**Project Title:** SPI Bus Monitoring Solution for High-Speed Applications

Project Overview:

The Serial Peripheral Interface (SPI) bus is widely used for communication between microcontrollers and peripheral devices in various high-speed applications, including automotive, aerospace, and industrial automation. Effective monitoring of SPI bus activity is crucial for debugging, troubleshooting, and ensuring the reliability of these systems. This project aims to design, develop, and test a comprehensive SPI bus monitoring solution capable of handling high-speed applications. The proposal is to make a "sniffer" based on CYC1000 with Cyclone 10 FPGA that enables us to monitor SPI communication with a data speed of minimum 50 MHz, stream it to a PC and analyze it.
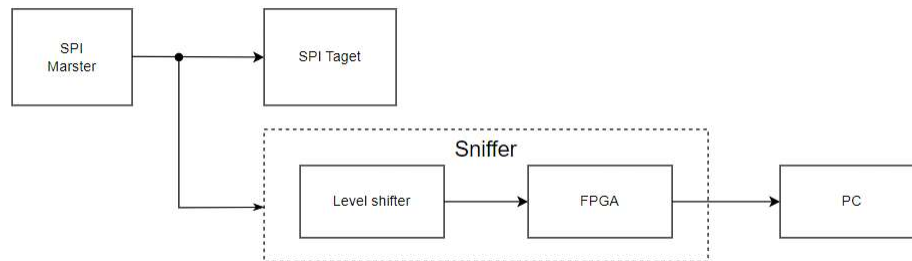
Objectives:

- Identify key requirements for a high-speed SPI bus monitoring solution (e.g., bandwidth, latency, trigger capabilities).
- Design and implement a custom hardware platform using FPGA with high-speed interfaces to capture and process SPI bus signals at high speeds.
- Create a user-friendly software interface (desktop or web application) for:
    - Real-time SPI bus signal monitoring.
    - Data logging with timestamping.
    - Define protocol for data transfer between FPGA and PC
    - Advanced analytics (e.g., error detection, protocol decoding, data visualization).
- Implement trigger functions for capturing specific events or errors.
- Validate the solution's performance, accuracy, and reliability under different conditions.

Equipment available at Rohde and Schwarz:
- FPGA Tools for implementation and testing.
- Software Development Tools (e.g., Python / C# / C++)
- CYC1000 Development board with Cyclone 10 FPGA, Level shifter, PC
- SPI signal generator or a device with a configurable SPI interface for testing.

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