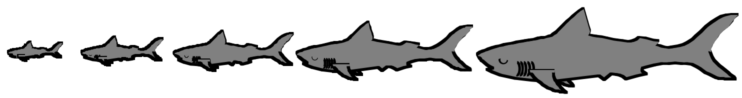
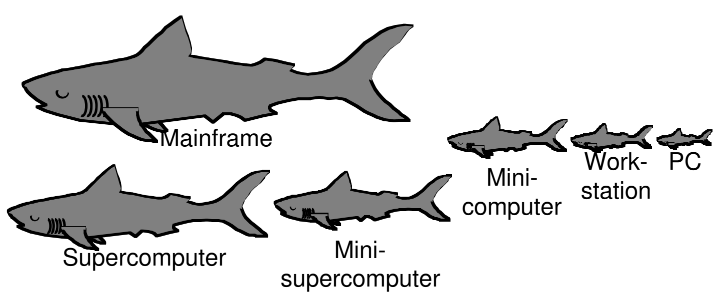
Original Food Chain Picture

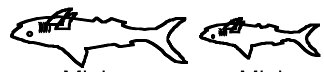


Case 1

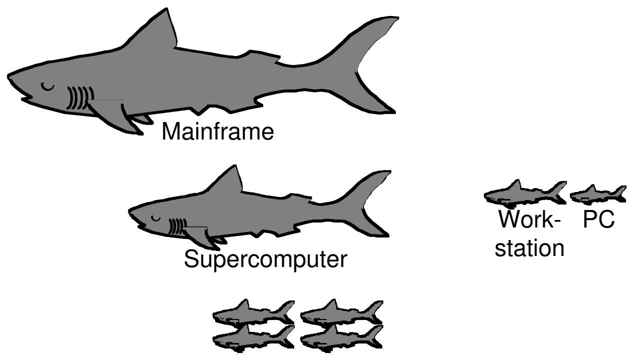
1984 Computer Food Chain



Case 2



1994 Computer Food Chain



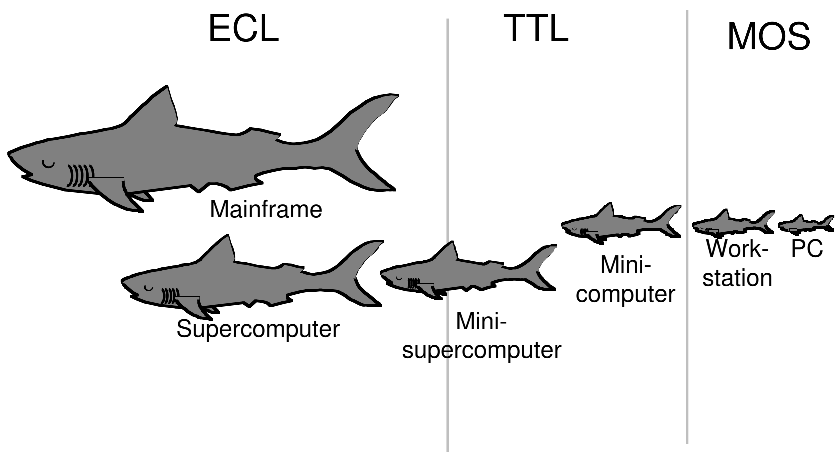
Case 3

Why the change in 10 years?

- **Function: LAN => Replace 1 large computer by many small ones yet offer communication**
- **Performance: Change in Technologies**
  - **CMOS VLSI dominates TTL, ECL in cost AND performance**
- **Performance: Advances in computer architecture improves low-end**
  - **RISC, superscalar, RAID, …**
- **Price: Lower cost due to simpler development**
  - **CMOS VLSI => small system, fewer components**
- **Price: Lower costs due to higher volume**
  - **CMOS VLSI : same dev. cost 10,000 vs. 100,000 units**
- **Price: Lower markup over cost by class of computer, due to fewer services**

Case 4

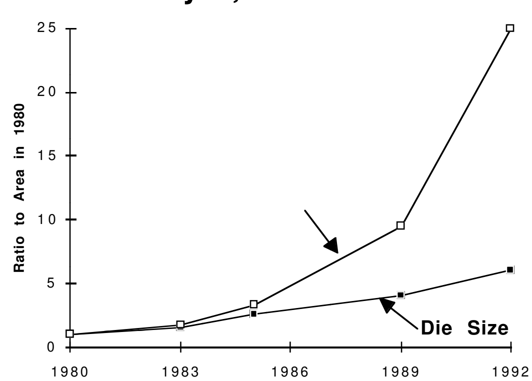
1984 Computer Food Chain Technologies



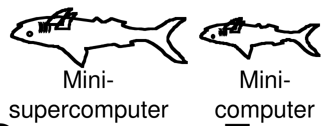
Case 5

CMOS improvements

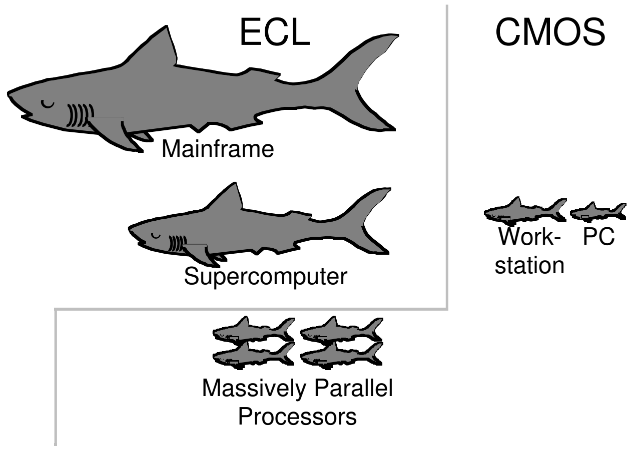
- **Die size 2X / 3 yrs; Line widths halve / 7 yrs**



Case 6

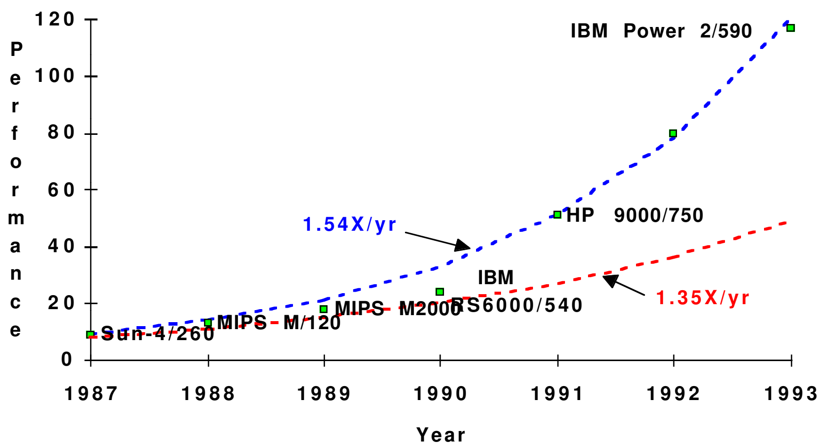


1994 Computer Food Chain Technologies



Case 7

Processor Performance



Case 8

Processor Perspective

- Putting performance growth in perspective:

	IBM POWER2 Workstation	Cray YMP Supercomputer
Year	1993	1988
MIPS	> 200 MIPS	< 50 MIPS
Linpack	140 MFLOPS	160 MFLOPS
Cost	$120,000	$1M ($1.6M in 1994$)
Clock	71.5 MHz	167 MHz
Cache	256 KB	0.25 KB
Memory	512 MB	256 MB

- 1988 supercomputer in 1993 server!

Case 9