or phone	Node-RED	By area, time slot and day
Fuel sales (option)	Pump system → server	Not published	Entries without fuel

HARDWARE USED

A WiFi PLC behind the receiver. A screen for the views.



ESP32 PLC 21 CORE

An industrial controller built on the dual-core ESP32, with Wi-Fi, Bluetooth LE and Ethernet, for DIN rail. It is programmed in C++ with the Arduino IDE. Here it takes the detections from the receiver, keeps the counters with a time stamp and sends them over WiFi with Modbus TCP.

Processor	ESP32 dual core, up to 240 MHz, 16 MB flash, 520 KB SRAM
Wireless	Wi-Fi 2.4 GHz, Bluetooth LE
Wired	Ethernet 10/100 Mbit; RS-485; RS-232 and TTL serial selectable by DIP switch
I/O	13 inputs, 8 outputs
Programming	Arduino IDE

The case used an Industrial Shields PLC of the WiFi and Bluetooth LE family, based on Arduino. The old page of the case shows an M-Duino 19R. The M-Duino PLCs with WiFi and Bluetooth are no longer in the web shop. The ESP32 PLC 21 CORE does the same job today: Wi-Fi to the station network, and a serial port for the receiver. The case does not say how the receiver connects to the PLC; check the signal levels of both sides. The OpenMote B receiver and the transducers are not Industrial Shields products.

[See the ESP32 PLC 21 CORE ›](#)



TouchBerry Pi Panel PC 10.1" FLEX

An industrial Panel PC with a Raspberry Pi 4 and a 10.1" touch screen. A typical use in this system: the screen in the station office that shows the Node-RED views by area, time slot and day.

Role	Screen for the Node-RED views
Screen	10.1", touch
Computer	Raspberry Pi 4
Network	Gigabit Ethernet

The old page of the case lists a TouchBerry Pi 10.1" with the products of the case. The text puts the data on a server with Node-RED and does not say where the screen goes. The current model is the TouchBerry Pi Panel PC 10.1" FLEX. The family also has 7" and 18.5" models.

[See the TouchBerry Pi 10.1" ›](#)

Radio from the road

The transducers send each detection by radio to one receiver. The system adapts to the place.

A standard protocol on the network

The PLC talks Modbus TCP over the WiFi of the station. Node-RED and most SCADA systems read it.

Counts by hour, compared by day

An hourly count by area turns into views by time slot and comparisons between days: the base for offers and prices at the right moment.

SIMILAR SITE?

Tell us where the vehicles pass. An engineer will answer.

Tell us how many lanes and accesses you want to count, how far they are from the building, and who must see the data. We will tell you which controller fits and how to connect the receiver.

FULL CASE STUDY ONLINE

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