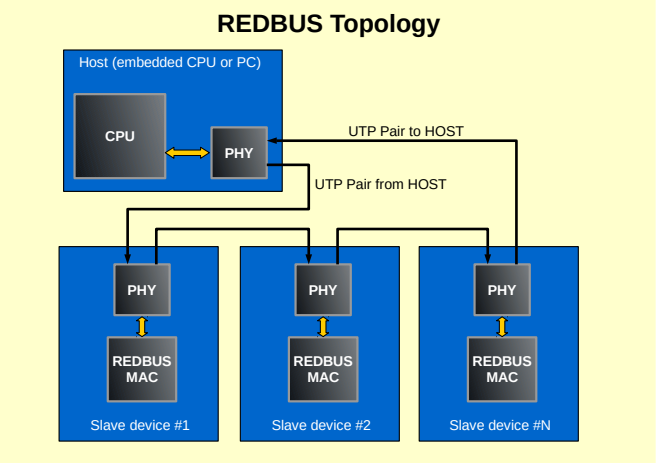
Real-time Ethernet for Embedded Systems

REDBUS® Real-time Ethernet

REDBUS® solution

REDBUS® is a patented communication interface based on standard Ethernet physical transport. It provides a robust and high-speed communication interface for applications like motor control, lighting, fast I/O, and, in general, distributed peripherals and embedded control.



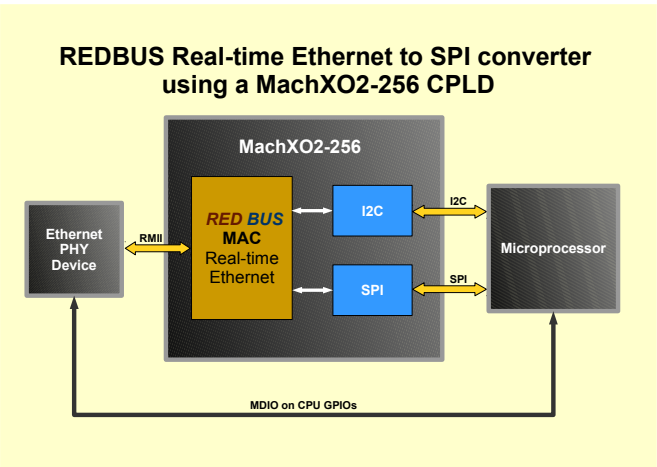
Devices are interconnected through an Ethernet bus arranged as a ring. The REDBUS® MAC instantly repeats the incoming Ethernet traffic to the adjacent device. When data is routed to a specific device, it is exchanged "on the fly" in the payload in transit. An external standard Ethernet PHY device implements the physical layer between the BUS and the MAC. This particular topology eliminates the need for external switches.

Features

- REDBUS® is an Ethernet-based BUS.
- It provides deterministic and real-time communication.
- IEEE 802.3 standard Ethernet frames.
- Multiple device connections without the need for expensive HUB/SWITCH.
- It requires only one PHY device per unit.
- It reduces wiring costs: the interface uses two twisted-pair thin cables.
- The IP-Core can use less than 400 LUT in a typical FPGA.
- Low-cost solution.

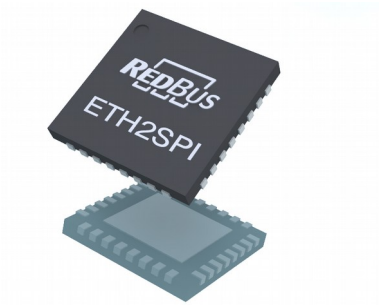
REDBUS® Ethernet to SPI converter MAC

The REDBUS® Ethernet to SPI converter MAC is an IP-Core for CPLD or FPGA that provides an easy and low-cost solution for real-time data exchange with distributed microprocessors. The very small IP-Core requires less than 300 LUT so that it can be placed, for example, into a MACHXO2-256 device, the smallest CPLD of the Lattice Semiconductorstm family "MACHXO2". A host system (SOM, Embedded CPU, etc.) can exchange data with a plurality of REDBUS® devices using its standard Ethernet interface. The data packet is organized to allow serialization at a lower rate through the synchronous serial interface (SPI).



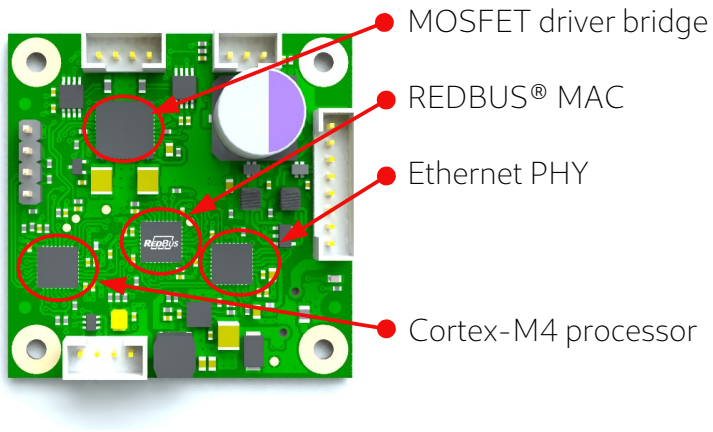
REDBUS® MAC Features

- RMII standard PHY interface.
- Bidirectional real-time data exchange.
- I2C interface for MAC registers access.
- It may address up to 8128 devices.
- Starting from a minimum of 3.125 MHz SPI clock.
- MAC Unique ID, readable by the I2C interface.
- The host controller can be any CPU board equipped with a standard 100Mbps Ethernet port.



Example: Stepper Motor Control Board

This stepper driver board uses a REDBUS® MAC to interface a Cortex-M4 small processor to a Host controller. Ethernet data is exchanged through a synchronous serial interface with a period of 250 microseconds. The host processor has complete control of the position and trajectory algorithm. Positions are generated every 50 microseconds, which gives very accuracy in motion control. Several driver boards may be connected to the same host with very simple wiring.



The position data is sent to up to 32 driver boards inside a single Ethernet frame, generated by the Host microprocessor using its own standard Ethernet MAC. Data from driver boards return to Host immediately, in the same Ethernet frame. Windings current, speed, acceleration, torque, and all the motors' real-time parameters are sent back inside a single Ethernet frame.

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