

CS252
Graduate Computer Architecture
Lecture 17

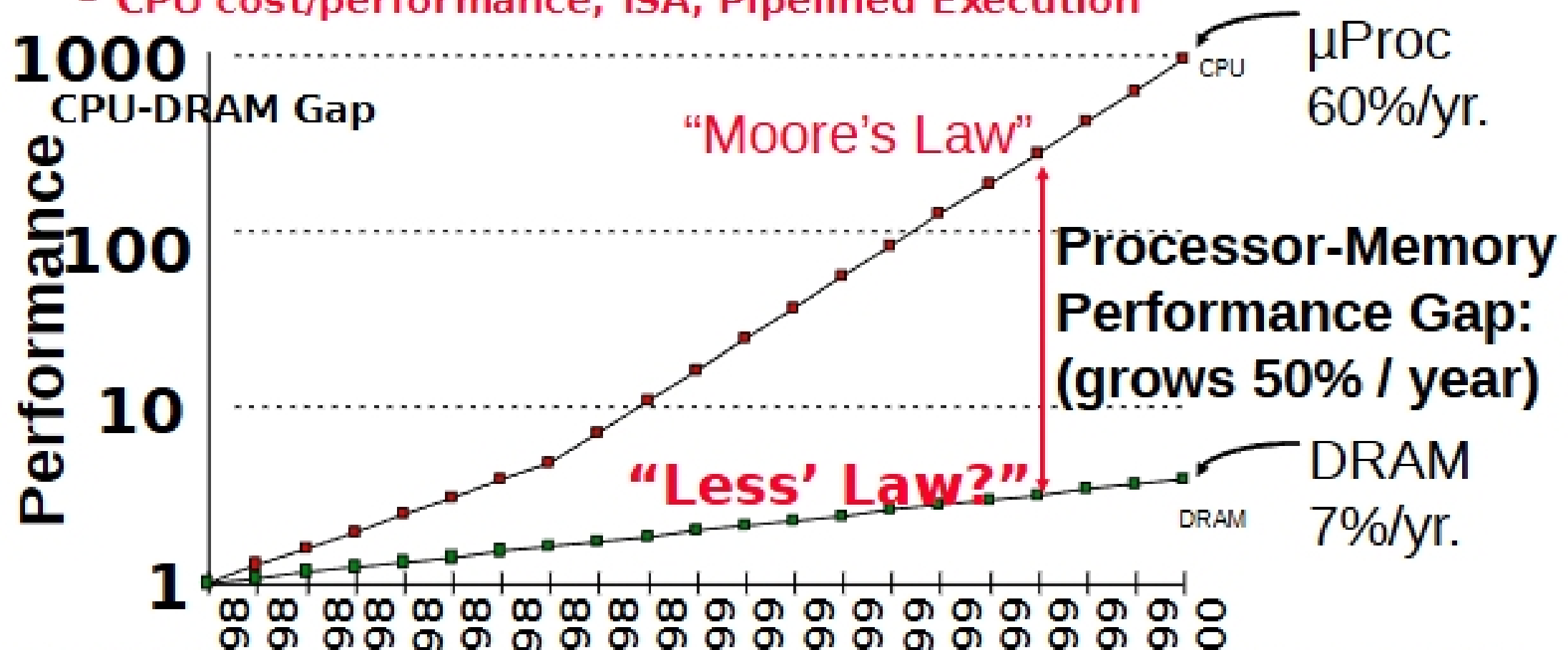
Memory Systems
Continued

November 1, 2000
Computer Science 252

Review: Who Cares About the Memory Hierarchy?

- Processor Only Thus Far in Course:

- CPU cost/performance, ISA, Pipelined Execution



- 1980: no cache in μ proc; 1995: 2-level cache on chip (1989 first Intel μ proc with a cache on chip)

Review: Cache performance

- **Miss-oriented Approach to Memory Access:**

$$CPUtime = IC \times CPI_{Execution} + \frac{MemAccess}{Inst} \times MissRate \times MissPenalty \times CycleTime$$

- **Separating out Memory component entirely**

$$CPUtime = IC \times CPI_{AluOps} + \frac{MemAccess}{Inst} \times AMAT \times CycleTime$$

- AMAT = Average Memory Access Time

$$AMAT = HitTime + MissRate \times MissPenalty$$

$$= (HitTime_{Inst} + MissRate_{Inst} \times MissPenalty_{Inst}) + (HitTime_{Data} + MissRate_{Data} \times MissPenalty_{Data})$$