Computer Science 141
Computing Hardware

Instructor: Prof. David Brooks

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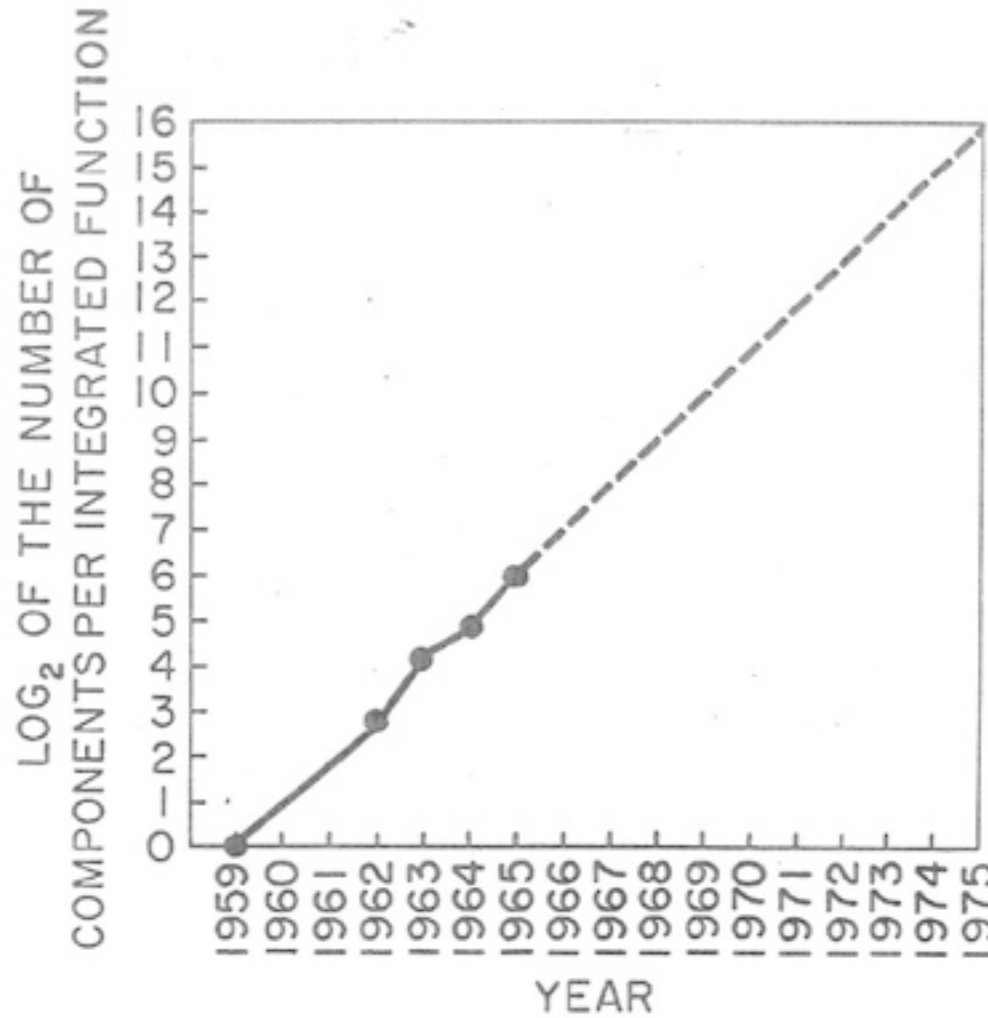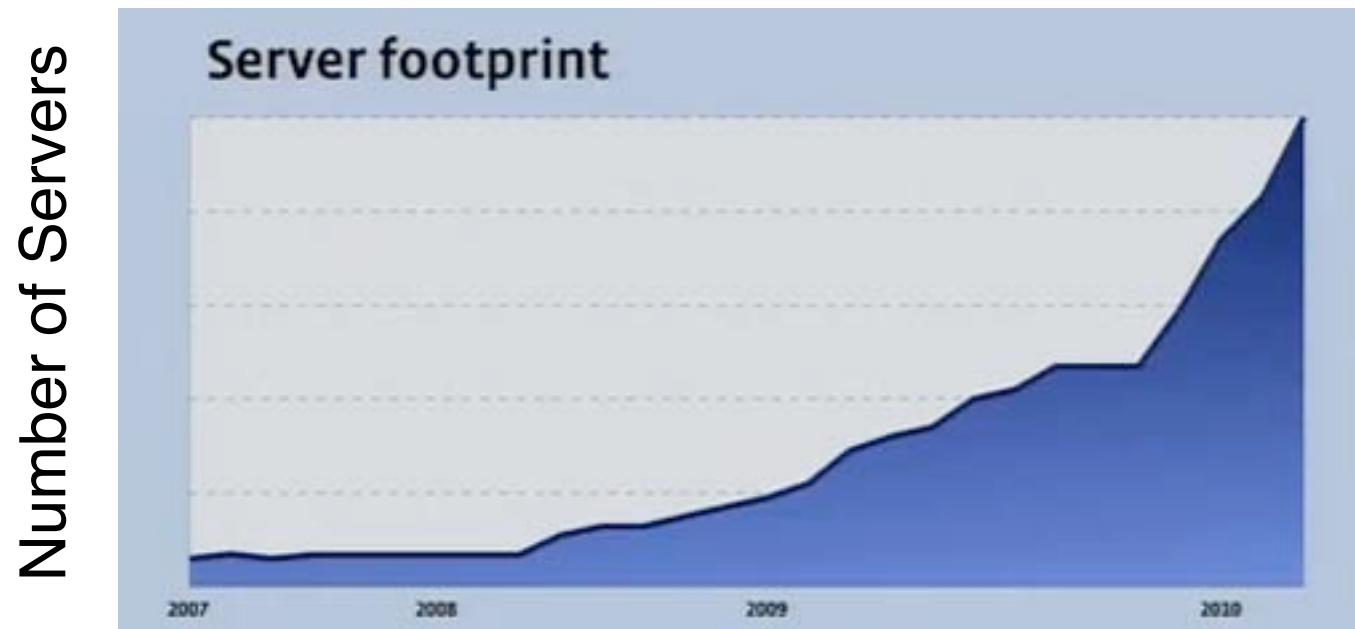
Moore's Law

Fig. 2 Number of components per integrated function for minimum cost per component extrapolated vs time.

Computing Performance

- Examples:
  - 1951 UNIVAC — 5K adds/sec in a 4400 ft3 package (22' x 20' x 10')
  - 2010 Nvidia GTX580 GPU — 1.58T FPadd/sec
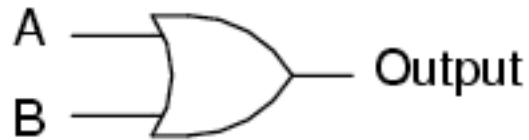
And demand is keeping pace!

Portable (low-power) Computing

- 1951 UNIVAC —124.5 KW

- SigmaTel STMP3550
  - 50 hours on a AA battery
  - 32-bit RISC core with DSP for audio decode
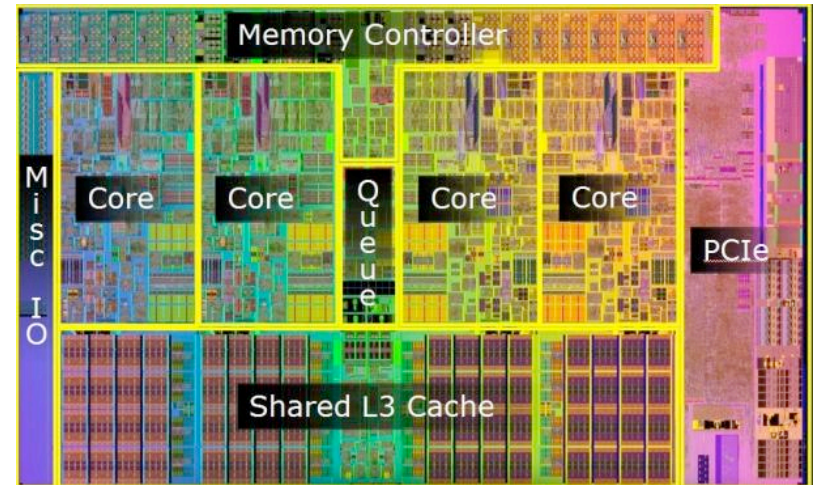 - Very similar to final CS141 project design!

What will you learn?

Digital Logic Design

Computer Organization

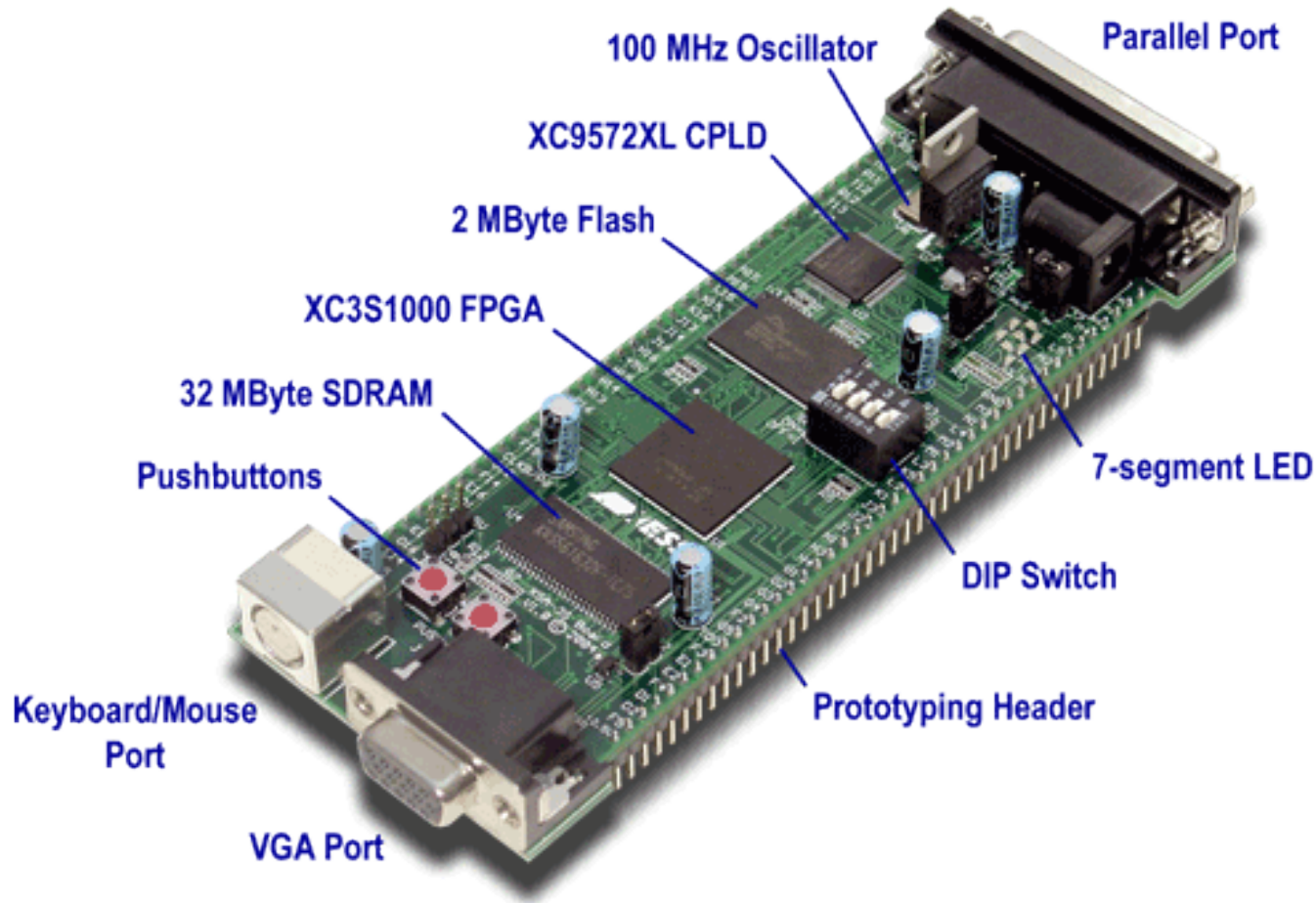## Verilog

```
module seq1101_mealy(x, y, CLK, RESET);
    input x;
    input CLK;
    input RESET;
    output y;
    reg y;

    parameter start = 2'b00, got1 = 2'b01, got1

    reg [1:0] Q;    // state variables
    reg [1:0] D;    // next state logic output
```

XSA-3S1000 Board

100 MHz Oscillator

Parallel Port

XC9572XL CPLD

2 MByte Flash

XC3S1000 FPGA

32 MByte SDRAM

Pushbuttons

7-segment LED

DIP Switch

Keyboard/Mouse Port

Prototyping Header

VGA Port

https://xess.com/prods/prod035.php

CS141 FAQ

- Prereqs?
  - Programming familiarity (CS50)
  - Some familiarity with number systems (binary)
  - Basic experience with Windows (CAD tools)
- When?
  - Fall 2011
- What else?
  - CS146 (Computer Architecture)
  - CS148 (Digital VLSI Design)
  - Several grad courses, research opportunities…