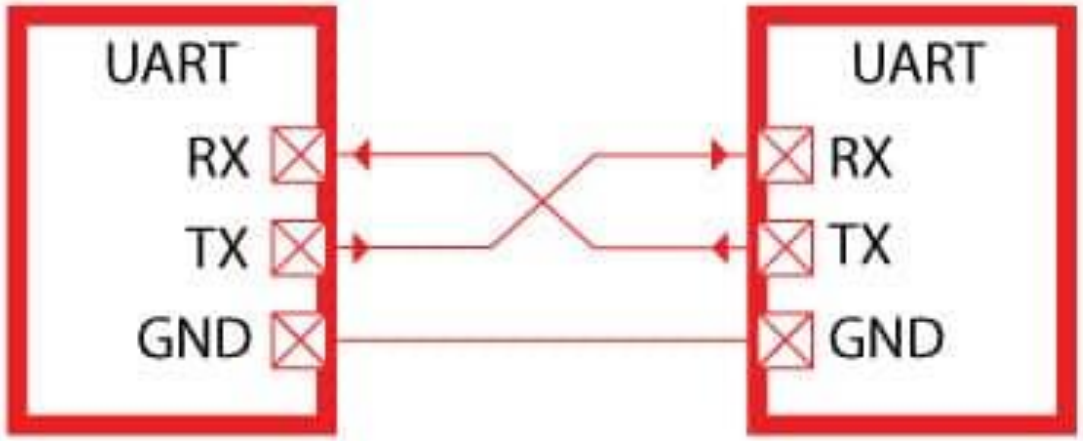

Project 2

UART TX Design Using Verilog

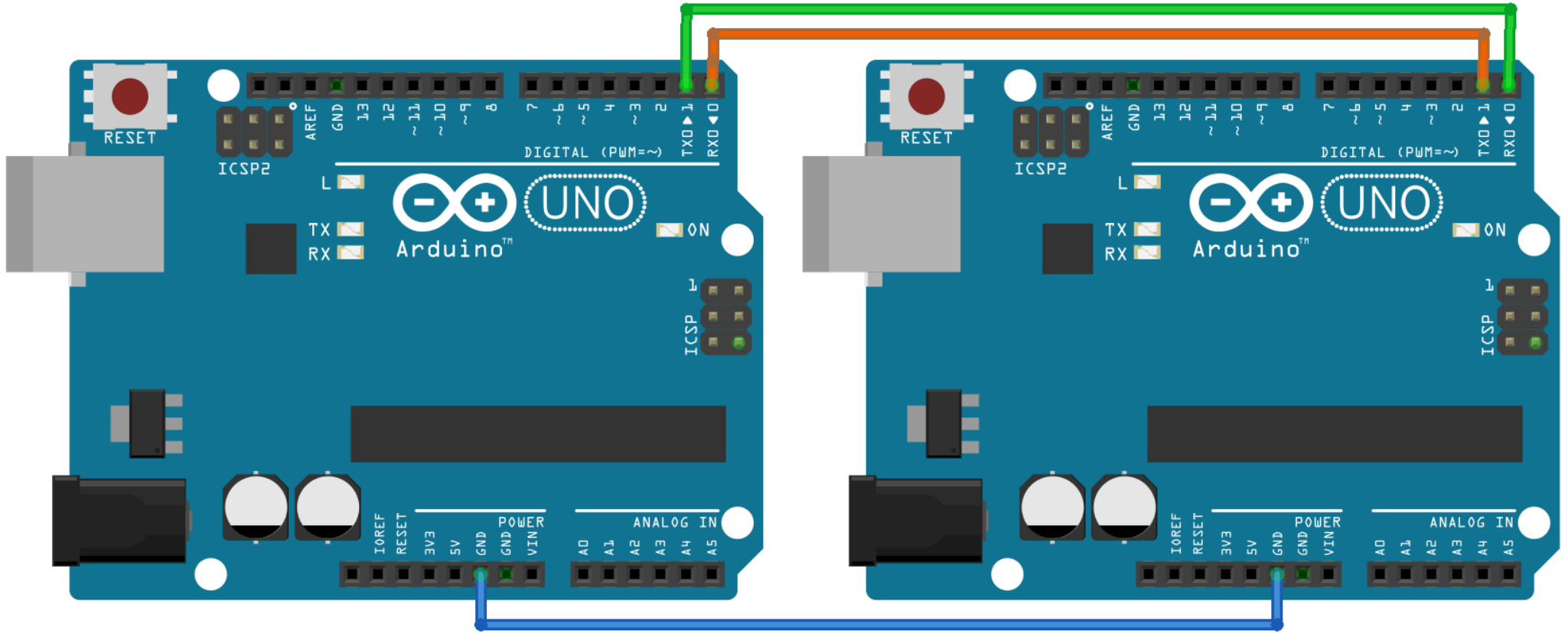
Made By : Youssef Gamal

What is UART

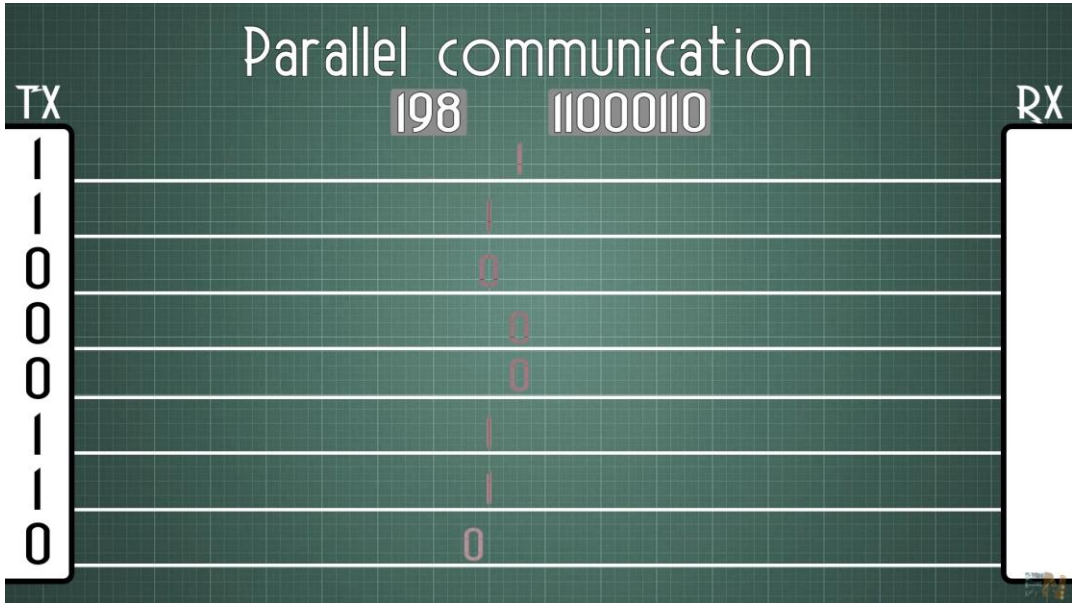
- Universal Asynchronous Receiver & Transmitter
- A Protocol for exchanging serial data between two devices
- Can be simplex , half-duplex , or full-duplex



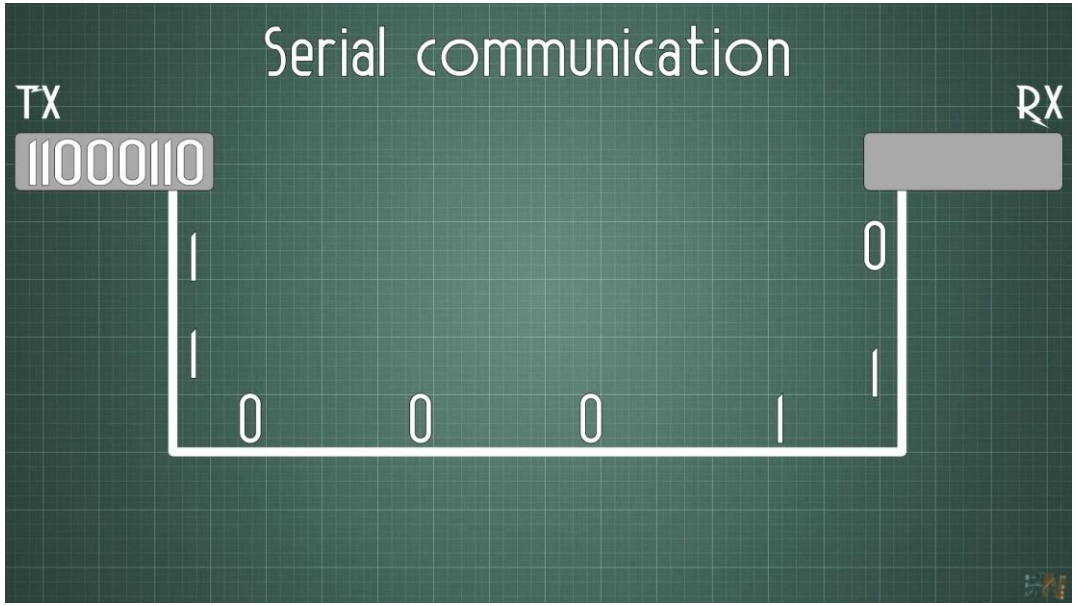
TX & RX in Arduino



Parallel Vs Serial Transmission



Merits : High speed
Demerits : Many Wires needed (High Cost)



Merits : Simple (only 2 wires are used)
Demerits : Low Speed

Timing and Synchronization

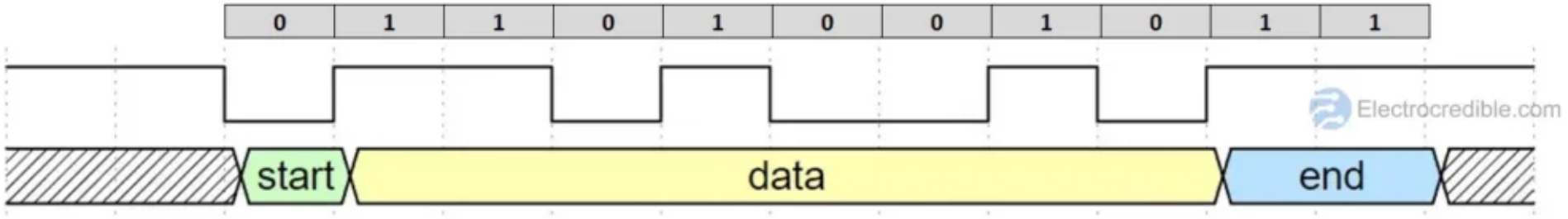
- Since UART is Asynchronous (the transmitter and receiver don’t share a common clock)

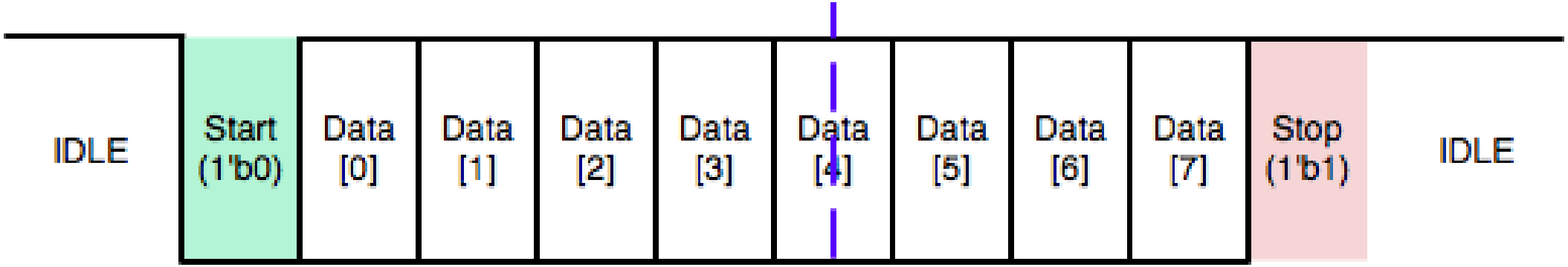
- Will need some configurations btw TX and RX
  - Transmit at the same known speed (Baud Rate)
  - Use the same Frame Structure

Common UART baud rates
4800
9600
19200
57600
115200

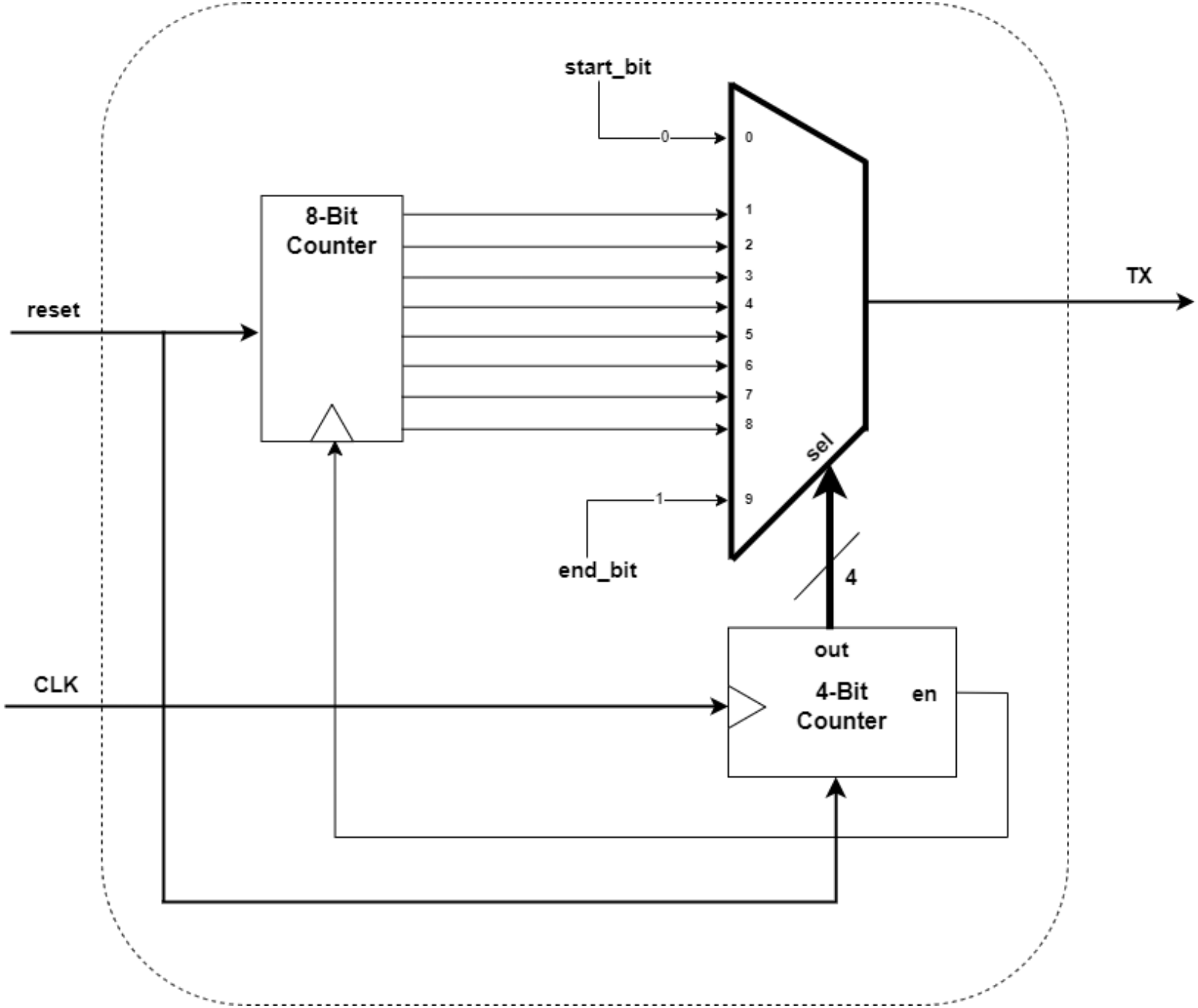
UART Frame Format

- Start bit indicates the data is coming
- Data Frame are data you send
  - length (from 5 to 9 bits usually 7 to 8) start with the LSB
- The Parity bit (Optional) Used for Error Checking
- The stop bit(s) indicates the Frame is complete
- In the idle state the line is held high

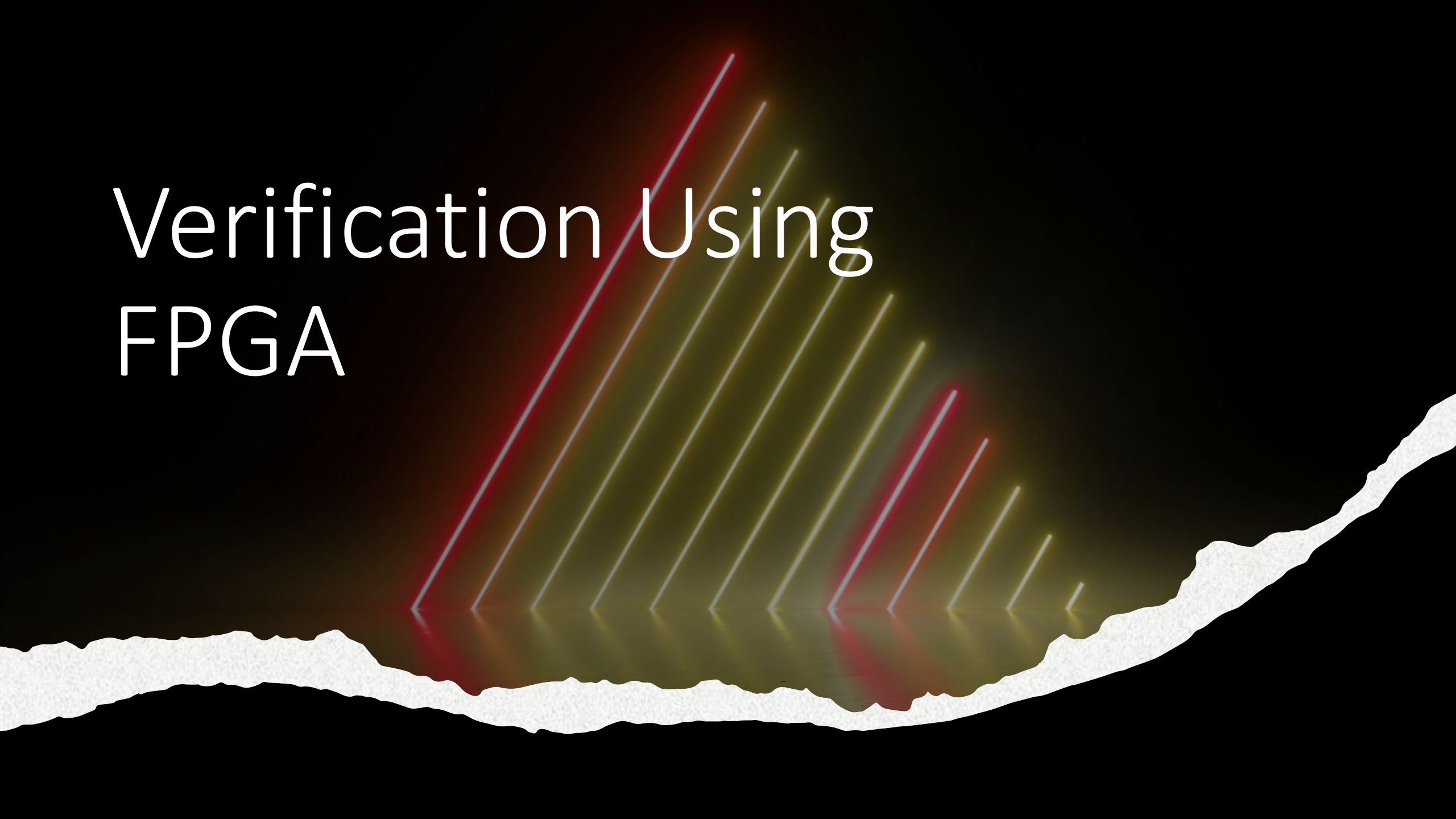

0
1
1
0
1
0
0
1
0
1
1
Electrocredible.com
start
data
end

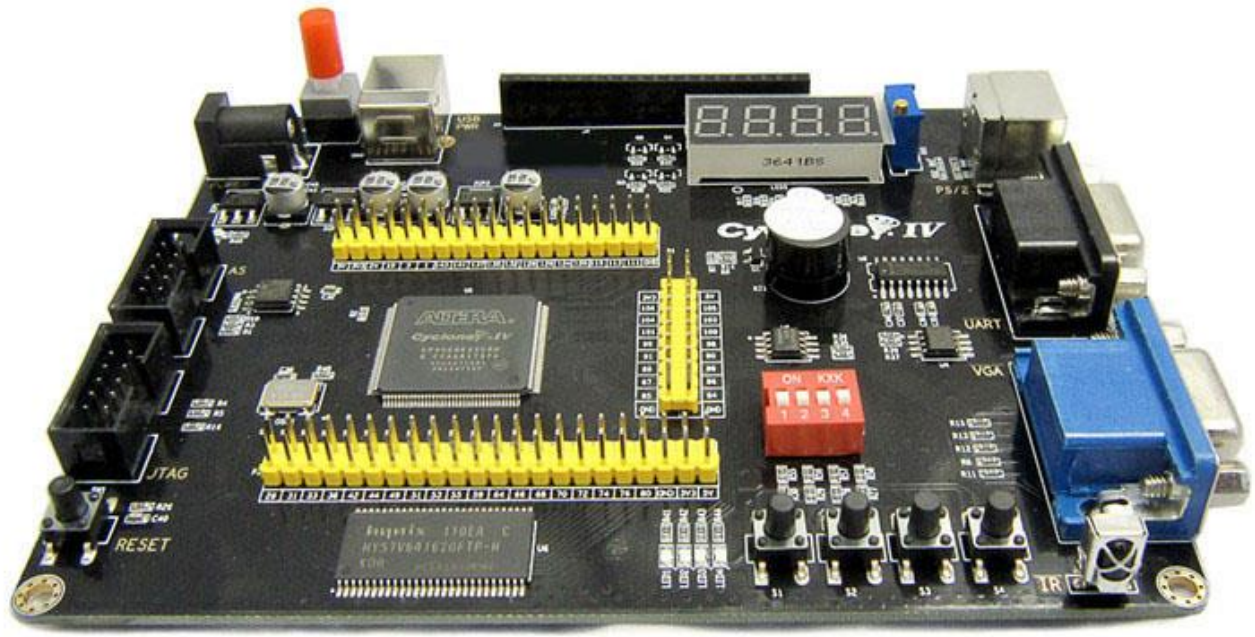

IDLE
Start
(1'b0)
Data
[0]
Data
[1]
Data
[2]
Data
[3]
Data
[4]
Data
[5]
Data
[6]
Data
[7]
Stop
(1'b1)
IDLE

UART TX Architecture

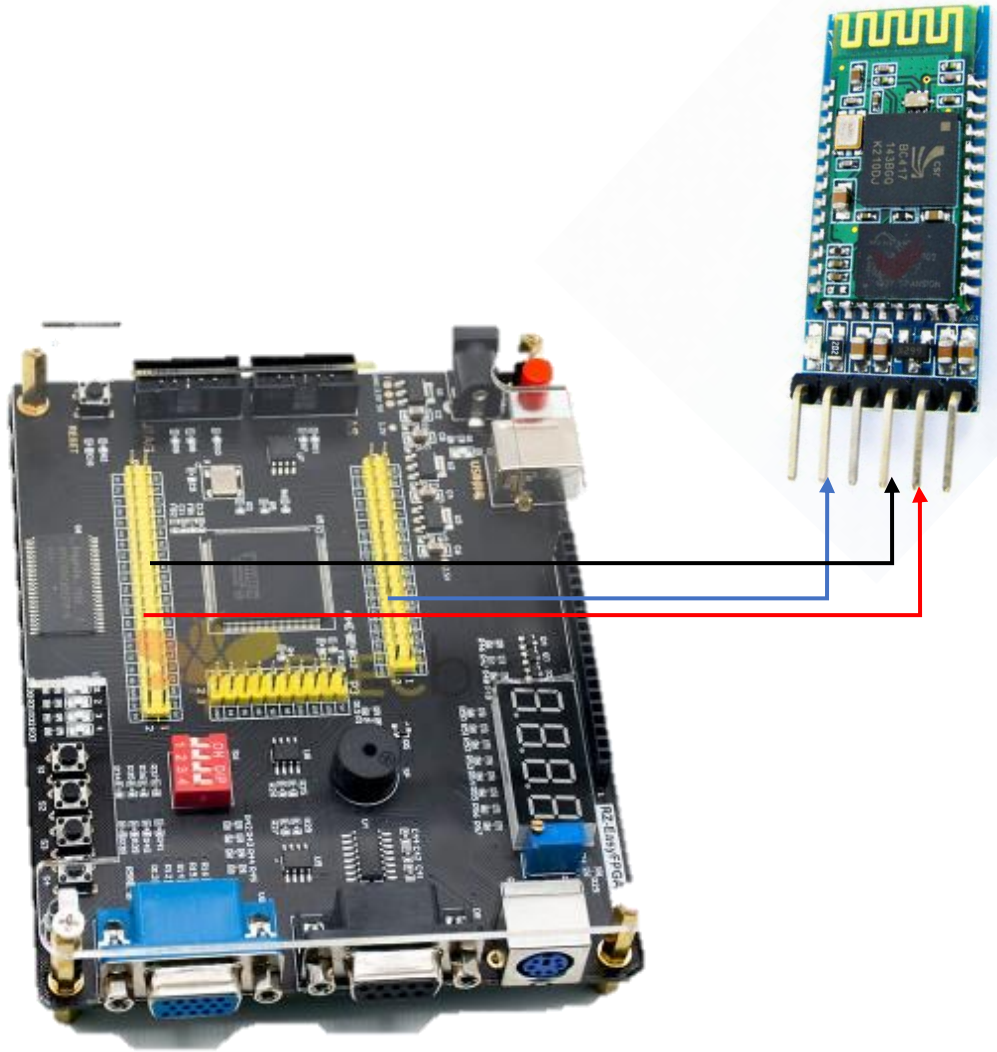

start_bit
0
0
1
2
3
4
5
6
7
8
9
8-Bit
Counter
reset
TX
sel
1
end_bit
4
out
4-Bit
Counter
en
CLK

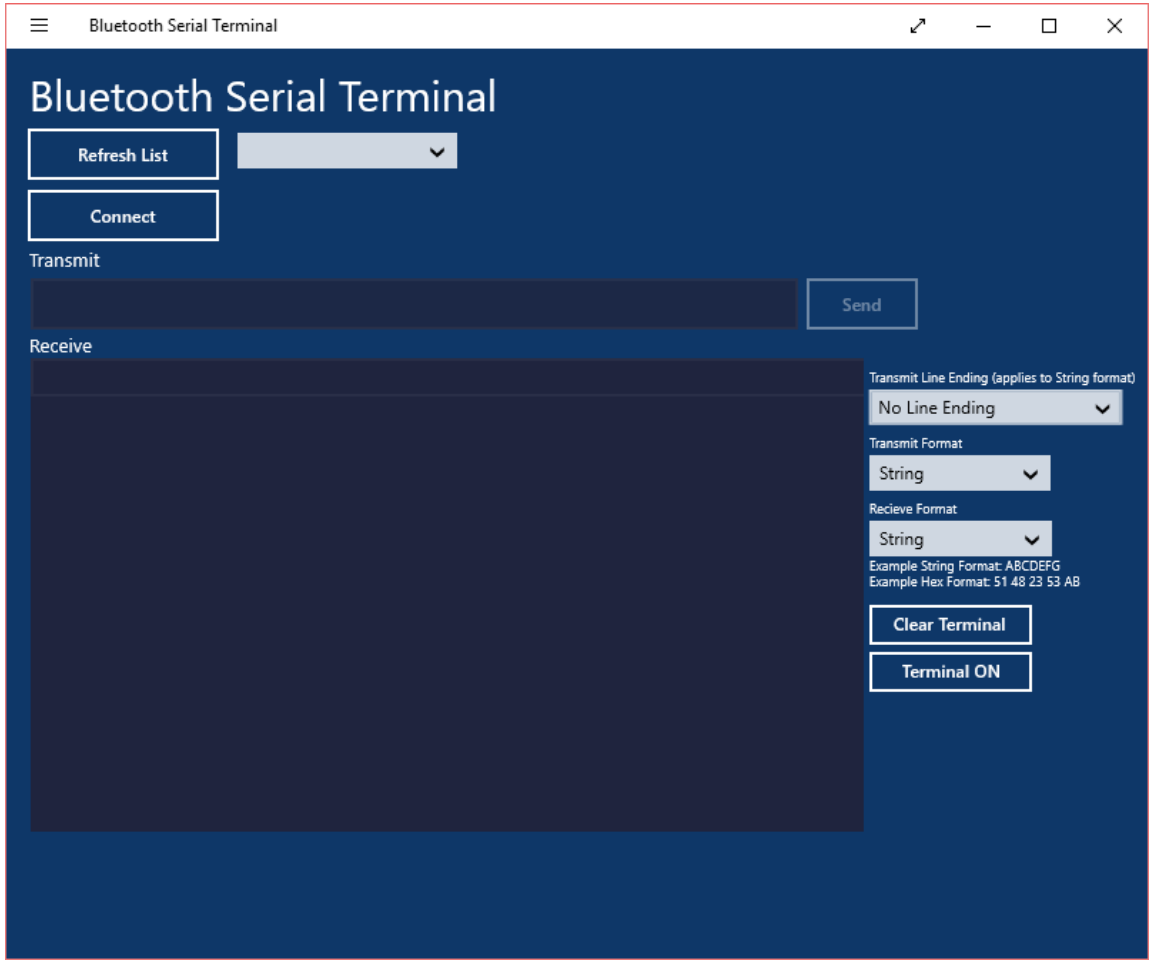
Verification Using FPGA




JTAG
RESET
UART
VGA
PS/2
IR


STATE
RXD
LEVEL:3.3V
TXD
GND
Power:3.6V——6V
VCC
ZS-040
EN




Bluetooth Serial Terminal
Bluetooth Serial Terminal
Refresh List
Connect
Transmit
Send
Receive
Transmit Line Ending (applies to String format)
No Line Ending
Transmit Format
String
Recieve Format
String
Example String Format: ABCDEFG
Example Hex Format: 51 48 23 53 AB
Clear Terminal
Terminal ON