

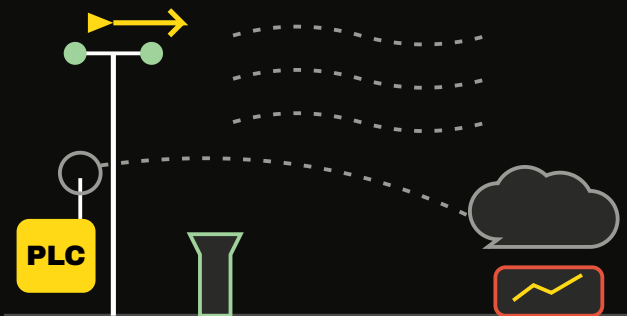
WEATHER STATION · GPRS PLC

Wind data from places with no network. One PLC sends it over GPRS.

A wind study in Panama, on one Arduino based PLC with GPRS.

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

Weather station



wind, rain and pressure over GPRS

Schematic illustration

6

parameters on the list of the case, from the wind to the forecast

3

sensor connections named: analog, I2C and SPI

3

rainfall totals: per day, per month and per year

1

PLC with GPRS sends all the data to the cloud

THE CHALLENGE

Record the weather far from any network.

The aim of the project is to manage a weather station built on open source technology, and to monitor it through a cloud platform. The goal is a record of the climate in Panama: the data of today and the data of the past, to make good forecasts of storms and other weather phenomena.

01

Six things to record

Wind speed and direction.
Temperature and humidity, inside and outside. Current and accumulated rainfall, per day, month and year.
Rainfall intensity.
Atmospheric pressure.
And the weather forecast.

02

Each sensor has its own connection

Each sensor model uses its own connection: analog, I2C, SPI or another one. The method depends on the model, the data type and the update time. One PLC must read all of them.

03

No Ethernet, no Wi-Fi

The sensors must be where the weather can be measured well. In most of those areas, the only communication available is GPRS.

04

Past data counts too

A forecast needs history. The platform needs a database, so that the data of the past is as useful as the data of now.



Why it matters

Storms and tornadoes can be very dangerous. The case says it is important to study them, to predict them and to avoid their consequences. A station that keeps sending data from the right place is the first step.

HOW IT WORKS

Three jobs: read every sensor, add up the rain, send it over GPRS.

Job 1 · Read every sensor

Many sensors, many connections, one PLC.

The PLC reads each sensor on the connection its model uses. In the case: analog, I2C, SPI or another one, chosen by the model, the data type and the update time. Then a program on the PLC processes all the values. Change the wind and watch the reads.

Job 2 · Add up the rain

Now, today, this month, this year.

The case asks for more than one rain value: the current rainfall, the totals per day, per month and per year, and the intensity. The PLC can keep these totals itself, with its real-time clock to close each day. Make it rain and go to midnight.

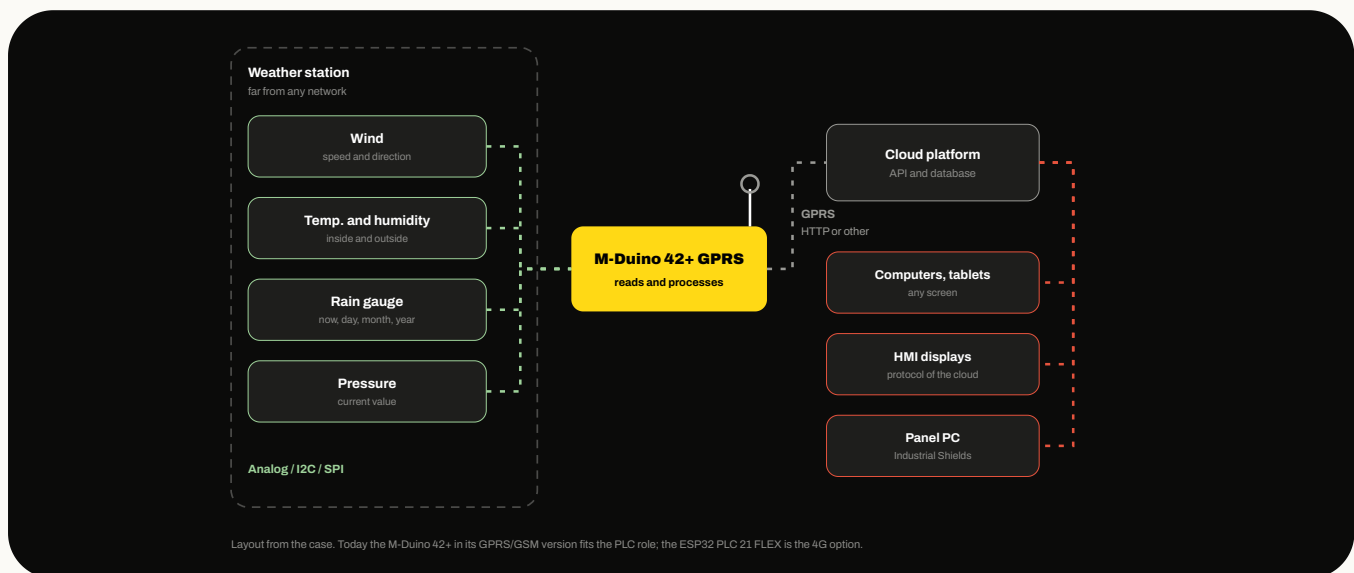
Job 3 · Send it over GPRS

From the station to the cloud, with no cable.

The PLC sends the data to the cloud through its GPRS module and antenna, with HTTP or another protocol. There, a platform with an API and a database keeps the record and shows it on computers, tablets, HMI displays or a Panel PC. Cut the coverage and bring it back.

How do you send weather data from a site with no network?

Connect each sensor to the PLC on the connection its model uses: analog, I2C, SPI or another one. A program on the PLC reads and processes all the data. Through its GPRS module and antenna, the PLC sends the data to the cloud with HTTP or another protocol. In the cloud, a platform with an API and a database keeps the record and shows it. Computers, tablets, HMI displays or an Industrial Shields Panel PC read it, if they use a protocol compatible with the cloud. In this case the PLC is an M-Duino 42+ with GPRS and GSM.



- Sensor connections: analog, I2C, SPI
- PLC with GPRS
- GPRS to the cloud
- Screens that read the cloud

Signals and data

Signal	Between	Type	Purpose
Wind speed and direction	Wind sensors → PLC	By sensor model	The main data of the wind study
Temperature and humidity	Inside and outside sensors → PLC	By sensor model	Two places: inside and outside
Rainfall	Rain gauge → PLC	By sensor model	Current rainfall, totals per day, month and year, and intensity
Atmospheric pressure	Pressure sensor → PLC	By sensor model	Current value
Sensor connections	Sensors → PLC	Analog, I2C, SPI or other	Chosen by the model, the data type and the update time
Data out	PLC → cloud	GPRS, with HTTP or another protocol	GPRS is the only link in most places where the sensors must be
Record	Cloud platform → database	API and database	Keeps the past data as useful as the current data
Monitoring	Cloud → computers, tablets, HMI, Panel PC	A protocol compatible with the cloud	Real-time view and tracking of the weather
Weather forecast	Platform → users	Software	On the list of the case; it comes from the record, not from one sensor

The PLC of the case, today. And a 4G option.



Current equivalent M-DUINO ETHERNET PLC ARDUINO 42

The M-Duino 42+ of the case, as it is sold today. It has the analog inputs, I2C and SPI that the sensors of the case use. Its GPRS/GSM version adds the mobile link.

Role in this design	Reads all the weather sensors, processes the data and sends it to the cloud
Controller	Arduino Mega 2560, programmed with the Arduino IDE
Inputs	26: 12 analog/digital (0-10 V, 10-bit) and 14 digital optoisolated, 5 to 24 Vdc, 4 with interrupt
Outputs	16: 6 analog/digital/PWM and 10 digital optoisolated
Buses and ports	I2C, SPI, RS-485, RS-232, TTL serial, Ethernet (W5500)
Power and mounting	12 to 24 Vdc, DIN rail TS35, IP20, 0 to 60 °C

The case used the M-Duino 42+ with GPRS and GSM. That product is no longer in the shop under its old name. This page links the current M-Duino 42+, and its GPRS/GSM version is described in the [M-Duino GPRS family datasheet](#). Ask our team for the cellular version.

[See the M-Duino 42+ ›](#)



Option on 4G ESP32 PLC 21 FLEX

For a site where you want 4G instead of GPRS. The FLEX version takes one 4G LTE-M/NB-IoT board, and it is also programmed with the Arduino IDE.

Role in this design	The same job, with a 4G LTE-M/NB-IoT link
Inputs	13: 6 analog/digital (0-10 V, 11-bit) and 7 digital optoisolated, 2 with interrupt
Outputs	8: 3 analog/digital/PWM and 5 digital optoisolated
Buses and ports	I2C, SPI, RS-485, RS-232, Ethernet, Wi-Fi, Bluetooth LE
Expansion	One board: 4G LTE-M/NB-IoT (u-blox SARA-R412M), LoRa or CAN
Power and mounting	12 to 24 Vdc, real-time clock, DIN rail TS35, IP20

Not part of the original case. GPRS uses 2G mobile networks, and some operators have switched 2G off. Check the coverage at the site before you choose the link.

[See the ESP32 PLC 21 FLEX ›](#)

One PLC for every connection

Analog inputs, I2C and SPI are on the same PLC. A new sensor model needs a new connection and new code, not a new controller.

Split the job into parts

Sensors, PLC, GPRS link, cloud and platform. The case says it plainly: the project can look complex, but the key is to separate each part and keep a common goal.

Any screen

The data in the cloud reaches computers, tablets, HMI displays or an Industrial Shields Panel PC, such as the [TouchBerry Pi 10.1" FLEX](#).

MEASURING THE WEATHER AT A REMOTE SITE?

Tell us about your station. An engineer will answer.

Tell us what you want to measure, which sensors you have, where the station is and how the data must leave it. We will propose the PLC, the link and the software.

READ IT ONLINE

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