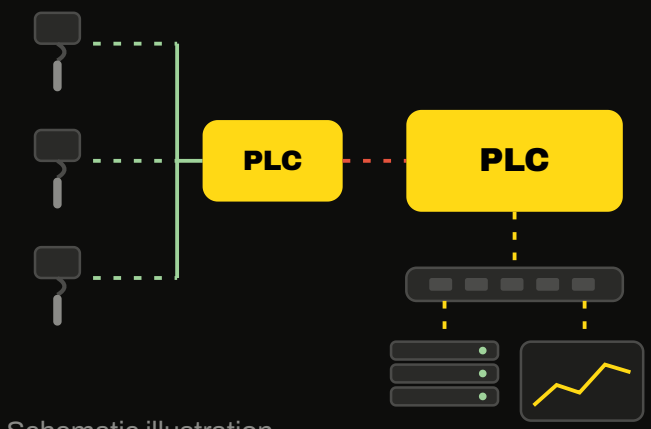
MODBUS RTU AND TCP · M-DUINO 21

Many thermometers. One Modbus network.

PLCs read the probes on Modbus RTU and share the data on Modbus TCP.

Read the interactive case study online ›



Schematic illustration

2 Modbus variants: RTU and TCP	**3** network levels: probes, local PLCs, main PLC	**2** destinations: a server and a Panel PC	**1979** the year Modicon published Modbus

THE CHALLENGE

Temperature at many points must reach one place, and stay there.

The goal is a very extended register of temperature readings, so that the data can be used for statistical control. That means many thermometers, often far from each other, and one place where all the readings are stored and seen.

01

Many measuring points

Each point has a TQS3-M thermometer with a Modbus RTU output. The scheme of the case shows three thermometers and three local PLCs; it does not say how many thermometers each PLC reads.

02

Readings must travel

Local PLCs collect the readings of their thermometers and forward them to a main PLC. The case did it with Modbus RTU; with the M-Duino 21 this page uses Ethernet and Modbus TCP for that link.

03

Store every reading

A server system receives all the temperature data and works as the storage of the register.

04

See what happens

A Panel PC shows what the main PLC monitors and the data it receives from the other PLCs.

An open protocol

Modbus is open: no licence fee.

HOW IT WORKS

Three steps: read the probe, collect, share.

Step 1 · Read the probes

A local PLC asks each thermometer. Each one answers with its reading.

The TQS3-M thermometers send their data to the local PLCs over Modbus RTU, a binary protocol on a serial line. On Modbus RTU, only the master asks.

- TQS3-M thermometers with a Modbus RTU output

Step 2 · Collect at the main PLC

The main PLC reads the local PLCs over Ethernet.

The local PLCs forward the data to the main PLC. The case did it with Modbus RTU.

- Main PLC as Modbus TCP client

Step 3 · Share on Ethernet

Modbus TCP takes the data to the server and the Panel PC.

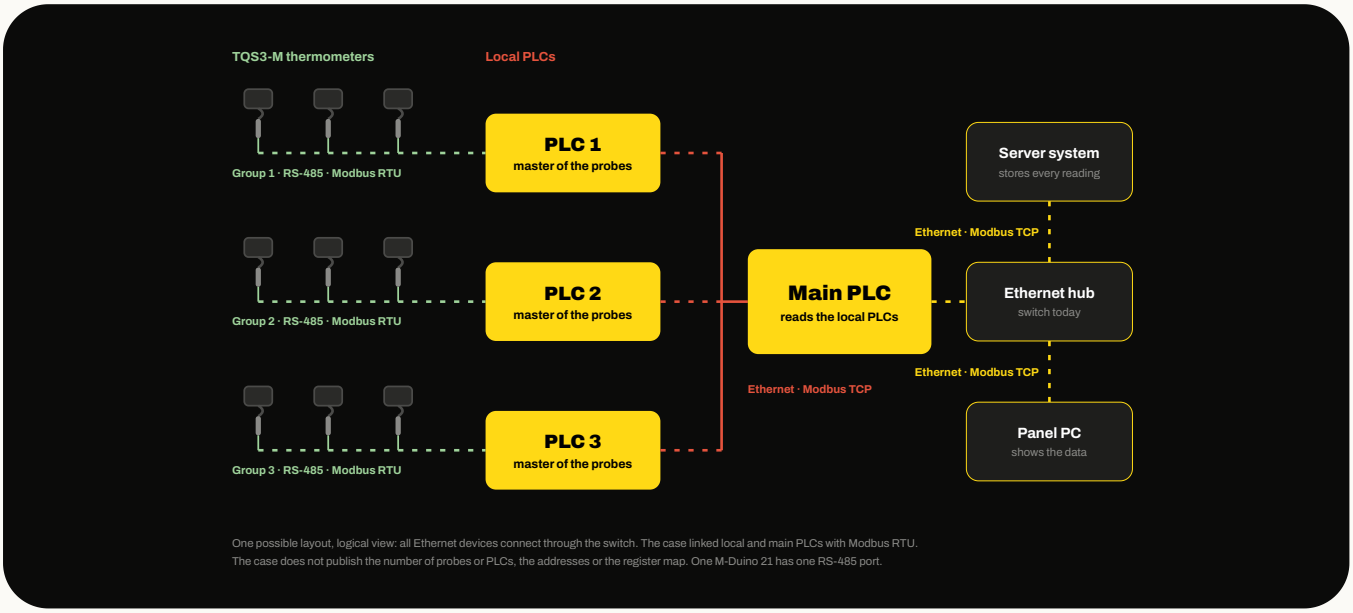
From the main PLC, the data go on Modbus TCP/IP over the Ethernet network. It works like Modbus RTU, but on TCP and IP.

- Modbus TCP over Ethernet from the main PLC

SYSTEM ARCHITECTURE

How do Modbus RTU thermometers reach a server over Modbus TCP?

TQS3-M thermometers send their readings to local PLCs over Modbus RTU on RS-485. The local PLCs forward them to a main PLC. The case used Modbus RTU for that link; an M-Duino 21 has one RS-485 port, taken by the thermometers, so this page links the local PLCs and the main PLC over Ethernet with Modbus TCP. The main PLC then shares the data over Modbus TCP, through a hub, with a server system that stores every reading and with a Panel PC that shows them. On this page, all the PLCs are M-Duino 21.



Modbus RTU, thermometers Modbus TCP, local PLCs to main PLC Modbus TCP, Ethernet

Signals and data

Data	Between	Link	Purpose
Temperature reading	Thermometer → local PLC	**Modbus RTU**	Each TQS3-M thermometer gives its reading to its local PLC
Readings of a group	Local PLC → main PLC	**Modbus TCP, Ethernet**	The main PLC reads the local PLCs. The case used Modbus RTU for this link
All the readings	Main PLC → server system	**Modbus TCP, Ethernet**	The server stores the whole register of temperatures
Data and instructions	Main PLC ↔ Panel PC	**Modbus TCP, Ethernet**	The Panel PC shows what the main PLC monitors and receives
Network	Main PLC, server, Panel PC	**Ethernet hub**	One local network for the three devices

HARDWARE USED

The same PLC at every level. A Panel PC to see the data.



M-DUINO ETHERNET PLC ARDUINO 21

An industrial PLC built around an original Arduino Mega 2560, with Ethernet, RS-485 and RS-232, for DIN rail.

Role	**Local PLC (thermometers) and main PLC (collect and share)**
I/O	**13 inputs (6 analog 0-10 V), 8 outputs (3 analog/PWM 0-10 V)**
Communications	**Ethernet (W5500, 10/100 Mbit, RJ45), RS-485, RS-232, TTL serial, I2C, SPI**
Modbus	**RTU over RS-485 and TCP over Ethernet, master or slave**

The text of the case names Industrial Shields PLCs based on Arduino and does not fix the model. The PLC photo of the original case is the M-Duino 21, which is still in the catalogue.

See the M-Duino 21 ›



TouchBerry Pi Panel PC 10.1" FLEX

The screen of the network.

Role	**Visible interface of the main PLC**
Screen	**10.1"**
Computer	**Raspberry Pi 4**
Link to the main PLC	**Ethernet, Modbus TCP**

The case uses a Panel PC from Industrial Shields and does not fix the model. The TouchBerry Pi Panel PC 10.1" FLEX is one current option, and the CORE version is the standard configuration; the family also has 7" and 18.5" models.

See the TouchBerry Pi 10.1" ›

No licence fee

Modbus is an open protocol. The PLCs, the server and the panel do not need a licence to use it.

Known by HMI and SCADA

Modbus is widely supported by HMI and SCADA software, so the server and the Panel PC can read the main PLC directly.

Many kinds of devices

Thermometers, PLCs and other industrial equipment with Modbus can share one network.

SIMILAR NETWORK?

Tell us your measuring points. An engineer will answer.

Tell us how many points you measure, how far apart they are, which sensors or meters you have and where the data must go: a server, a SCADA, a screen. We will tell you which controllers fit and how to connect them.

READ IT ONLINE
industrialshields.com/case-study-modbus-rtu-tcp-temperature-network

EMAIL
info@industrialshields.com

PHONE
(+34) 938 760 191