Individual Project

- Goal: Understand the design of a real microprocessor
- Each student: Select some “reference” implementation of some chip
  - Ideally very simple with known characteristics
- Identify basic library of standard cells
- Estimate how many and where transistors are used in its design
- Project what versions in other technologies might look like: Area, Power, Max clock
  - In variety of technologies (esp. ND 2 micron & today)
- Develop a “simple” Verilog model of a subset
- Make a class presentation

Reference Options

- See class website link page for pointers to documentation

Microprocessor	Data Width (bits)
6502	8
1802	8
8048/8051	8
8080	8
PDP-8	12
Simple 12	12
JAM-8	8
NOVA	16
MIPS	32
mini TPU	8

Presentation Outline

- Gather reference implementation characteristics
  - Technology, speed, power, area, transistor count, …
- Overview of instruction set (if processor)
- Overview of microarchitecture and how data flows
- What “off-chip” connections needed (include power, clocks, reset)
- Outline major blocks (and estimate area)
  - Develop a “Datapath slice plan” as in Fig. 1.68
- Transistor estimate for each
  - Where appropriate show transistor diagrams of block
- Project ahead to smaller feature sizes
  - Estimate area, power, speed, …
- Do projection in 2 steps
  - Include stop at 2 microns (ND process)
  - Using Dennard scaling (until 2004 technology)
  - Using constant voltage scaling thereafter

Standardizing Libraries OK

- Class development of std cell & bit slice library encouraged
- At some class T.B.D.
  - Bring your understanding of your chip
  - Identify common cells
  - Each student selects subset of cells for implementation
- Later in semester
  - Agree on
    - standard height (for standard cells)
    - standard width (for bit slices)
    - Standard ports
  - Revise Electric implementation & share
- Goal: reuse library in class project