Ethernet-Based Arithmetic Logic Unit and Beyond

FPGA Implementation Track

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Context

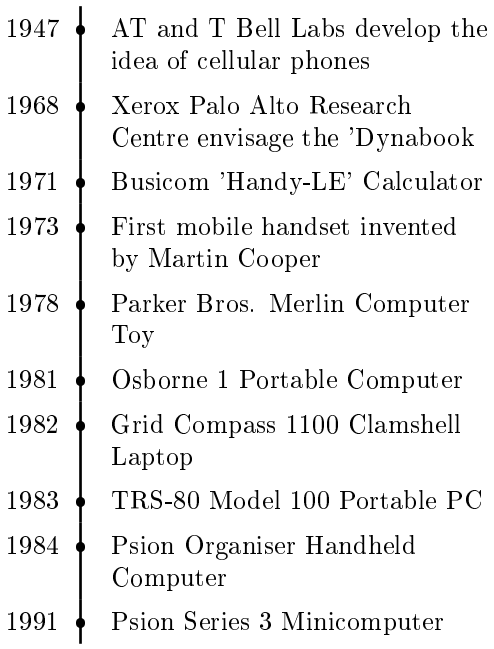
Ethernet has several many significant advantages over traditional serial communication protocols. Ethernet communication offers higher bandwidth and more flexible network topologies through its packet-based approach. While serial communication transmits data sequentially over a single channel with direct point-to-point connections, Ethernet enables multiple devices to communicate over a shared medium using CSMA/CD (Carrier Sense Multiple Access with Collision Detection) or switched networks. Modern Ethernet standards support data rates from 100 Mbps to 400 Gbps, far exceeding typical serial protocols like UART which typically operate at rates in the kbps. This increased performance comes with a trade-off in complexity, as Ethernet requires more sophisticated hardware and protocols to manage data transmission.

Objectives

The primary objective of our final project is to implement a basic Arithmetic Logic Unit (ALU) that can be controlled over an Ethernet connection. This will be very similar to the ALU we implemented in the first project but with the added complexity of Ethernet communication instead of UART. The ALU will be capable of performing basic arithmetic operations such as addition, signed multiplication, and signed division. To demonstrate functionality we will also create a python library which will allow a user to control the ALU over Ethernet.

Additional Goals

Depending on time remaining after completing our primary objective we will examine the feasibility of implementing the protocols necessary to communicate with the ALU over the internet.


1947
AT and T Bell Labs develop the idea of cellular phones
1968
Xerox Palo Alto Research Centre envisage the 'Dynabook
1971
Busicom 'Handy-LE' Calculator
1973
First mobile handset invented by Martin Cooper
1978
Parker Bros. Merlin Computer Toy
1981
Osborne 1 Portable Computer
1982
Grid Compass 1100 Clamshell Laptop
1983
TRS-80 Model 100 Portable PC
1984
Psion Organiser Handheld Computer
1991
Psion Series 3 Minicomputer