FPGAs

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Field-Programmable Gate Arrays

- Large collection of logic gates + connection logic
- “Field-programmable” i.e., in the field
- Alternative to custom-design “Application Specific Integrated Circuit” (ASIC)
How Big?

- Xilinx Spartan 6 LX9 ($14)
  - 9,152 logic blocks
  - 64 KB RAM
  - 144 pins
  - Able to simulate e.g. two simultaneous ATMEGA108s
Advantages

- Reconfigurable
- Fast (100 MHz +)
- Parallel
- Lots of IO
- Good for dedicated processing pipeline (DSP filters, Bitcoin mining)
Disadvantages

- Hardware & parallel not software & sequential
- Awful 1990s-era design language & tools (PC-centric)
- Expensive (dev board ~$100)
- Esoteric - small community
Example: Sine Oscillator

- http://hamsterworks.co.nz/mediawiki/index.php/FPGA_course chapter 16
1 Bit DAC

- Increment counter by the desired value output whether you “overflow”