Lesson Outline

- The Microcomputing World in 1980
- Enter IBM
- The Microsoft Story – Part 1
- The IBM PC
- Xerox PARC: SmallTalk and the Alto
- Apple: The Lisa and the Macintosh
- The Microsoft Story – Part 2
- The Microsoft Story – Part 3
The Microcomputing World in 1980

- **Processors**
  - Intel 8080 and Zilog Z80 (hobbyists and TRS-80)
  - MOS Tech. 6502 (Apple and Commodore)
  - Motorola 6800, and many others (e.g., National Semiconductor)
  - Intel 8086/8088 announced, not widely used

- **Systems**
  - “Hobbyist” 8080/Z80 based systems
    - Altair, IMSAI, many others, both pre-assembled and as kits
    - Often had 8-inch floppy drives
    - Usually ran CP/M
  - Complete systems
    - Apple ][ family, TRS-80 family, others
    - Often used 5 ¼” drives
    - Typically used proprietary operating systems ([Apple]DOS, TRS-DOS, etc.)
    - Built-in BASIC, usually from Microsoft
    - Expansion slots (e.g., S-100, Apple bus)
A small group was formed to build a “personal computer” (1980)
- Project Chess: “Skunk works” project with 12 people, in Boca Raton, FL
- Wanted to get to market quickly
- Did not want to develop major new technologies
- Did not expect to sell many (perhaps 275,000 over 5 year product life)
- Plan: Use the “best” off-the-shelf technology and ideas:
  - Processor: Intel 8088 (easier to integrate than 8086)
  - Max 640KB memory (ten times more than most 8-bit micros!)
  - Storage: cassette tape and/or 5 ¼” floppy
  - Built-in language: Microsoft BASIC
  - Operating System: CP/M-86 (was under development by Digital Research)
  - IBM Keyboard
  - Monochrome, character-based video (24x80)
  - Expansion slots (with bus later called “ISA” bus):
    - For serial and parallel (printer) ports, extra memory, etc.
The Microsoft Story – Part 1

✦ “Oops!” Digital Reseatch didn’t want to do business with IBM!
  • Unwilling to sign non-disclosure agreement, so don’t hear IBM’s offer
  • Beginning of the end for DRI, beginning of the boom for Microsoft

✦ At Seattle Computer Products:
  • An S-100 board manufacturer, working on 8086 processor board
  • Tim Patterson wrote a simple operating system:
    • Quick-and-Dirty Operating System (QDOS)
    • Low-level interfaces very much like CP/M
    ◦ Probably a prototype of what CP/M-86 was expected to be
  • Microsoft licensed a copy for their work on BASIC for CP/M-86

✦ IBM was talking with Microsoft about BASIC for their new machine
  • Microsoft discovered that IBM’s deal for CP/M-86 wasn’t working
  • Offered to license their (non-existent) OS to IBM, IBM agreed
    • Microsoft retained the right to sell its (non-existent) OS to others

✦ Microsoft bought QDOS from Seattle computing for about $50,000
  • Tim Patterson went to work for MicroSoft working on PC/MS-DOS
  • In 1986, Seattle Computing sued MS for an additional $1 million
The IBM PC

- The Result: The IBM PC
  - First wide-spread use of the term “PC”
    - Term “Personal Computer” was used as early as 1972 for Xerox Alto
  - Intel 8088 processor at 4.77MHz
    - Optional 8087 Math Coprocessor
  - 16KB-640KB memory (384KB ROM and video memory space)
  - 5¼” single-sided 180KB floppies (optional)
  - Microsoft BASIC (in ROM) and PC DOS 1.0 (CP/M-86 was later option)
  - Monochrome, character-based video (24x80)
  - 83-key keyboard, with numeric keypad, 10 function keys, Ctrl, Alt, Esc
  - 5 Expansion slots
  - Some unique IBM games and other simple programs

- Released on August 12, 1981
- Sold about 50,000 in first two days!
  - About 20% of total projected sales
The PC had only 1 unique component

- IBM’s ROM BIOS (Basic Input/Ouput System in Read-Only Memory)
  - This was first copied, then later “reverse-engineered” by other companies
- First completely IBM-compatible was Compaq Portable
  - Also first “luggable” PC
  - Ran MS-DOS
    - Microsoft’s version of PC-DOS
  - Could run all PC applications
- Followed by many others
  - E.g., Dell, HP, eventually component manufacturers
  - IBM lost control of the “PC” market
    - Tried to regain control with PS/2 and MicroChannel, but failed
- Microsoft got a royalty for each machine sold with MS-DOS
  - Both IBM PCs and clones
  - Customized MS-DOS for each manufacturer, bundled with computer
    - Consumer could not buy MS-DOS directly
  - Real beginning of Microsoft’s fortune
The IBM PC

- **Original PC followed by later versions:**
  - **PC/XT (eXtended Technology) - 1983**
    - Almost same architecture as original PC
    - 8088 CPU at 4.77MHz
    - 64KB-640KB RAM
    - One 360KB floppy, plus 10MB hard disk drive
    - 8 expansion slots
    - PC-DOS 2.0 w/ hierarchical directory support
  - **PC/AT (Advanced Technology) – 1984**
    - 80286 CPU at 6 MHz (later 8 Mhz)
    - 256KB-16MB (!) RAM
    - 16-bit ISA bus (also 8-bit)
    - 1.2 MB floppy (5 1/4”), plus 20 MB HDD
    - PC-DOS 3.0
  - **Personal System/2 (PS/2) – 1987**
    - Next-generation family of PCs
    - High-end models had
      - 80386 DX processor at 20 Mhz
      - Micro-channel architecture (MCA) bus
      - First use of 3 1/2” diskette, VGA (!), PS2 keyboard & mouse ports
      - Target for OS/2 (more later...)
      - Popular in businesses, but not for home users
Xerox PARC: SmallTalk and the Alto

- Xerox Palo Alto Research Center, 1970s
  - Also invented Laser Printer
- SmallTalk programming environment
  - Object-oriented programming language
  - Graphical programming environment
  - Overlapping windows, mouse, icons
  - This is what Steve Jobs saw
  - …and saw as the future of computing
- Xerox Alto Workstation
  - Bitmapped display
  - “Portrait” mode for page display (808x606 pixels)
  - Networking, mouse, etc.
  - Ran SmallTalk environment
- Xerox Star released in 1981
  - “Stripped-down” version of the Alto
  - No overlapping windows
  - Sold for $17,000, not a success
Apple: The Lisa and the Macintosh

- Jobs heard about work at Xerox PARC from an employee
  - Convinced Xerox executives that he could market their technology
    - Got their okay to visit PARC in 1979
  - Paid Xerox for use of their ideas
    - $1 Million investment in Apple
      (Bill Gates did neither of these things, just used what wanted)
- Apple had tried to break into business market with Apple III
  - Was not generally successful
  - Both Lisa (next-generation business machine) and Macintosh (low-end, inexpensive system) projects were already underway
- Lisa:
  - Next attempt, based on ideas from PARC
  - Used Motorola 68000 at 5MHz, 1MB RAM
    - very powerful processor for the time
  - Created the GUI interface we use today
  - Released in mid-1983
    - Cost $9,995 (!)
    - Included Lisa Office Suite:
      - LisaWrite, LisaCalc, LisaList, LisaProject, LisaDraw, LisaPaint, LisaTerminal
Apple: The Lisa and the Macintosh

- **Macintosh**
  - Though groundbreaking, Lisa did not sell well
    - Expensive, and somewhat slow
  - Jobs decided to turn the Macintosh product into an inexpensive Lisa
    - Took over “Mac” project, ran it personally
  - Result was the original Macintosh, released in early 1984 at $2,495
    - Also based on 68000 processor, at 8MHz
    - 256KB of RAM (quickly expanded to 512K)
    - 1 built-in floppy drive, 1 optional external floppy
    - Included MacWrite and MacPaint
The Microsoft Story – Part 2

- Microsoft got early versions of Macintosh (hardware & software)
  - Developed applications for Apple (like Excel and Word)
  - Also began developing versions of these programs for PC
    - But needed a graphical interface
    - “Interface Manager” was a layer on top of DOS for running GUI apps
      - Became Windows 1.0
  - Apple threatened to sue Microsoft
    - Microsoft signed agreement not to use Apple technology in Windows 1.0
  - Windows 1.0 released in 1985
    - Ugly, slow, and unpopular
  - Followed by 2.0 in 1987
OS/2:

- Also in 1985, IBM and Microsoft agreed to develop the next generation of Operating System: OS/2
  - Multitasking, virtual memory, GUI
  - Development shared between the two companies
  - Jointly released several versions:
    - 1.0 (text-only) 1987; 1.1 (GUI) in 1988; 1.2 (HPFS) in 1989
- Quotes from Bill Gates and Microsoft:
  - “I believe OS/2 is destined to be the most important operating system, and possibly program, of all time. As the successor to DOS, which has over 10,000,000 systems in use, it creates incredible opportunities for everyone involved with PCs.” – Gates
  - “Microsoft has not changed any of its plans for Windows. It is obvious that we will not include things like threads and preemptive multitasking in Windows. By the time we added that, you would have OS/2.” – Gates
  - “New [Windows 2.11 for 286] interface closely resembles Presentation Manager, preparing you for the wonders of OS/2!” – Windows 2.11 Box
The Microsoft Story – Part 3

- Problems developed:
  - The two companies’ development styles didn’t mesh well
  - A group at MS continued to work on Windows
    - Took ideas and code from OS/2, built Windows 3.0
    - Windows 3.0 released in 1990, became immediate success
    - MS continued to say that they believed OS/2 was the future
  - IBM and Microsoft decided to split responsibility for OS/2 development:
    - IBM would build OS/2 2.0
    - MS would build OS/2 3.0
  - IBM Released OS/2 2.0 in 1992
    - “A better DOS than DOS and a better Windows than Windows”
      - Ran both Windows and DOS programs
    - Microsoft’s new Windows (NT) was very late
  - IBM’s OS/2 Warp out in 1994
    - Very complete 32-bit OS
    - Still supported by IBM for use by some customers
The Microsoft Story – Part 3

Windows History

- In 1988 Microsoft hired Dave Cutler (from DEC) to build OS/2 3.0, a.k.a OS/2 New Technology (NT)
  - Later renamed “Windows NT”
  - A “real” Operating System (unlike earlier version of Windows)
  - Originally supported OS/2, Unix, and Windows APIs
    - Microsoft was unsure which OS architecture would “win”
  - NT is the code base for all current (and probably future) versions of Windows