

# Interface USB to Thermal Conductivity Instrument

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## Outline

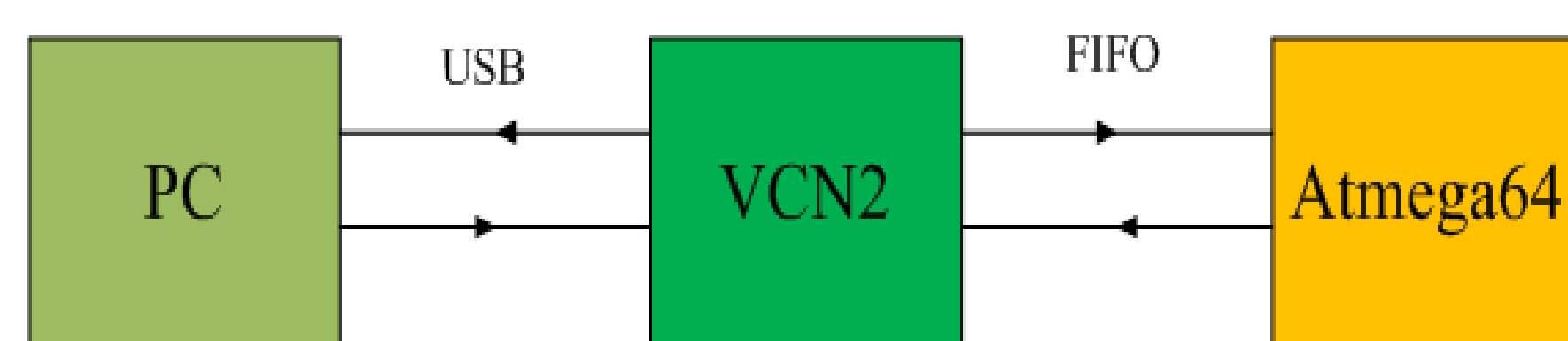
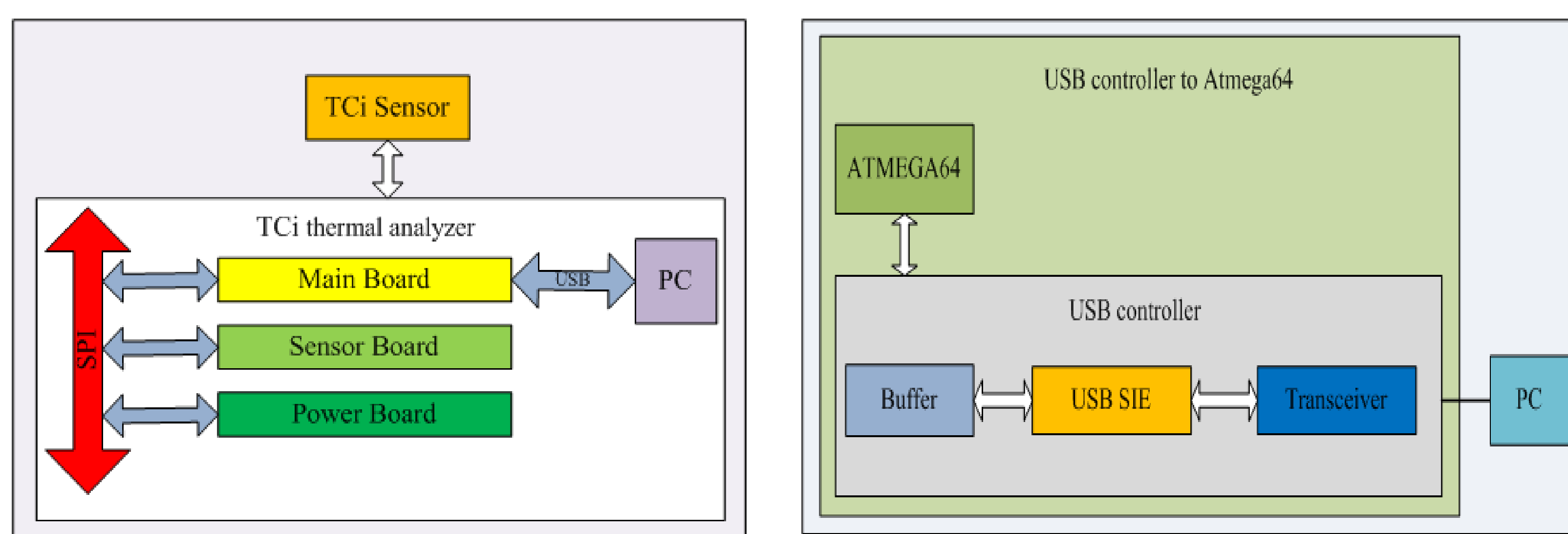
- Choose a suitable USB controller.
- Realizing and Design USB controller firmware.
- Connect USB controller to TCi by FIFO interface.
- Modify TCi' firmware to support communication through FIFO.
- Build a USB driver on PC side to drive USB controller.
- Modify TCi software to control TCi via USB driver.

## Motivation

For a modern scientific measurement instrument, it is necessary to support the main communication interface such as serial port, USB port, GPIB and so on. The USB interface is more popular in the current world. However, TCi only has a serial port, which cannot satisfy customers' requirements. So, we are working to interface USB to TCi.

## Background

The Thermal Conductivity Instrument(TCi)is a state-of-the-art scientific instrument for analyzing thermo-physical properties of materials. It is made of three boards: main board, sensor board, power board.

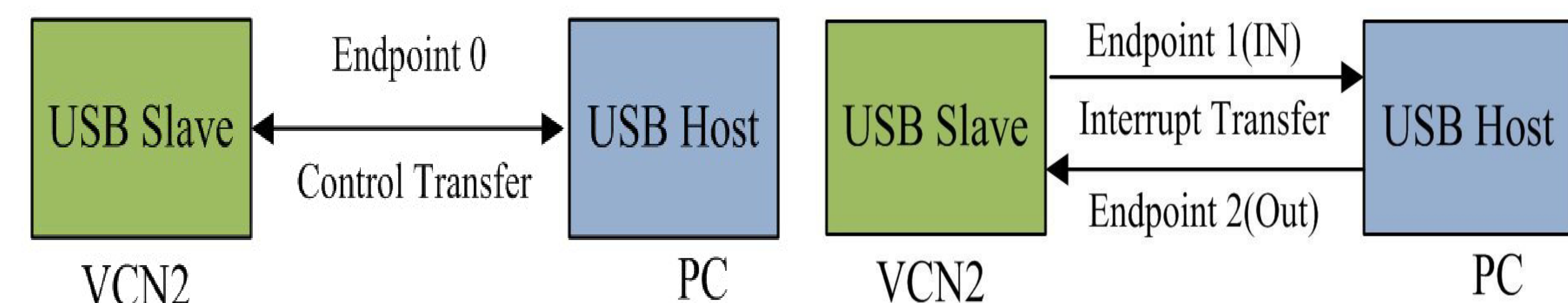


The interface USB to TCi consists of two parts:

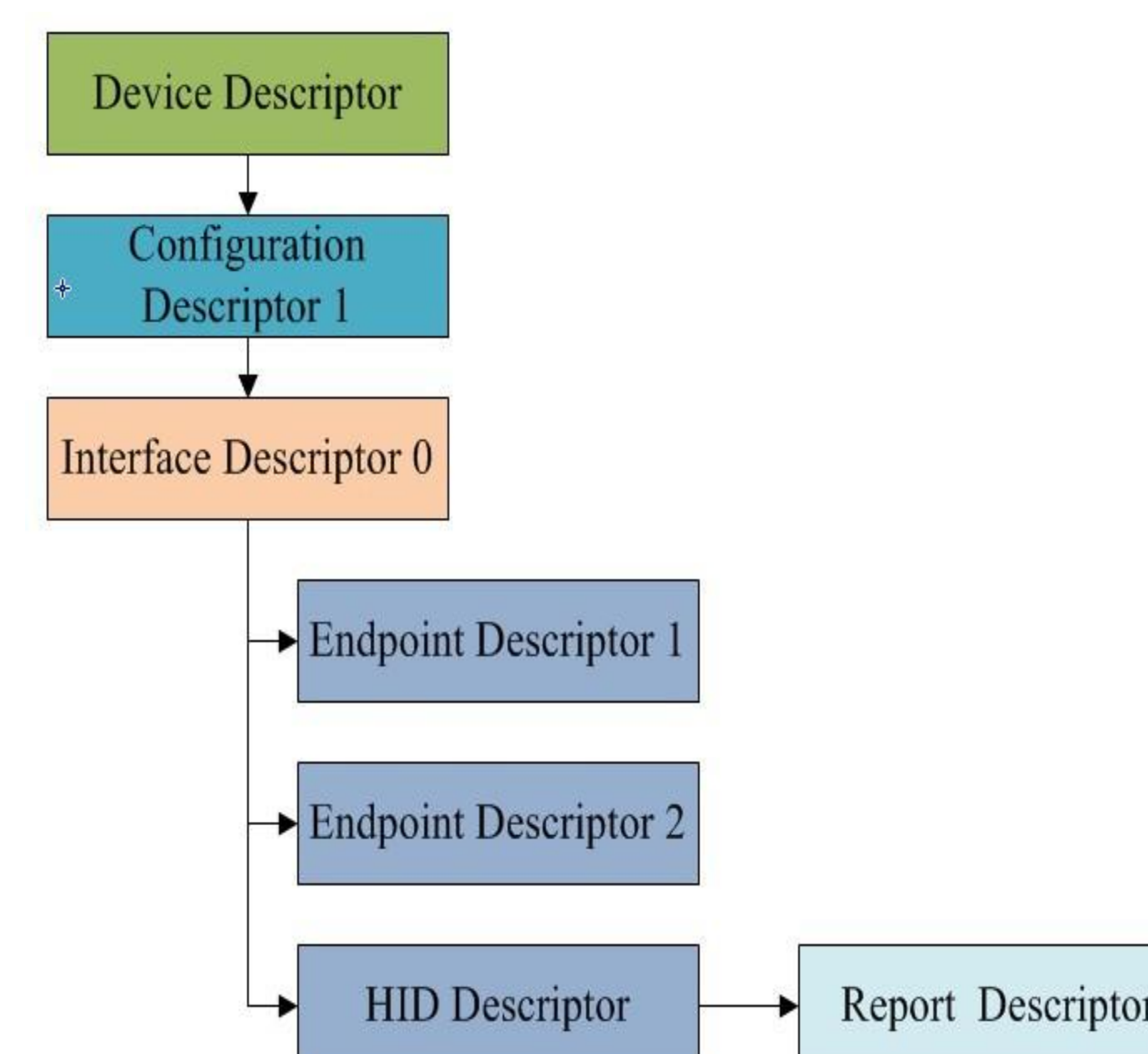
- PC to USB controller-VCN2
- USB controller to Atmega64 on the main board

## Solution

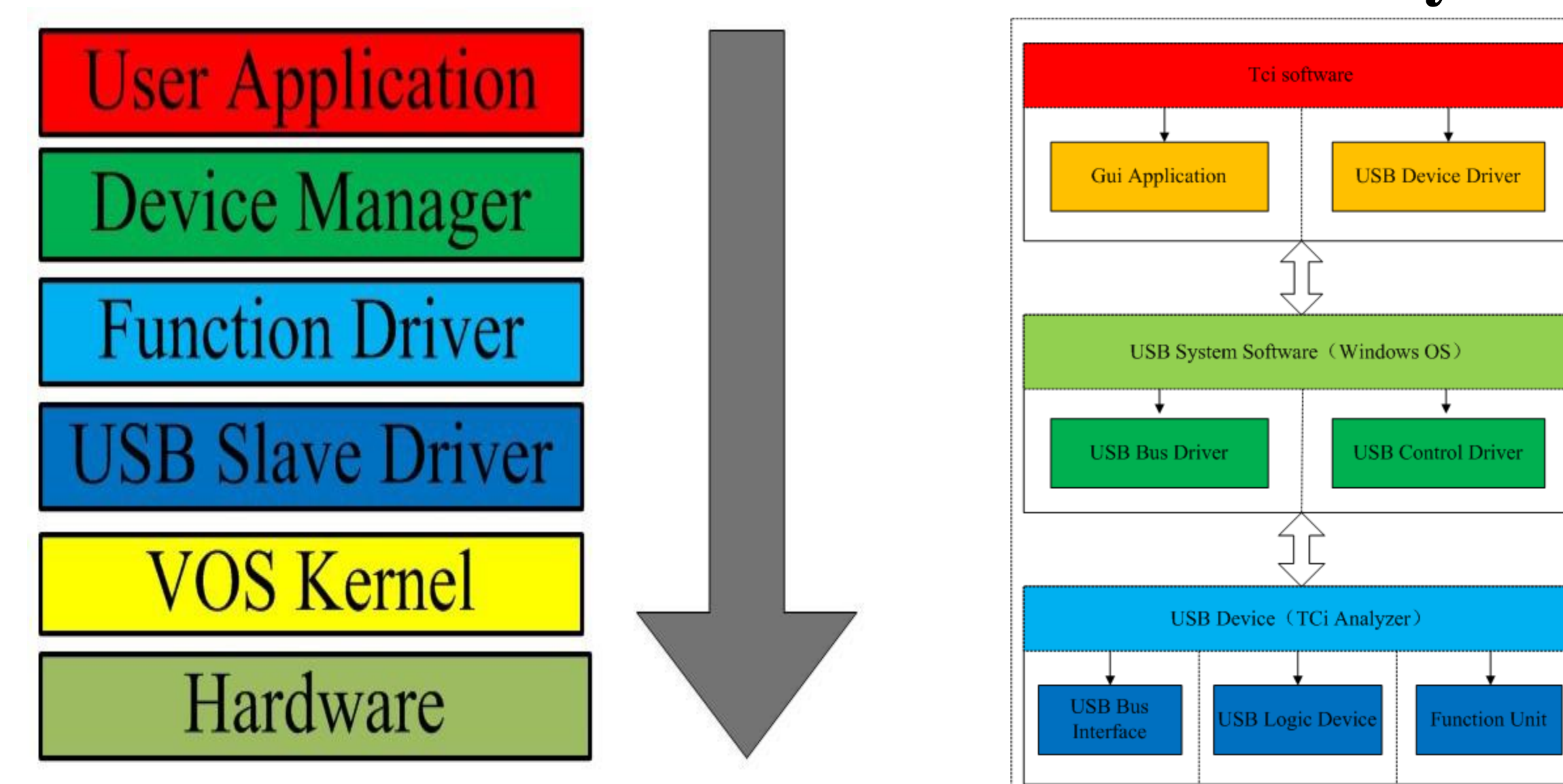
- Choose a suitable USB controller-VCN2
- Define a USB device as a HID device according to TCi' features
- Determine the transfer type between PC and USB controller



- Complete the descriptors used by PC to detect USB device



- Realize USB firmware based on the hierarchy below (left)



- Modify Atmega64's firmware to support FIFO interface
- Modify TCi software based on the hierarchy above (right)

## Results

TCi was detected as a HID USB device successfully and TCi software (on the PC side) can control TCi to do measurements via USB interface. Both commands from PC and measurement results from TCi are properly transferred through the USB interface.