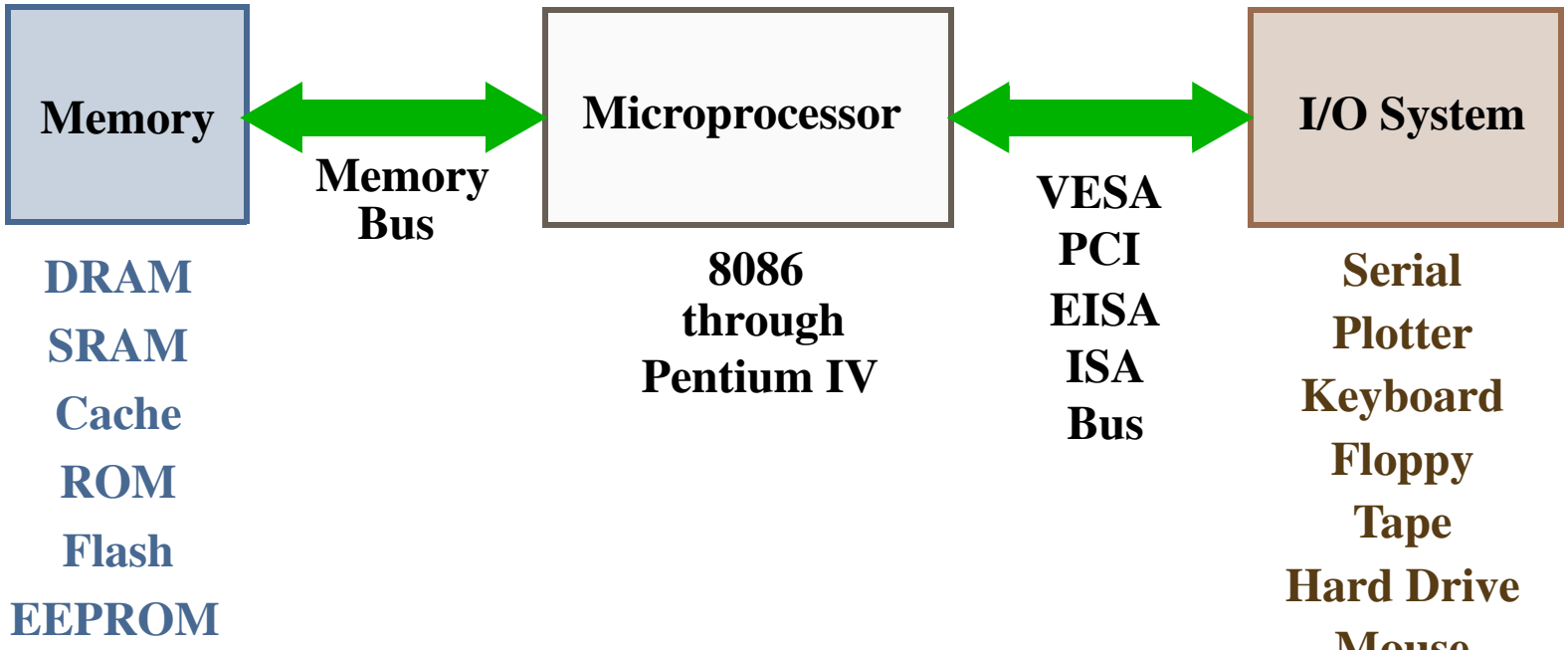
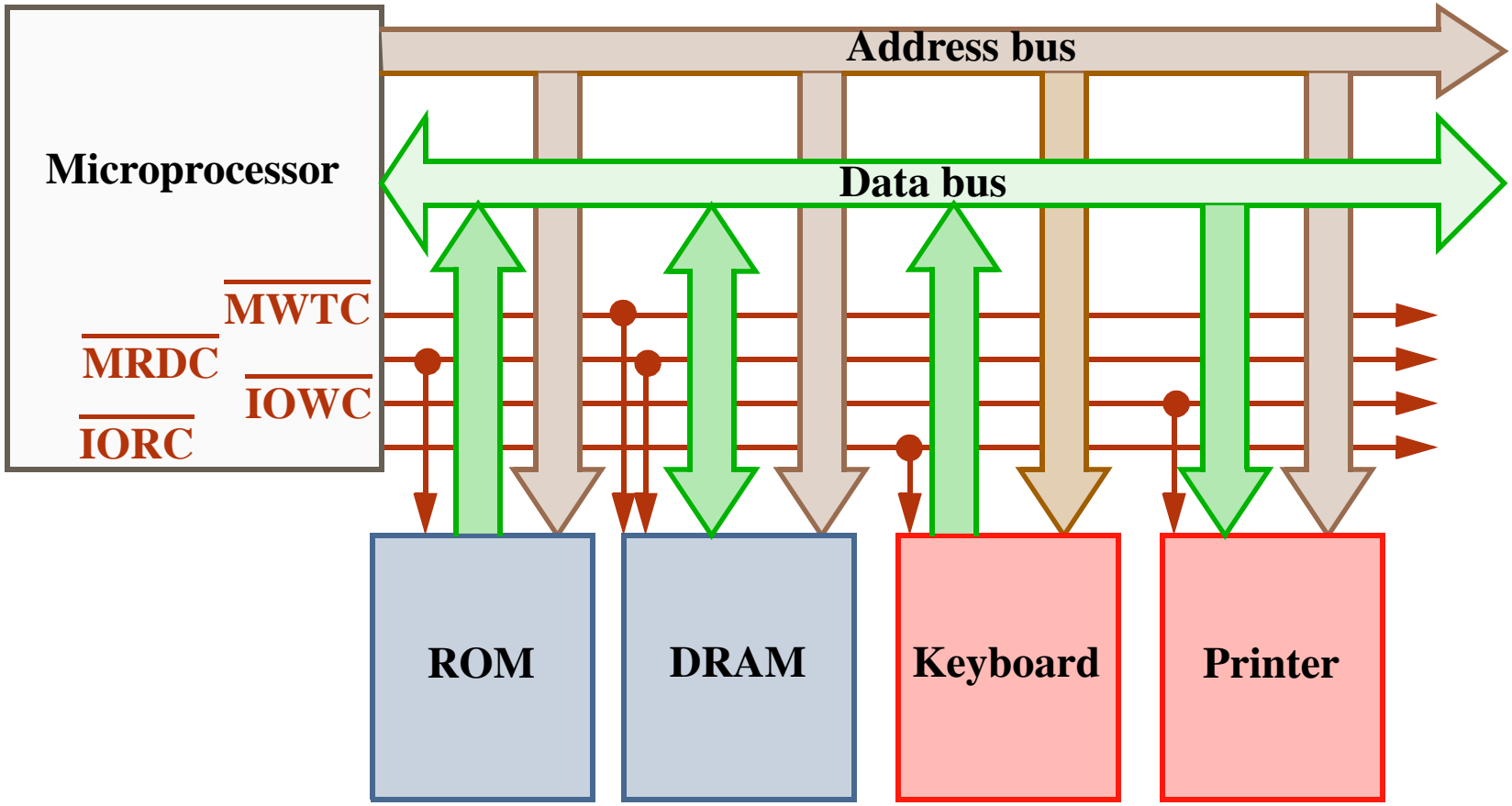
Basic Architecture

Basic components



Basic Architecture

Bus Architecture:



The Pentium bus architecture is not this simple.

We will elaborate on this later.

Basic Bus Architecture

Bus Architecture:- Three buses:

- ***Address:***

  If I/O, a value between 0000H and FFFFH is issued.

  If memory, it depends on the architecture:

  20-bits (8086/8088)

  24-bits (80286/80386SX)

  25-bits (80386SL/SLC/EX)

  32-bits (80386DX/80486/Pentium)

  36-bits (Pentium Pro/II/III)

- ***Data:***

  8-bits (8088)

  16-bits (8086/80286/80386SX/SL/SLC/EX)

  32-bits (80386DX/80486/Pentium)

  64-bits (Pentium/Pro/II/III)

- ***Control:***

  Most systems have at least 4 control bus connections (active low).

  $\overline{\textit{MRDC}}$ (Memory ReaD Control), $\overline{\textit{MWRC}}$, $\overline{\textit{IORC}}$ (I/O Read Control), $\overline{\textit{IOWC}}$.

Basic Bus Architecture

Bus Standards:

- *ISA (Industry Standard Architecture)*: 8 MHz
  - 8-bit (8086/8088)
  - 16-bit (80286-Pentium)

- *EISA:* 8 MHz
  - 32-bit (older 386 and 486 machines).

- *PCI (Peripheral Component Interconnect)*: 33 MHz
  - 32-bit or 64-bit (Pentiums)
  - New: PCI Express and PCI-X 533 MTS

- *VESA (Video Electronic Standards Association)*: Runs at processor speed.
  - 32-bit or 64-bit (Pentiums)
  - Only disk and video. Competes with the PCI but is not popular.

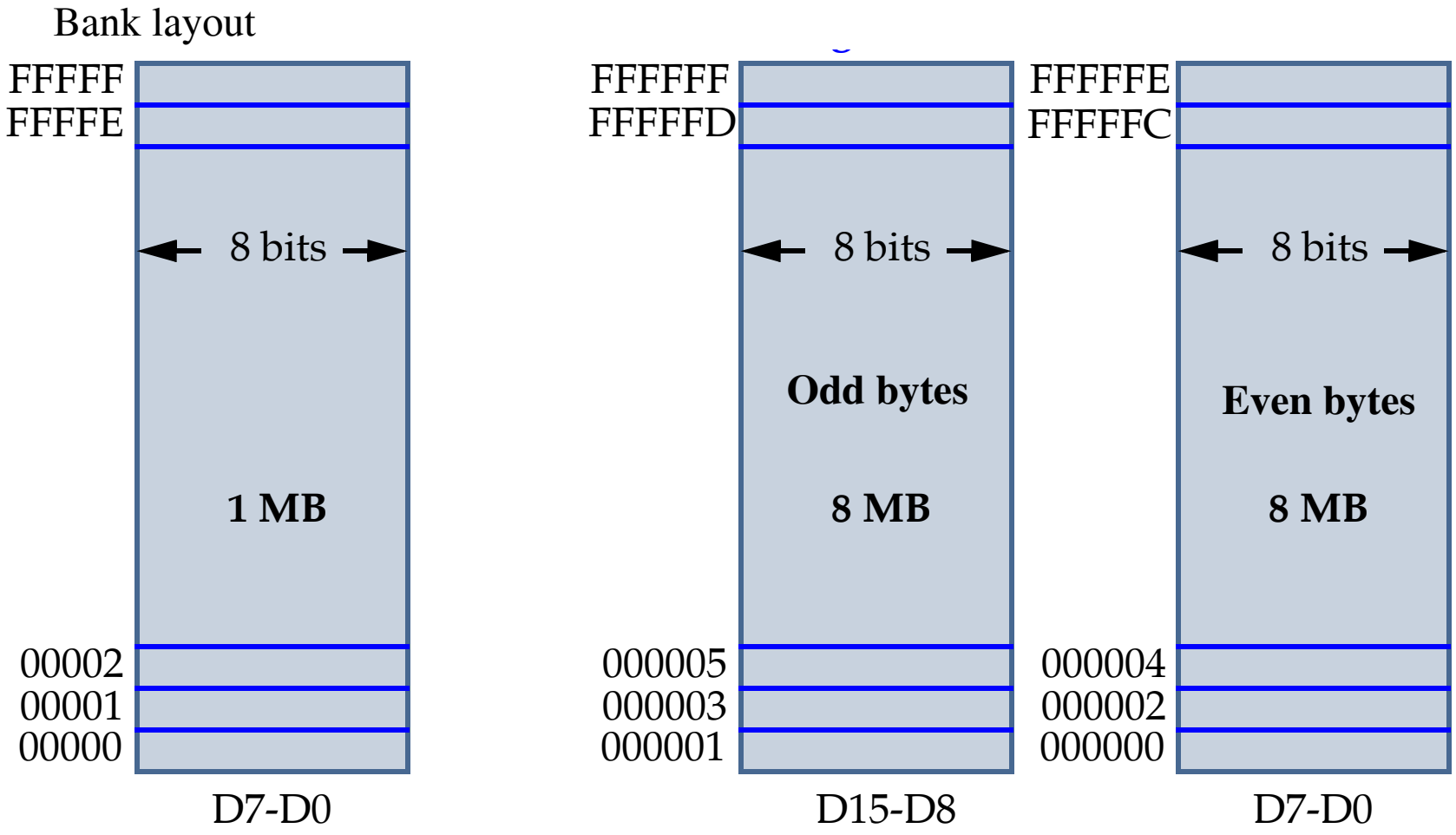
Basic Bus Architecture

Bus Standards:

- ***USB (Universal Serial Bus)***: 1.5 Mbps,12 Mbps and now 480 Mbps.
  - Newest systems.
  - Serial connection to microprocessor.
  - For keyboards, the mouse, modems and sound cards.
  - ***To reduce system cost through fewer wires.***

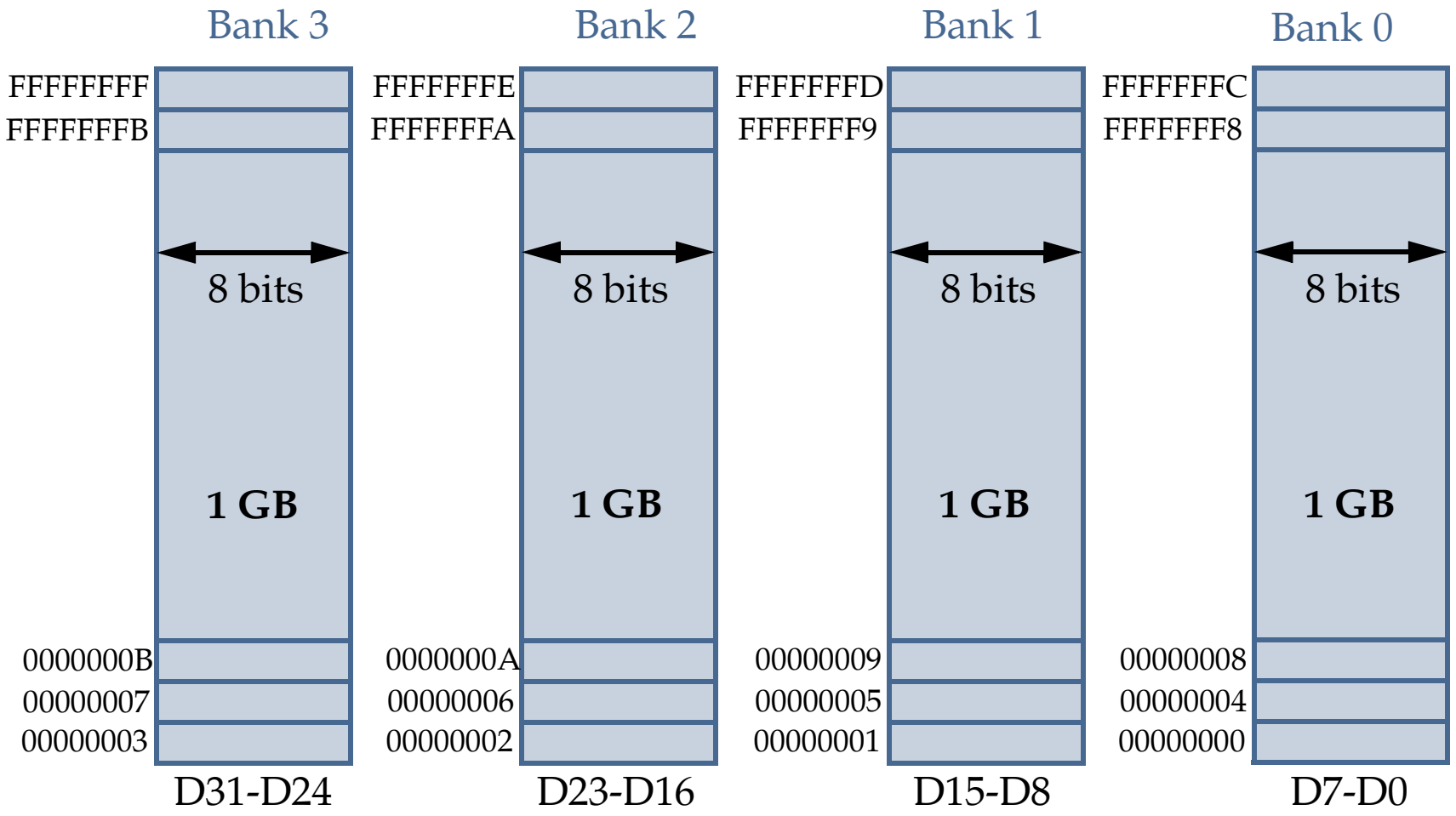
- ***AGP (Advanced Graphics Port)***: 66MHz
  - Newest systems.
  - Fast parallel connection: Across 64-bits for 533MB/sec.
  - For video cards.
  - ***To accommodate the new DVD (Digital Versatile Disk) players.***
  - ***Latest AGP 3.0 with peak bandwidth of 2.1GB/s.***

Basic Memory Architecture



Basic Memory Architecture

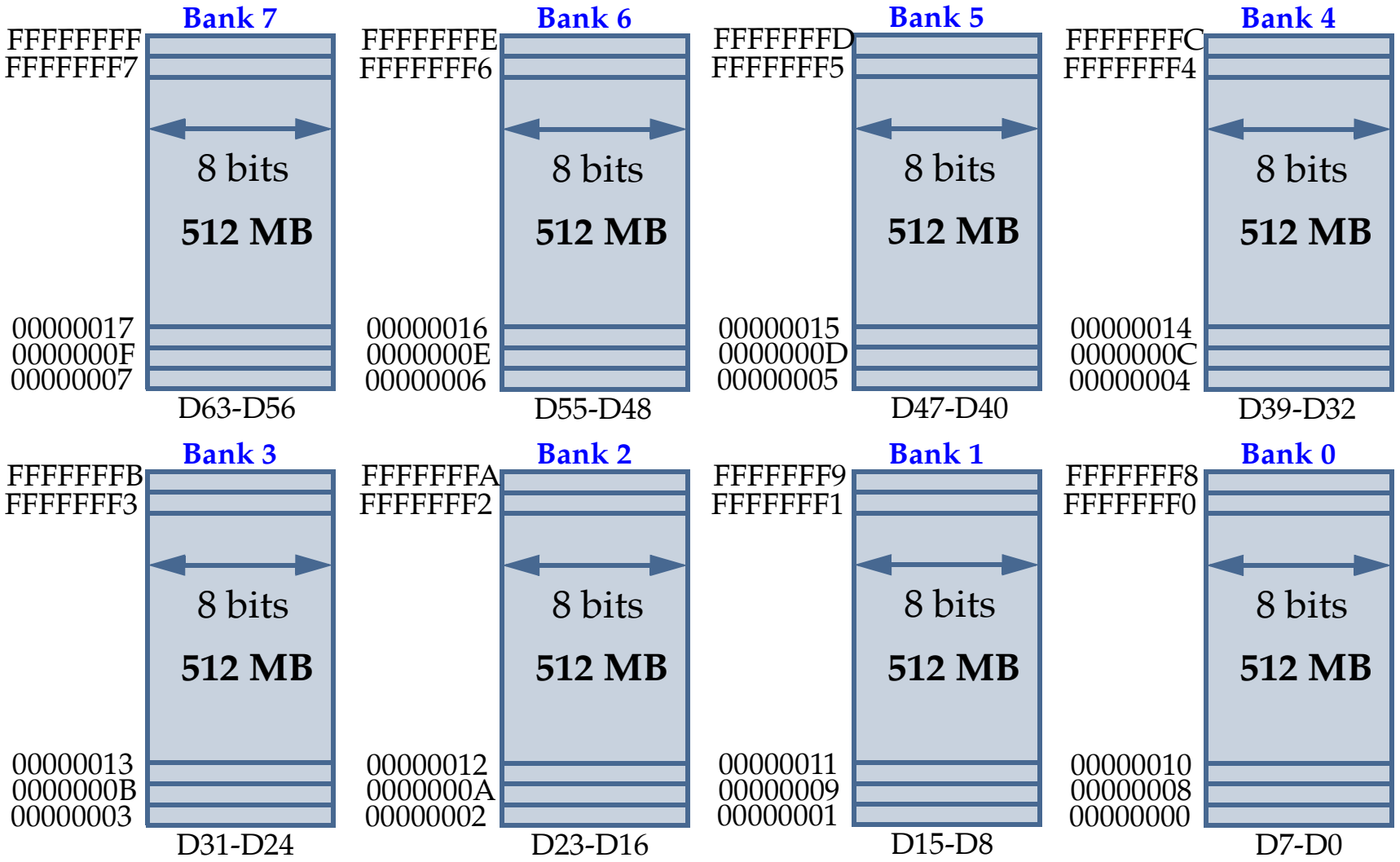
Bank layout



80386DX, 80486

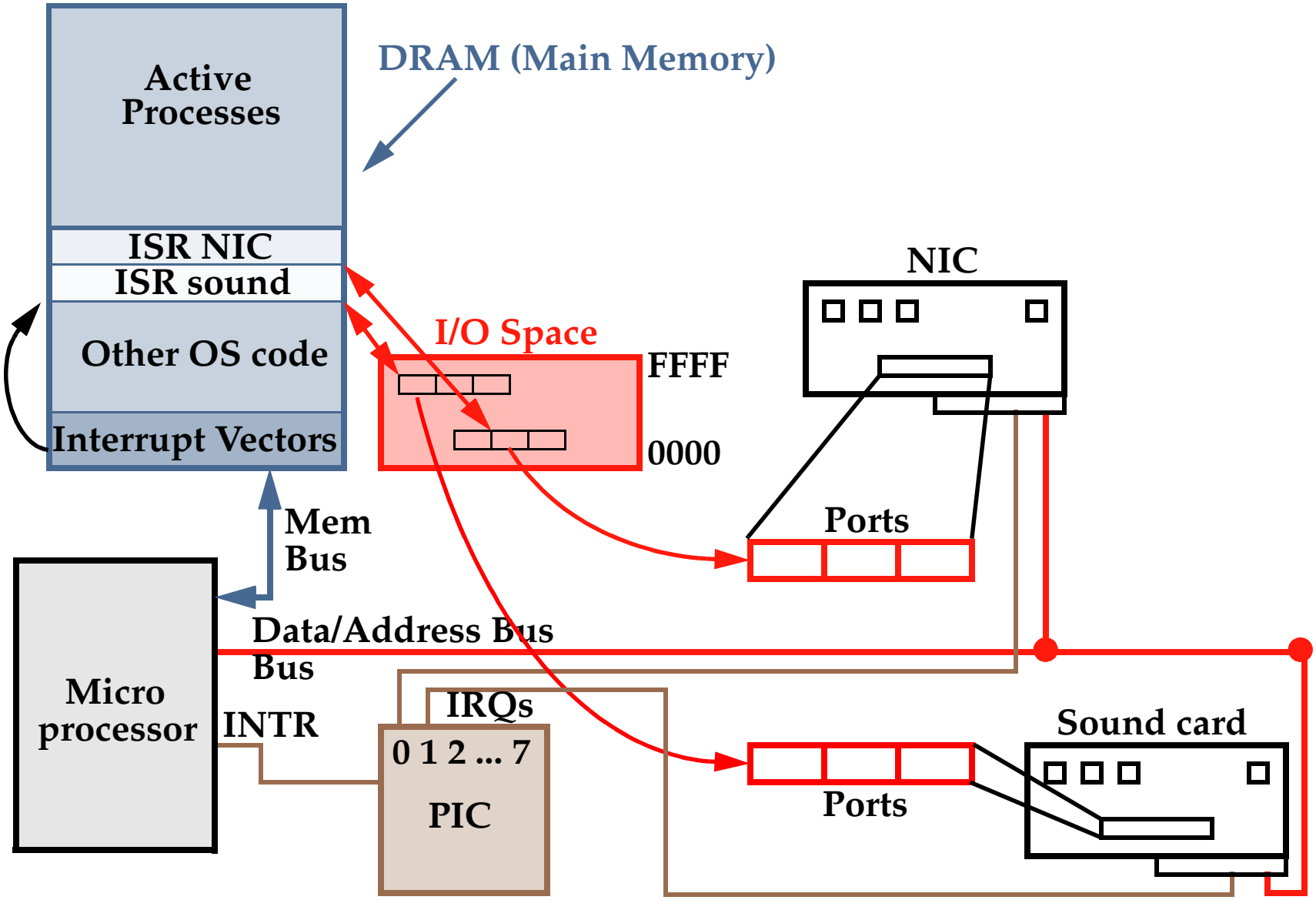
Basic Memory Architecture

Bank layout

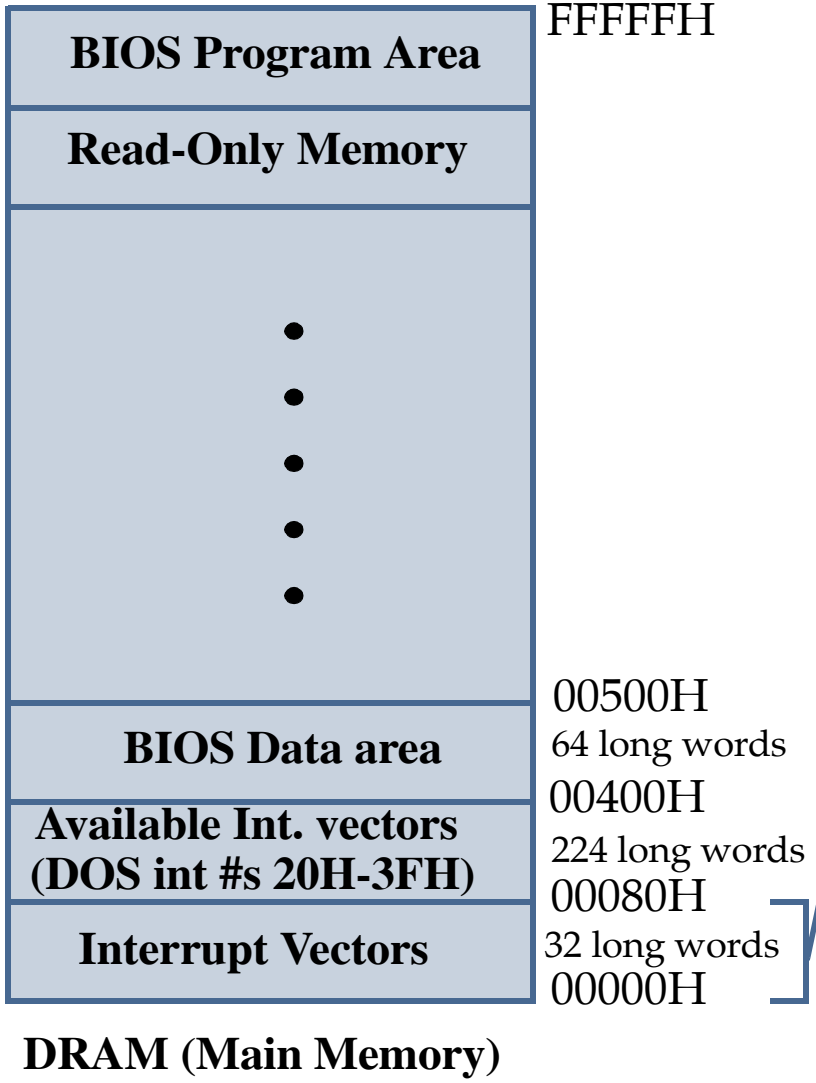


Pentium/Pro/II/III

Basic I/O Architecture



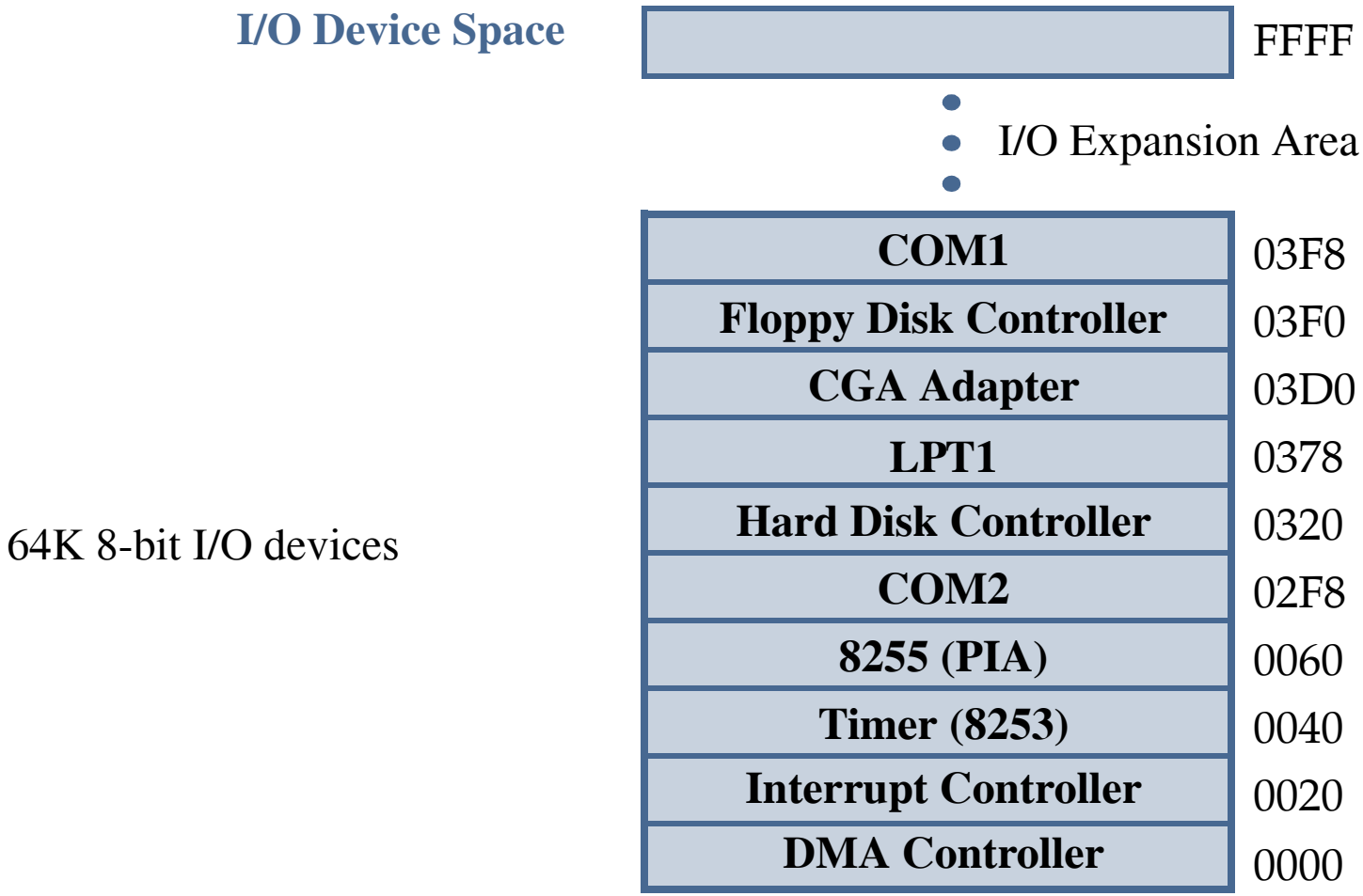
Interrupt Vectors (DOS PC)



Address		Interrupt #	
7C-7F	Video Graphic Chars	1FH	Pts to Data
78-7B	Diskette Parameters	1EH	
74-77	Video Initialization	1DH	
70-73	Timer Tick (18.2/sec)	1CH	Software Interrupts Synchronous
6C-6F	Keyboard Break	1BH	
68-6B	Time of Day	1AH	
64-67	Bootstrap	19H	
60-63	Resident BASIC	18H	
5C-5F	Printer	17H	
58-5B	Keyboard	16H	
54-57	Cassette	15H	
50-53	Communications	14H	
4C-4F	Diskette/Disk	13H	
48-4B	Memory	12H	
44-47	Equipment Check	11H	
40-43	Video	10H	
3C-3F	Printer	FH	Hardware Interrupts Asynchronous 8259A
38-3B	Diskette	EH	
34-37	Disk	DH	
30-33	Communications	CH	
2C-2F	Communications	BH	
28-2B	Reserved	AH	
24-27	Keyboard	9H	
20-23	Time of Day	8H	
1D-1F	Reserved	7H	
18-1B	Reserved	6H	
14-17	Print Screen	5H	
10-13	Overflow (CPU)	4H	Microprocessor Interrupts
C-F	Breakpoint (CPU)	3H	
8-B	Non-maskable (8087)	2H	
4-7	Single Step (CPU)	1H	
0-3	Divide by zero (CPU)	0H	

I/O Space

It is important to notice that these I/O addresses are NOT memory-mapped addresses on the 80x86 machines.



Special instructions (IN/OUT) are used to communicate to the I/O devices.