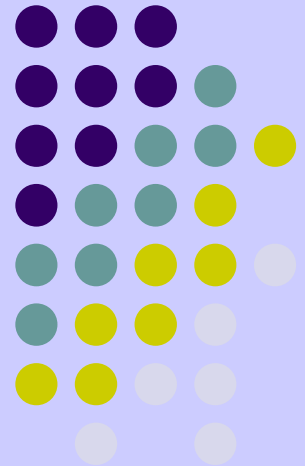
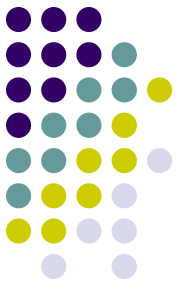


The Invention of the Microprocessor



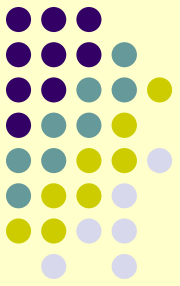
The Invention of the Microprocessor



- Ted Hoff invented the Microprocessor
- Intel had been hired by the Japanese firm **Busicom** to design and build a set of chips for a number of different calculators.



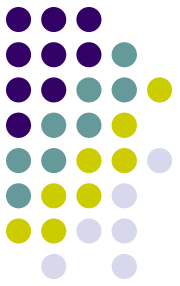
The Invention of the Microprocessor



- Hoff was the architect of the chip set which Federico Faggin and a team of designers implemented. The set included four chips:
 1. A central processing unit (CPU) called the 4004.



The Invention of the Microprocessor



2. A read-only memory (ROM) with custom instructions for calculator operation.

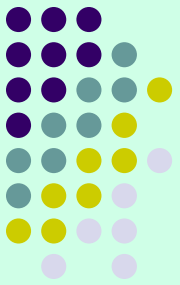


3. A random-access memory (RAM).



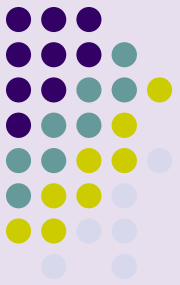
4. A shift register for input/output buffering

The Invention of the Microprocessor

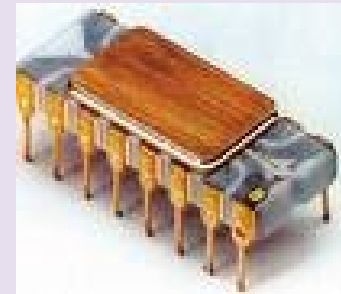


- Early 1970, Intel signed a \$60,000 contract which gave Busicom proprietary rights to design. The CPU chip, 4004, was eventually called a **Microprocessor**.
- While Intel produced chips for Busicom which were successfully made into 100,000 calculators.

The Invention of the Microprocessor



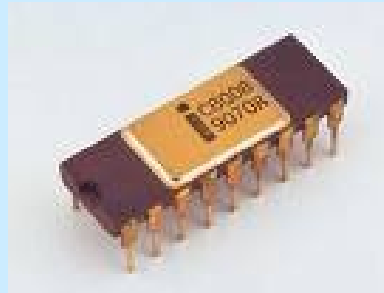
- 4004 – The 4004 was introduced in 1971.
- It contained 2,300 MOS transistors and could execute 60,000 instructions per second.



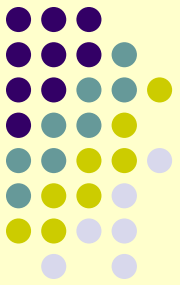
The Invention of the Microprocessor



- 8008- Intel developed 8-bit microprocessor which was introduced in 1972.
- It was too slow and required 20 support chips for operation.



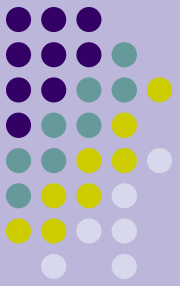
The Invention of the Microprocessor



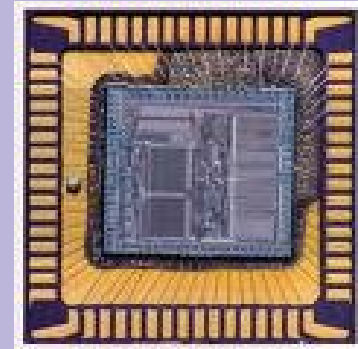
- 8080- Intel had created an NMOS process. it could execute 290,000 instructions per second, in addition, the 8080 required only six support chips for operation.
- Intel was one year ahead of Motorola's introduction of the 6800 and eventually took nearly the entire 8-bit market.



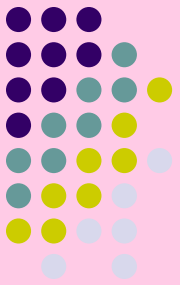
The Invention of the Microprocessor



- Intel's 16-bit ,the 8086, again was first to market by about one year when it was introduced in 1978.
- Motorola introduced its own 16-bit , the 68000,and appeared to be gaining momentum in the field.

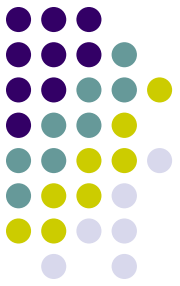


The Invention of the Microprocessor



- Intel created a task force to attack the 68000. The project was called operation CRUSH.
- The CRUSH campaign emphasized Intel the most notable win was IBM's decision to use the 8088 in their first PC.

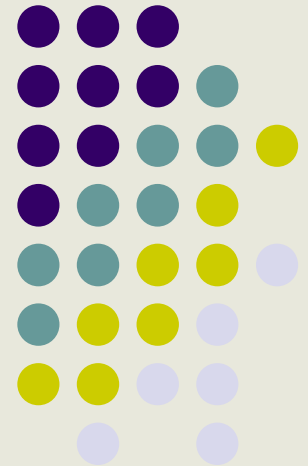
The Invention of the Microprocessor



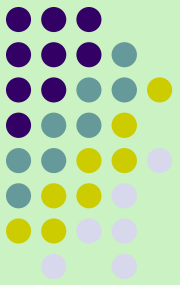
- The 80186 and 80286 were designed to increased integration, internal memory management ,and advanced software protection capability.
- Motorola- project CHECKMATE paralleled the earlier project CHUSH in concept.



Synergies Between EPROMs and Microprocessor

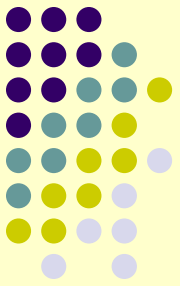


Synergies Between EPROMs and Microprocessor



- EPROM better than ROM
 - develop and revise program.
 - could not effort the expense of a custom ROM could substitute off-the-shelf EPROMS.

Synergies Between EPROMs and Microprocessor



- Intel had a competitive advantage in the EPROM
 - EPROM's Intel had floating gate process.
 - Packaging, testing and reliability engineering.

Synergies Between EPROMs and Microprocessor



- In 1977 Intel introduced the 16K EPROM, 2716, which was compatible with any microprocessor system.
- In 1981 the EPROM market was challenged by several competitors.

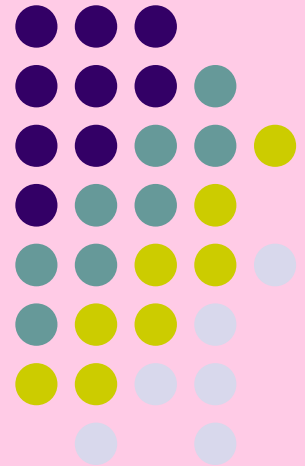


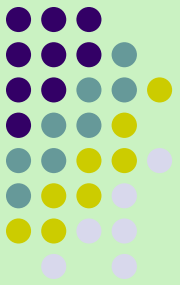
Synergies Between EPROMs and Microprocessor



Intel 64K EPROM “ 2764” met very aggressive yield goals and was again leading the world in EPROM.

Technology Development



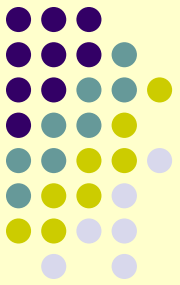


Technology Development

3 groups of Intel Technology Development

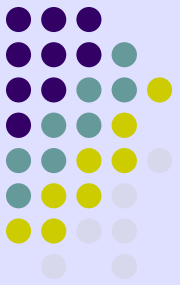
- DRAM
- EPROM
- Logic/SRAM

Technology Development Groups



	DRAM	EPROM and EEPROM	Logic/SRAM
Location	Aloha, Oregon	Santa Clara, California	Livermore, California
Focus	Linewidth reduction	Process Step Ex.increased polysilicon process for floating gate	Process critical to logic devices

Technology Development



- The memory technology development group represented Intel's best corporate resource for process development.
- There is more of a connection between the designer and the process engineer.