

## Goal for the next 2 weeks: Simple Processor




## Multi-bit Multiplexers

 Select one of several inputs as output.

Example: selector lines $A B C=011 \quad$ Output $F=D_{3}$

## Multi-bit Multiplexers Select one of several inputs as output.


$n$ selector lines

A MUX is conceptually an encoder ( $2^{n}$ inputs to $n$ outputs) + selection

## MUX + voltage source $=$ truth table




## 8-to-1 MUX with gates



## Decoders

Decodes input number, asserts corresponding output.
$n$-bit input (an unsigned number)
$2^{n}$ outputs
Built with code detectors.
$\mathbf{B}_{0} \cdot \square^{-}$



## 3-bit decoder with gates



## Buses and Logic Arrays

A bus is a collection of data lines treated as a single logical signal.
= fixed-width value

An array of logic elements (logical array) applies same operation to each bit in a bus.
= bitwise operator


## Decoders and multiplexers

A decoder has an $n$-bit input and $2^{n}$ outputs. Only 1 output active at once.


A multiplexer has $2^{n}$ inputs,
n selector wires, and 1 output.


