

Lab 6: USB Serial Communication

CSE 2100-001

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Partners: none

1 Objective

Program the Teensy 3.2 microcontroller with the packetized serial communication program on the class GitHub repository (`serial_communication_variable.ino`). Verify working bidirectional communication using the CuteCom terminal program on your Raspberry Pi.

Once you have your communications working correctly, modify the firmware (`serial_communication_variable.ino`) to extend the checksum from 8-bits to 16-bits (2 byte fields instead of 1). When generating the checksum, use the same cumulative XOR method, but perform using two bytes for each operand. For example, in the packet...

0xAA 0x07 0x01 0x02 0x03 [checksum]

the 16 bit checksum would be...

0xAA07 XOR 0x0102 XOR 0x0300 = A805

For payloads with odd numbers of bytes (such as above), use the last payload byte as the first (leftmost) byte and 0x00 as the second when performing the final XOR.

Demonstrate your modified packeting protocol with CuteCom using the test cases provided by the lab instructors.

1.1 Definitions

serial port a connector by which a device that sends data one bit at a time is connected to a computer

serial emulation is a connection over RS-232 or serial port connection that allows a person access to a computer or network device console. Typically,

a console is accessed over an SSH connection. However, with software or hardware, it may only be possible to access the machine or device over serial connection.

HID Human Interface Device and refers to USB-HID specification, a defined protocol that allows devices such as computer mice, keyboards...to connect to your computer without having to download additional software.

bulk transfer is used to transfer large bulk data. Bulk transfer provides error correction in the form of CRC16 field on data payload and error detection/retransmission mechanisms which ensures data is transmitted and received without error. This type of transfer also supports unidirectional mode.

isochronous means occurring at the uniform time and being time-sensitive.

2 Question 1

Name 3 different standards for serial communication

RS-232, RS-422, and RS-423

3 Question 2

Suppose we transmit a packet and the final byte (the checksum) of the unmodified packeting strategy is lost by the receiver. Immediately after the transmission, another packet is sent and the receiver interprets the start byte of the 2nd packet as the checksum of the previous one. What are the odds that the receiver would incorrectly interpret the first packet as valid? What would be the odds for the modified (16-bit) protocol?

The odd that the receiver would incorrectly interpret the first packet as valid= $1/256$

The odd for the modified 16-bit protocol= $1/(2 \text{ to pow } 16)$