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An Implementation of a Configurable UART-to-Ethernet Converter

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Abstract : This paper presents an implementation of a configurable UART-to-Ethernet converter using an ARM-based 32-bit microcontroller as well as a dedicated configuration program running on a PC for configuring the operating parameters of the converter. The program was written in Python. Various parameters pertaining to the operation of the converter can be modified by the configuration program through the Ethernet interface of the converter. The converter supports 3 representative asynchronous serial communication protocols, RS-232, RS-422, and RS-485 and supports 3 network modes, TCP/IP server, TCP/IP client, and UDP client. The TCP/IP and UDP protocols were implemented on the microcontroller using an open source TCP/IP protocol stack called lwIP (A lightweight TCP/IP) and FreeRTOS, a free real-time operating system for embedded systems. Due to the use of a real-time operating system, the firmware of the converter was implemented as a multi-thread application and as a result becomes more modular and easier to develop. The converter can provide a seamless bridge between a serial port and an Ethernet port, thereby allowing existing legacy apparatuses with no Ethernet connectivity to communicate using the Ethernet protocol.

Keywords : converter, embedded systems, ethernet, lwIP, UART
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