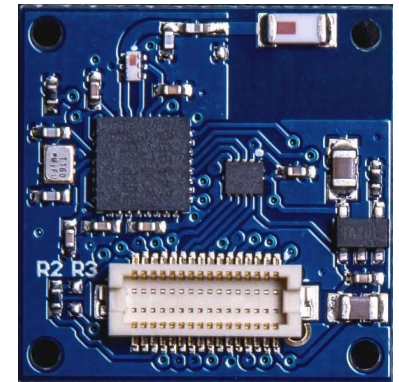
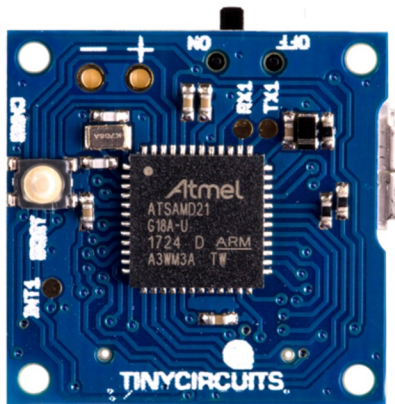


CSE190 Fall 2023

Lecture 9

Serial Busses



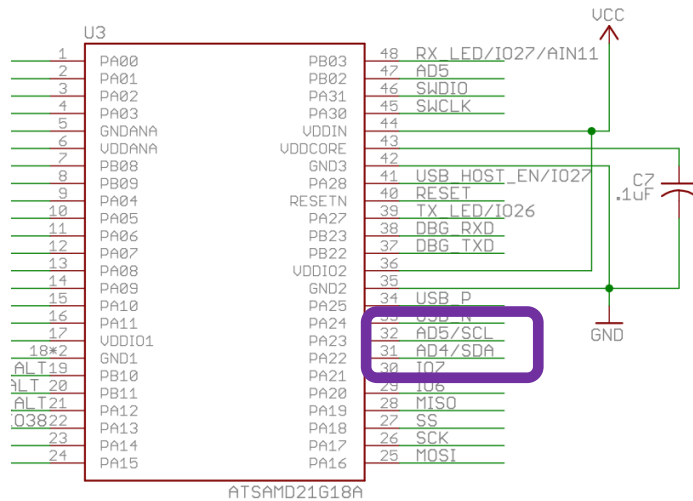
Wireless Embedded Systems

Aaron Schulman

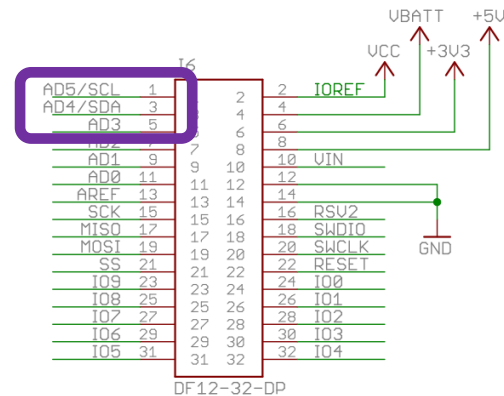
Serial Busses

Digital data highways that *external peripherals* use to communicate with microcontrollers

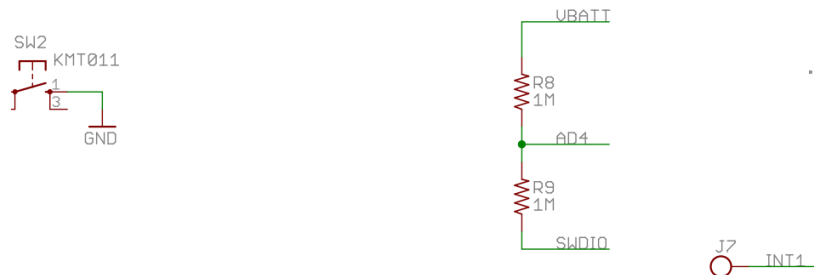
SAMD21 Processor



TinyShield Expansion - Top



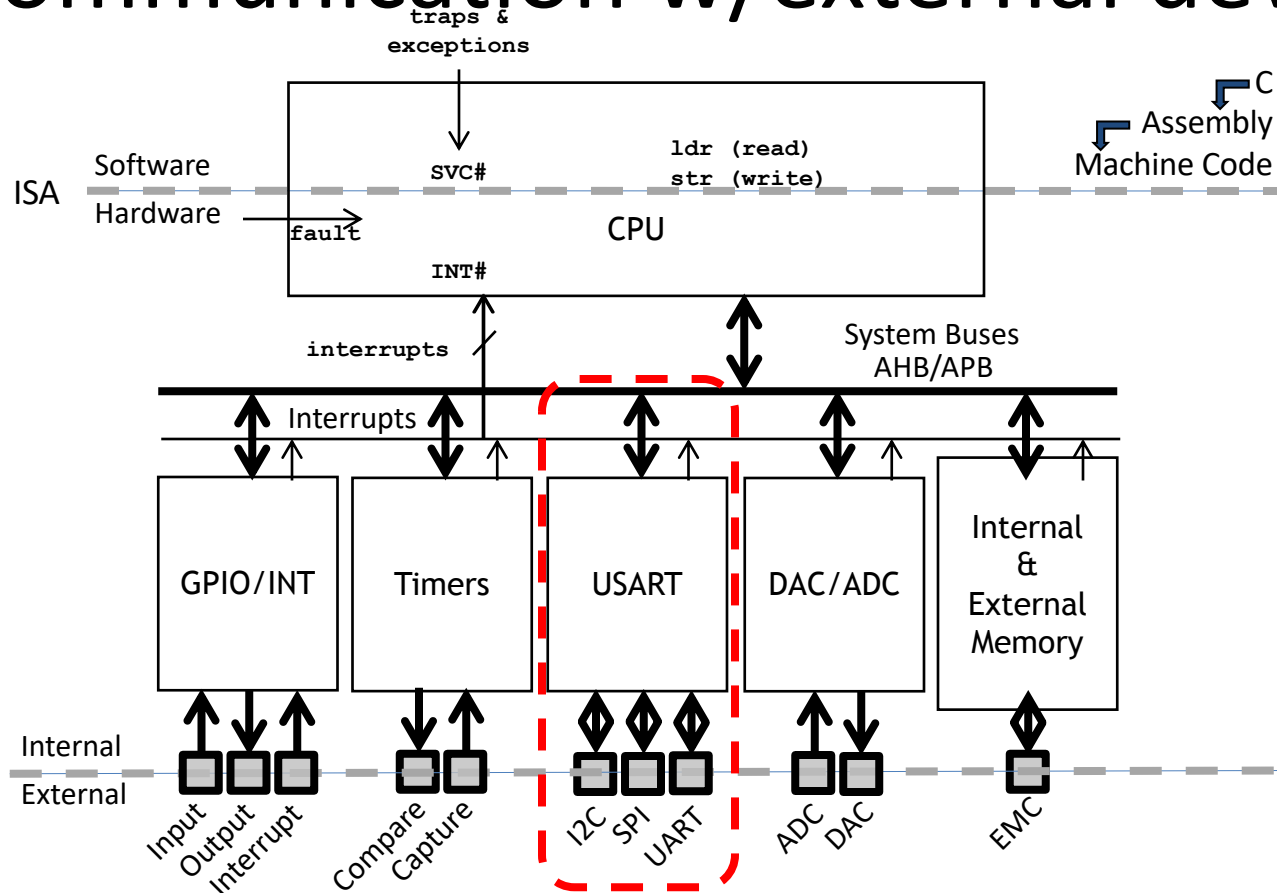
BMA250 Accelerometer



Serial Buses in our project

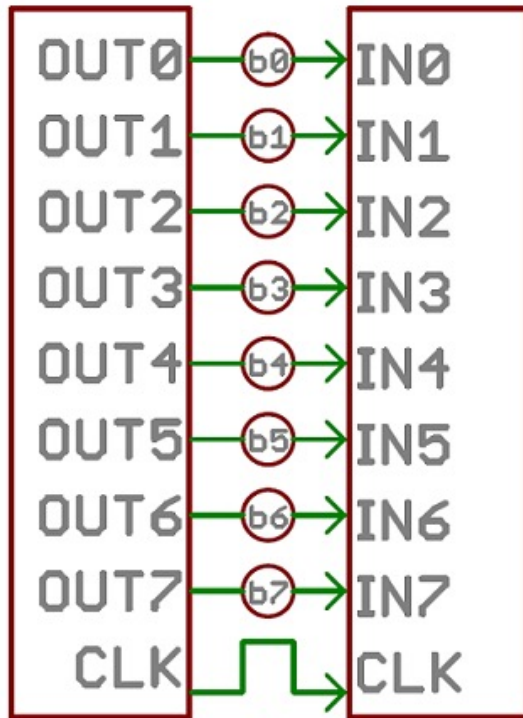
- UART serial bus for sending debug messages to your development host
- I2C serial bus for communicating with sensors (e.g., the accelerometer)
- SPI serial bus for communicating with the Bluetooth Low Energy radio

We use an internal peripheral for serial communication w/external devices

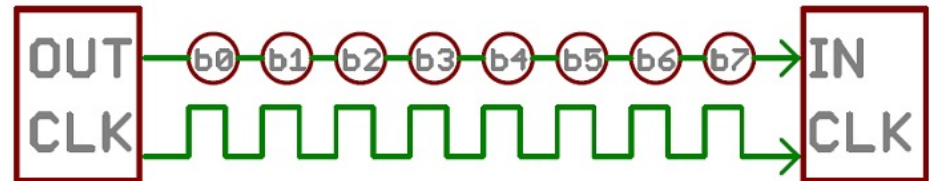


Parallel Bus vs Serial Bus

Parallel

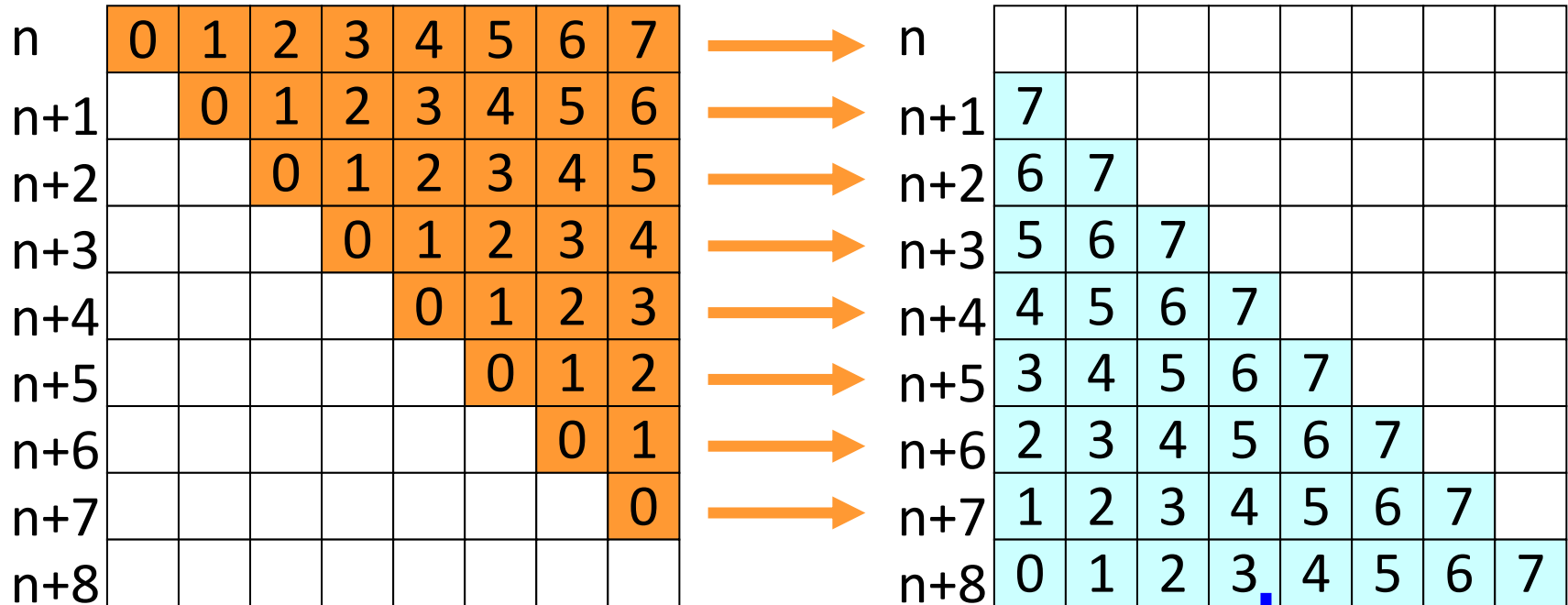


Serial



What is the benefit of a serial bus over a parallel bus (and vice versa)?

Simplistic View of Serial Port Operation



Interrupt raised when Transmitter (Tx) is empty
 ⇨ Byte has been transmitted and next byte ready for loading

Interrupt raised when Receiver (Rx) is full
 ⇨ Byte has been received and is ready for reading

Serial Bus Interface Motivations

- Motivation
 - Without using a lot of I/O lines
 - I/O lines require I/O pads which cost \$\$\$ and size
 - I/O lines require PCB area which costs \$\$\$ and size
 - Connect different systems together
 - Two embedded systems
 - A desktop and an embedded system
 - Connect different chips together in the same embedded system
 - MCU to peripheral
 - MCU to MCU
 - Often at relatively low data rates
 - But sometimes at higher data rates
- So, what are our options?
 - Universal Synchronous/Asynchronous Receiver Transmitter
 - Also known as USART (pronounced: “you-sart”)