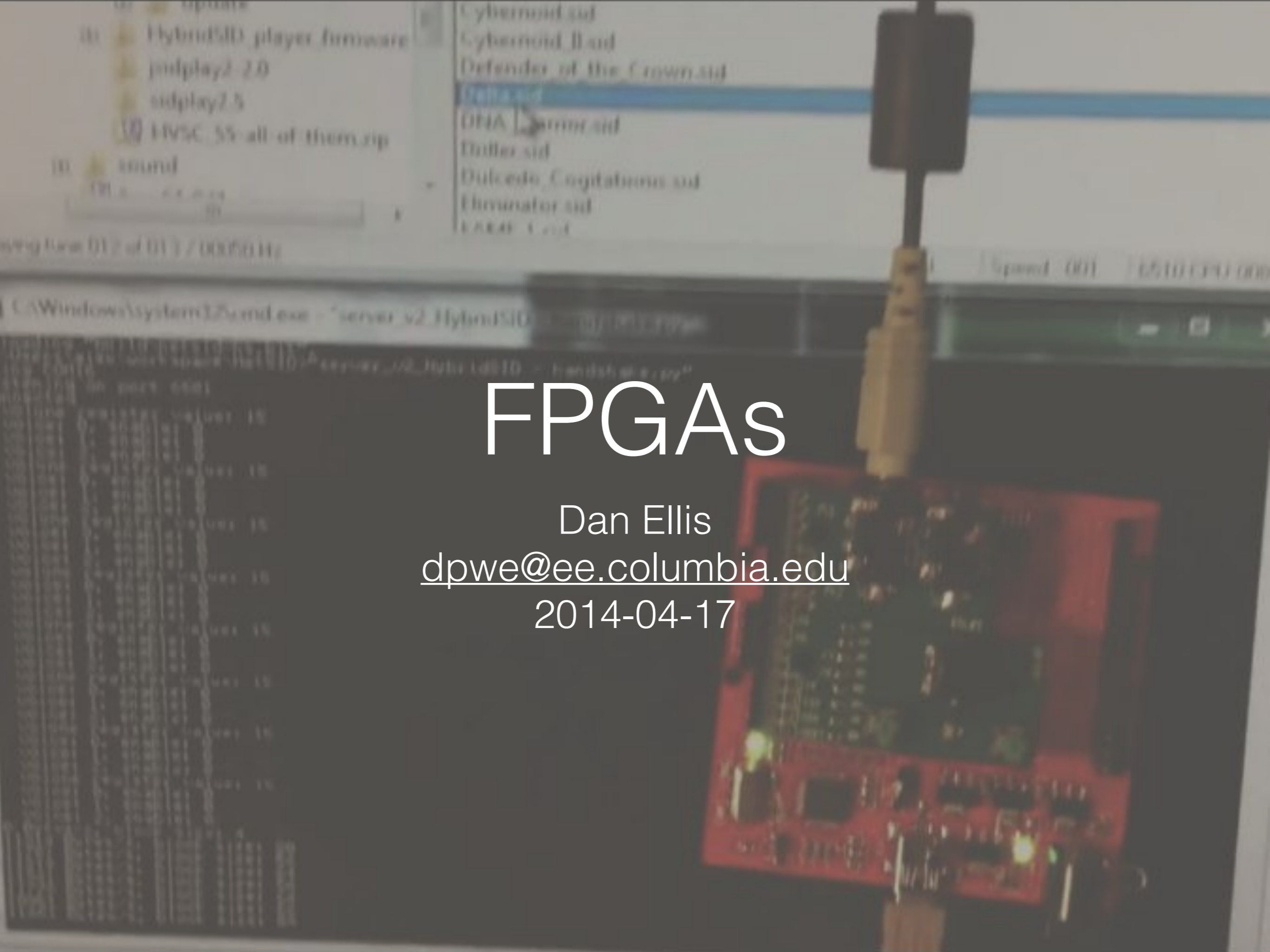


FPGAs

Dan Ellis

dpwe@ee.columbia.edu

2014-04-17

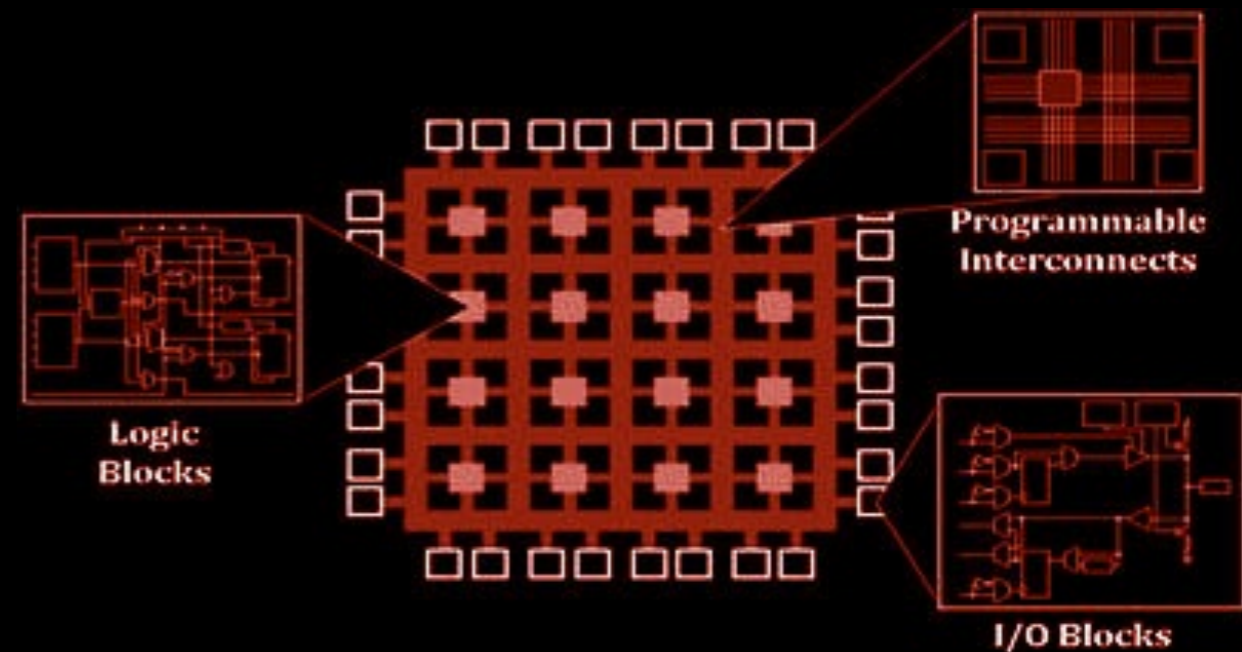


Field-Programmable Gate Arrays

- Large collection of logic gates + connection logic

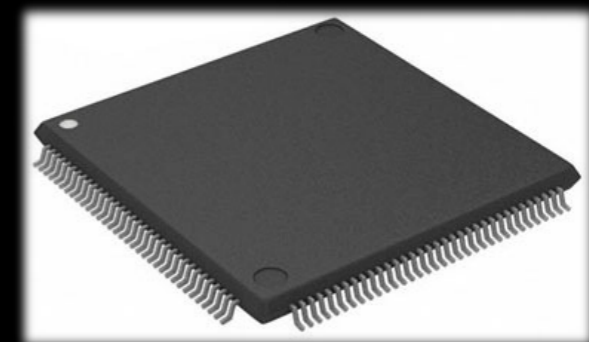
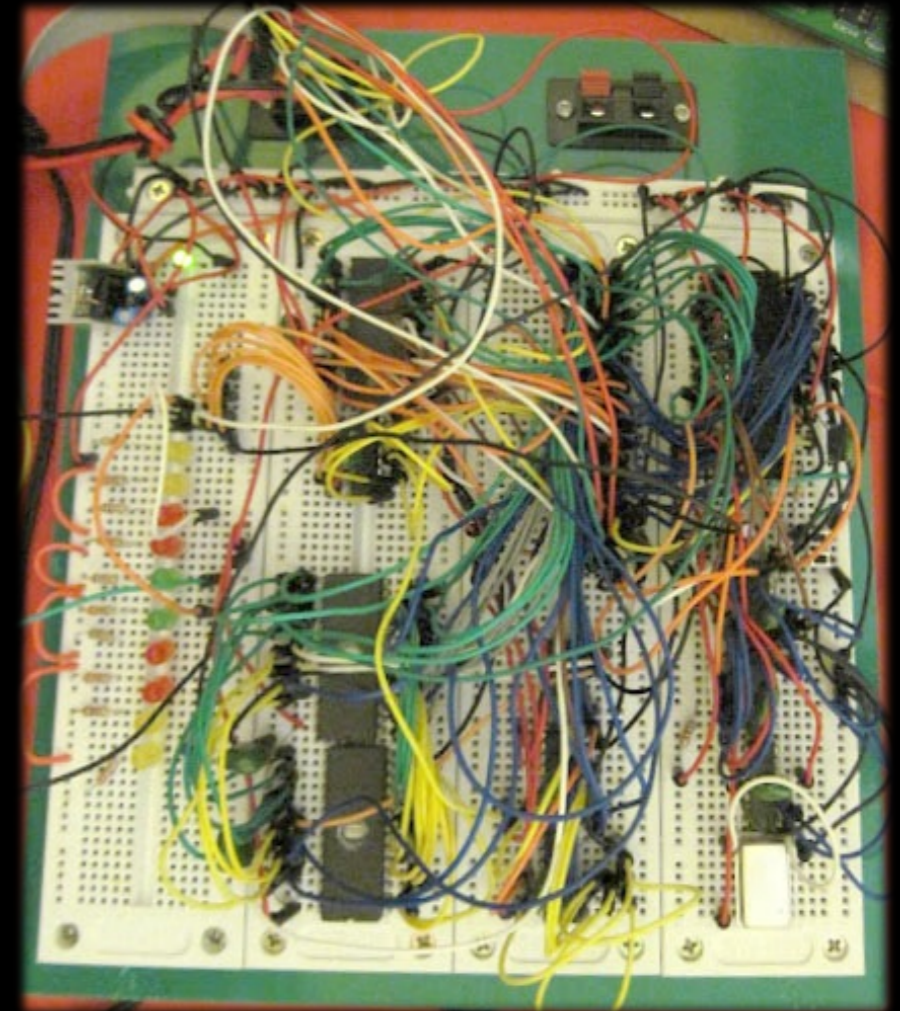
- “Field-programmable” i.e., in the field

- Alternative to custom-design “Application Specific Integrated Circuit” (ASIC)



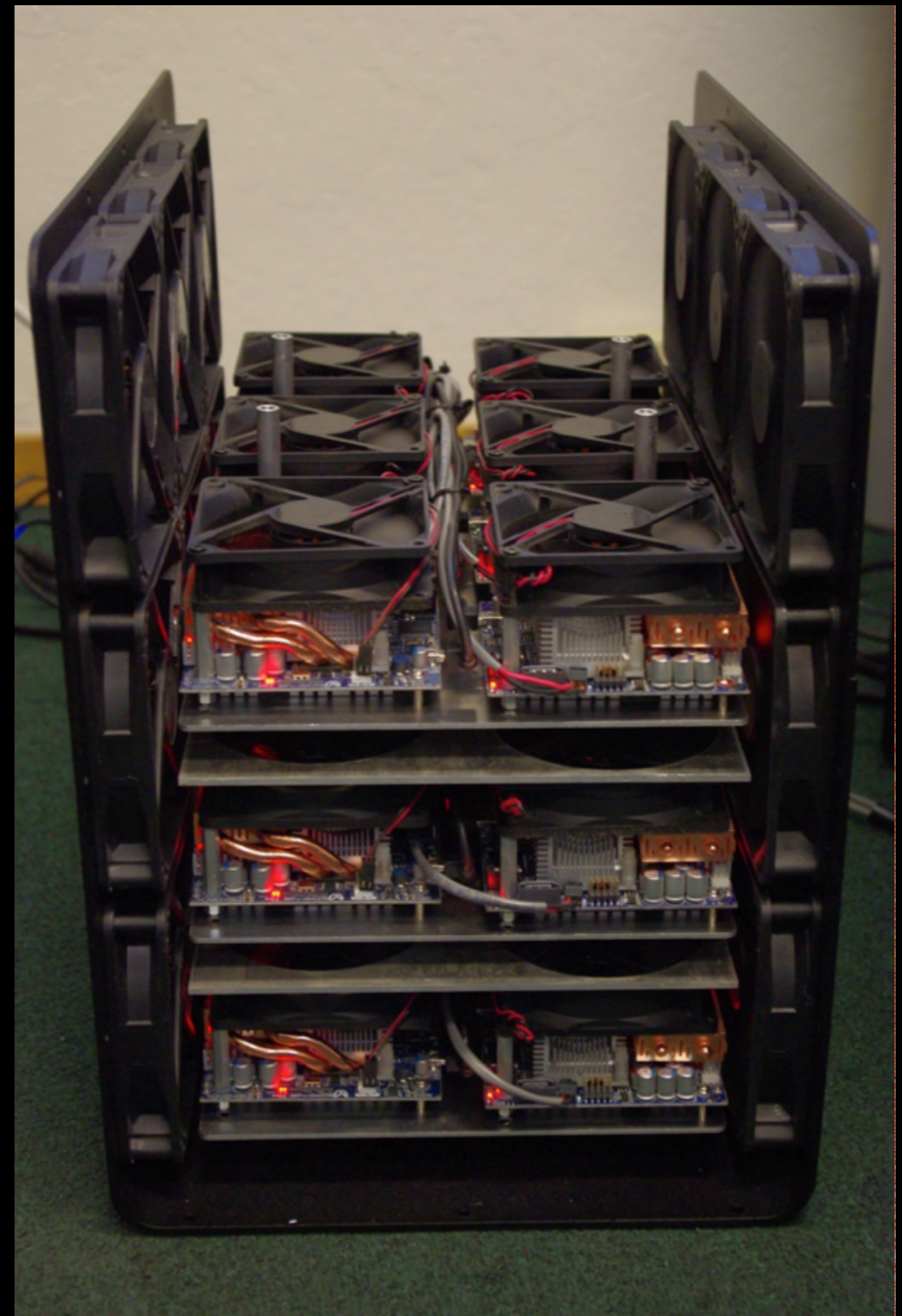
How Big?

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



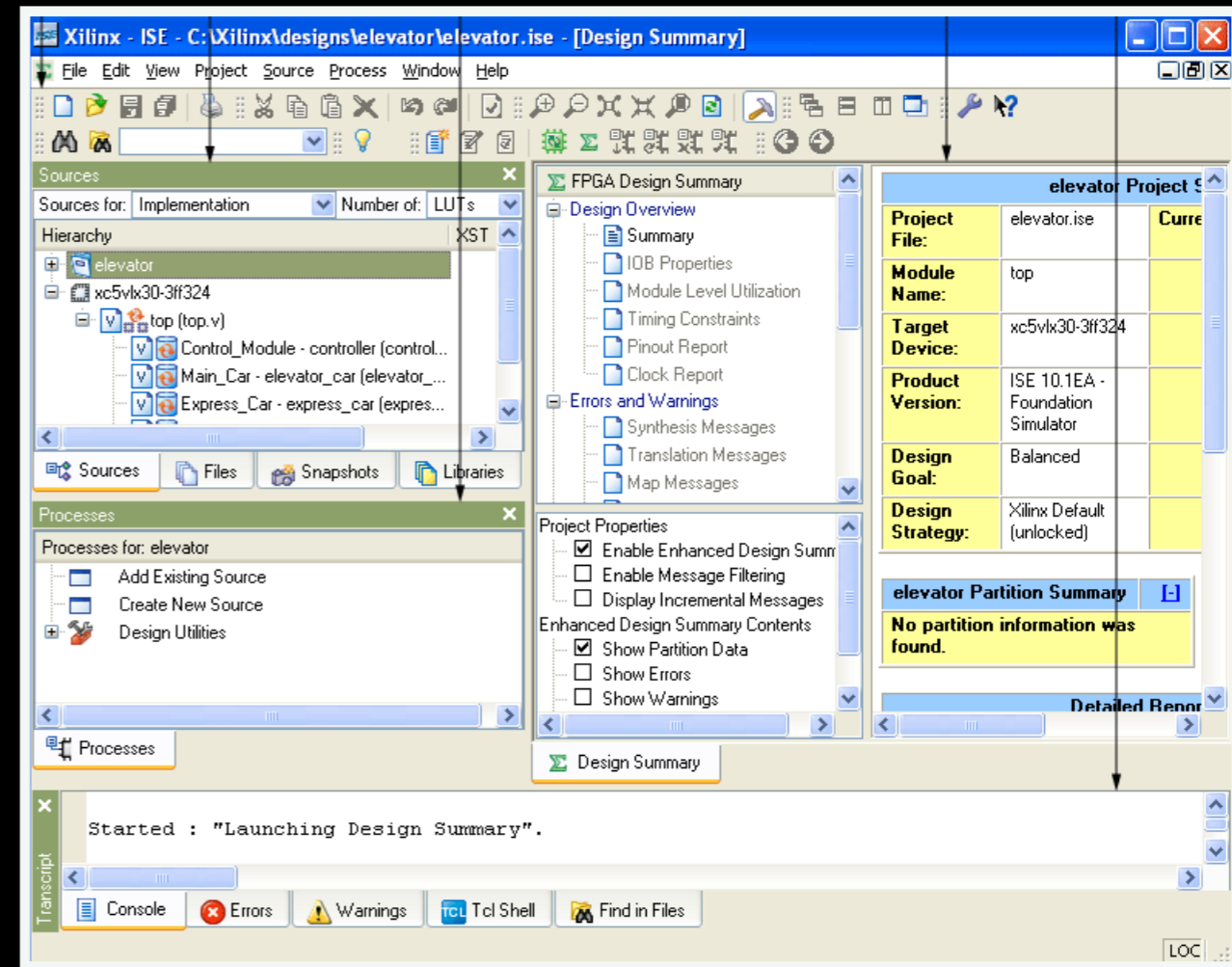
Advantages

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



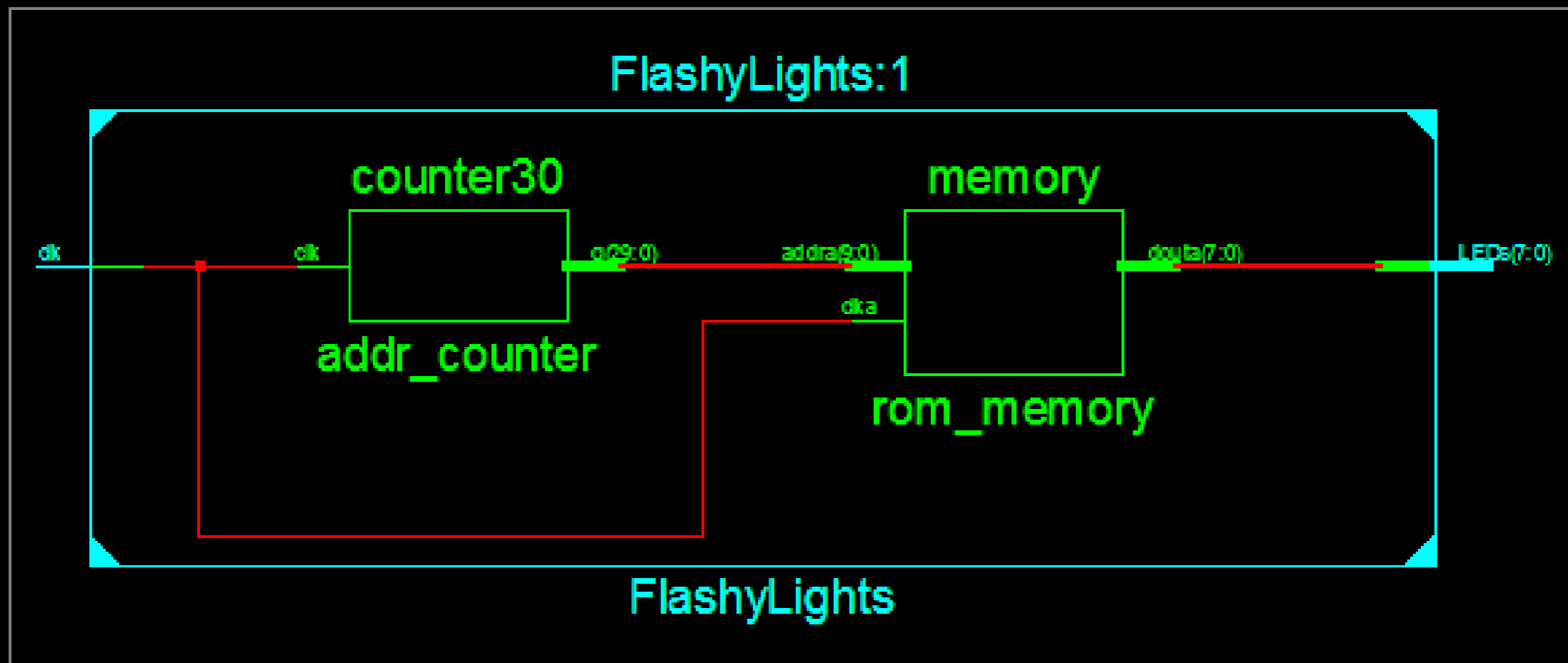
Disadvantages

- 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”

