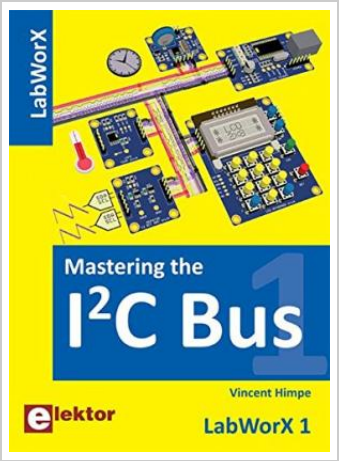

Mastering the I2C Bus

By Vincent Himpe

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I2C (Inter-Integrated Circuit), pronounced I-squared-C, is a synchronous, multi-master, multi-slave, packet switched, single-ended, serial communication bus invented in 1982 by Philips Semiconductor (now NXP Semiconductors). It is widely used for attaching lower-speed peripheral ICs to processors and microcontrollers in short-distance, intra-board communication. Alternatively, I2C is spelled I2C (pronounced I-two-C) or IIC (pronounced I-I-C). Even though multiple masters may be present on the I2C bus the arbitration is handled in such a way that there is no corruption of data on bus in case when more than 2 masters try to transmit data at the same time. Since the transmission, synchronization and arbitration is done using only 2 wires on the bus, the communication protocol might be a bit uneasy to understand for beginners .. but its actually easy to understand â€“ just stick with me ðŸ™‚. A general I2C/TWI bus topology with multiple masters and multiple slaves connected to the bus at the same time is shown below: Let us go through I2C The I2C-bus is a multi-master bus. This means that more than one device capable of controlling the bus can be connected to it. As masters are usually micro-controllers, letâ€™s consider the case of a data transfer between two microcontrollers connected to the I2C-bus (Figure 3). This highlights the master-slave and receiver-transmitter relationships to be found on the I2C-bus.Â Generation of clock signals on the I2C-bus is always the responsibility of master devices; each master generates its own clock signals when transferring data on the bus. Bus clock signals from a master can only be altered when they are stretched by a slow-slave device holding-down the clock line, or by another master when arbitration occurs. The I2C bus is a very popular and powerful bus used for communication between a master (or multiple masters) and a single or multiple slave devices. Figure 1 illustrates how many different peripherals may share a bus which is connected to a processor through only 2 wires, which is one of the largest benefits that the I2C bus can give when compared to other interfaces. This application note is aimed at helping users understand how the I2C bus works. Figure 1 shows a typical I2C bus for an embedded system, where multiple slave devices are used. The microcontroller represents the I2C master, and