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Mac OS X

Mac OS X

History & Technology

University of Utah
Student Computing Labs
Macintosh Support
mac@scl.utah.edu

Mac OS X Hist & Tech Overview

- **History**

- **What is Mac OS X?**

- **System Architecture**

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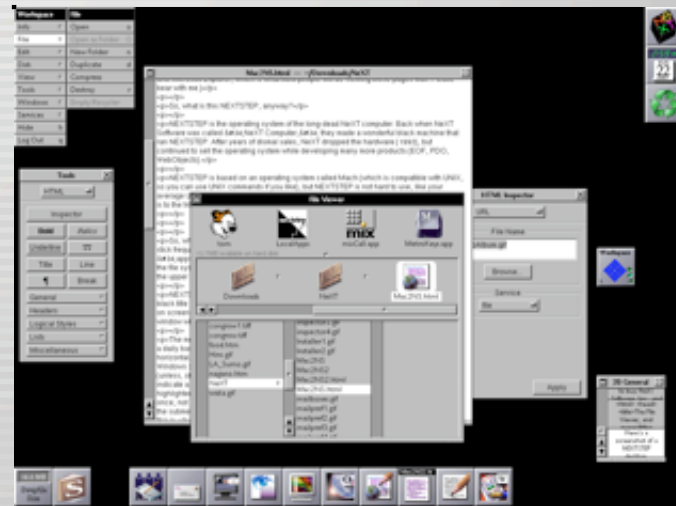STUDENT COMPUTING LABS

History – Apple Computer

- **1976**
  - Steve Wozniak & Steve Jobs
- **1977**
  - Apple II
- **1981**
  - IBM takes over "personal computer" market
- **1984**
- **Macintosh**
  - Steve Jobs
  - System 1.0

History – Next Computer

- **1985**
  - **Steve Jobs left Apple, started NeXT Computer**
  - **"Do everything right"**
    - **Unix**
      - **Stable**
      - **Powerful**
    - **Objective-C**
      - **Easy to program**
    - **Easy to use**
      - **Emphasized GUI**
  - **High-end market only**

History – Apple Computer

* **1990 – 1996**
    * **Apple in serious trouble**
    * **Tried to survive**
        * **Ported Mac OS to Intel**
            * **Never released**
        * **Allowed hardware clones**
            * **Competed against Apple instead of Intel market**
        * **Copland project**
            * **Expensive OS failure**
        * **Discussed Licensing SunOS and purchasing BeOS**
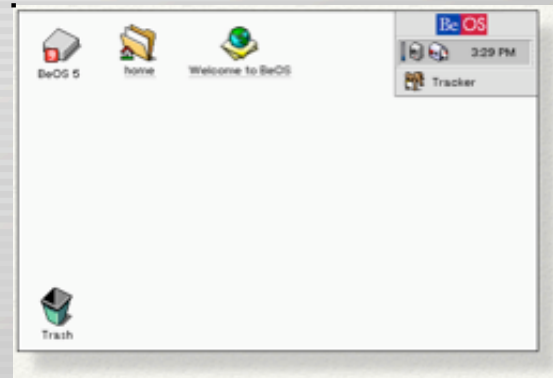
History – Copland

- **The first Mac OS**
  - **System 1.0 released in 1984**
  - **19 years ago**
  -

- **Copland**
  - **The successor to the original Mac OS**
  - **Focused on Four Areas of Enhancement**
    - **Performance, Stability, Portability and Ease of Use**
  - **Supposed to be release mid–1996**
  - **Canceled in late–1996**
    - **Due to costs and development issues**

History – BeOS

- **BeOS**
  - Rumored to be a option for Apple's new OS
  - The BeOS was incredibly fast, stable and scalable, and sports advanced features such as pervasive multithreading and symmetric multiprocessing.
  - But, there were very few applications available for the OS.

History – Apple Computer

* **1996**
  * **Purchases NeXT Computer, hires Steve Jobs**
* **1998**
  * **iMac – future looks good for 1st time in years**
* **1999**
  * **Mac OS X delayed**
    * **Added Java support**
    * **Hardware problems**
    * **Carbon**
    * **Removed PostScript printing and replaced it with PDF**

History – Rhapsody

- **Rhapsody**
  - **Apple purchases NeXT Software in 1996**
    - **NeXT operating system called OpenStep**
    - **WebObjects and other software**
    - **Steve Jobs & NeXT software/hardware engineers**
  - **Combination of OpenStep with Mac UI**
  - **Developed into Mac OS X**
    - **Basically the same OS**
    - **Support for legacy Mac OS**
    - **Simplify porting software**

History – Mac OS X

* **1999**
  * **Mac OS X Server "Rhapsody" released**
    * **Missing a lot of functionality**
    * **Server OS only**
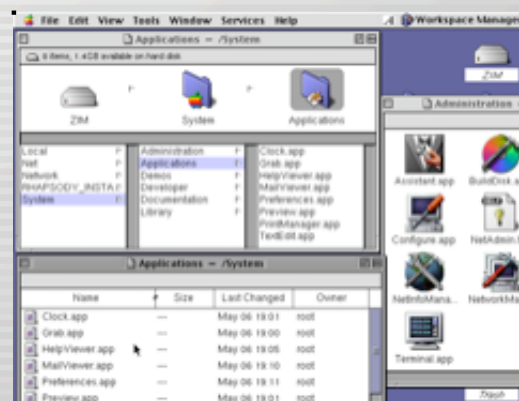
History – Mac OS X Public Beta

- **Mac OS X Public Beta**
  - **Released Sept 9th, 2000**
  - **Unfinished, incomplete preview**
  - **Allowed the public to test the Mac OS X waters**
  - **Cost $29.95**

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History – Mac OS X Public Beta

- **More screen shots…**

History – Mac OS X 10.0

- **Released March 24th, 2001**
- **Complete overhaul of Mac OS**
- **Introduces**
  - **Preemptive Multitasking**
  - **Protected Memory**
  - **Advanced Memory Management**
  - **Symmetrical Multiprocessing (OS-wide)**
  - **Many other features**

History – Mac OS X 10.0 Hype

March 24th – Midnight Madness

History – Mac OS X 10.1

- **Mac OS X 10.1**
  - Release September 29th, 2001
  - First, major revision of Mac OS X
    - Faster and more responsive
    - Launch programs 2 to 3 times faster than previous versions
    - Increased CD-burning capabilities
    - Better tools for DVD-Video disc creation
    - Several Aqua enhancements
      - System Preferences are now arranged by use
      - Dock on the left or right side of the screen

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History – Mac OS X 10.2

- **New in Mac OS X 10.2**
  - **Rendezvous**
    - Zero configuration networking
    - Is open source
    - Companies love it
      - Philips, Canon, Xerox, Sybase and World Book
      - Hewlett–Packard, Epson and Lexmark
  - **Quartz Extreme**
  - **CUPS**
    - Common Unix Printing System

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What is Mac OS X?

* **What is Unix?**
    * **1969 – today (33 years old!)**
    * **Designed with multiple users in mind**
        * **Multitasking**
            * **More than one user can use the computer at the same time and not be aware others are using it**
        * **Multiuser**
            * **Permissions restrict what users can do**
        * **Stable**
            * **One user can't crash it**
    * **"Supercomputer"**
        * **Not "Desktop" or "Personal"**
    * **Responsible for the www**
    * **By programmers for programmers**

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What is Unix?

* **Some other Unix OS names:**

  * **BSD**

  * **SunOS**

  * **Solaris**

  * **IRIX**

  * **UnixWare**

  * **Linux**

  * **Mach**

* **u.cc.utah.edu uses SunOS 5.6:**

  Last login: Thu Sep 26 2002 06:55:10 from x.x.x.x

  Sun Microsystems Inc.   SunOS 5.6   Generic August 1997

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What is Unix?

* **Console**
  * **Command–line**
  * **applications**

*

* **Xwindows, X11**
  * **GUI applications**

History of Unix 1969–1977

History of Unix 1978–1983

History of Unix 1984–1989

NeXTSTEP born

BSD

Mach
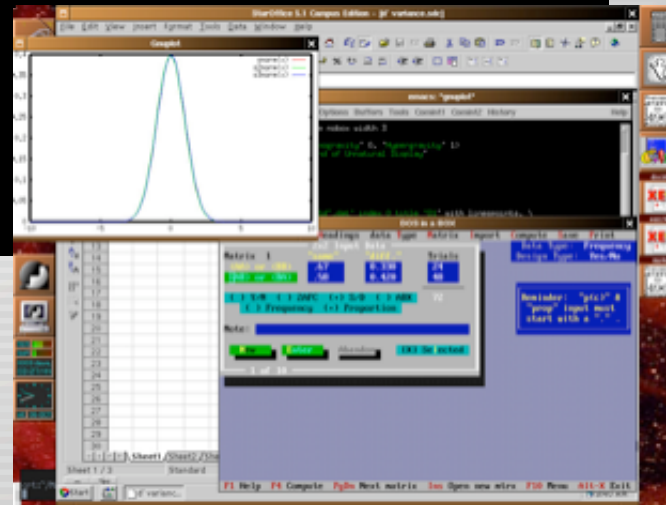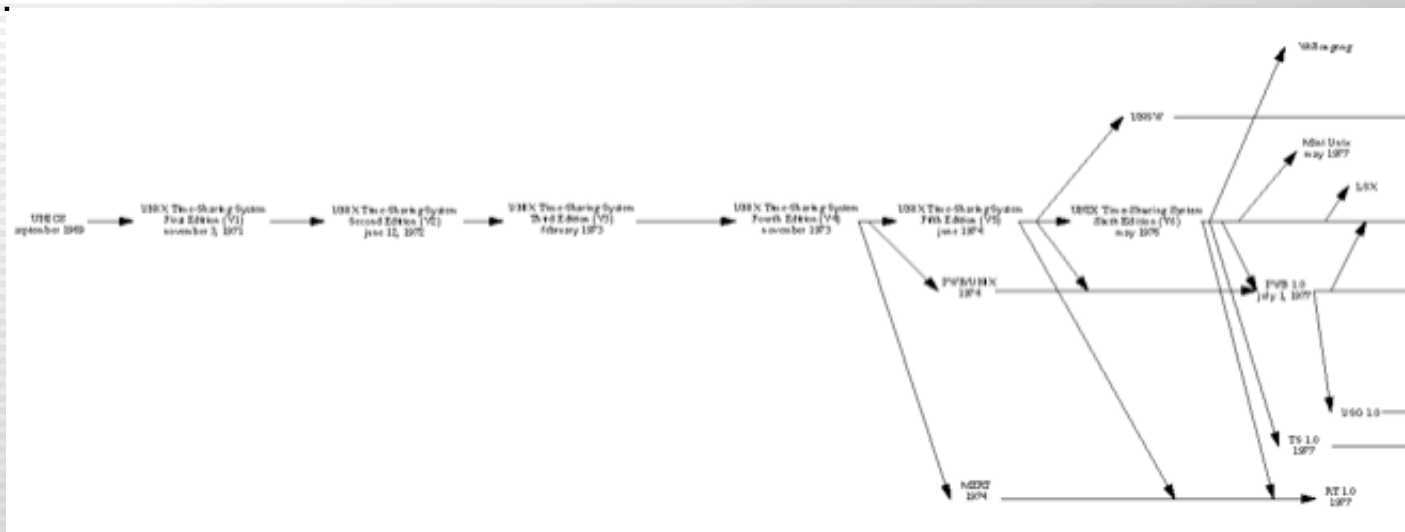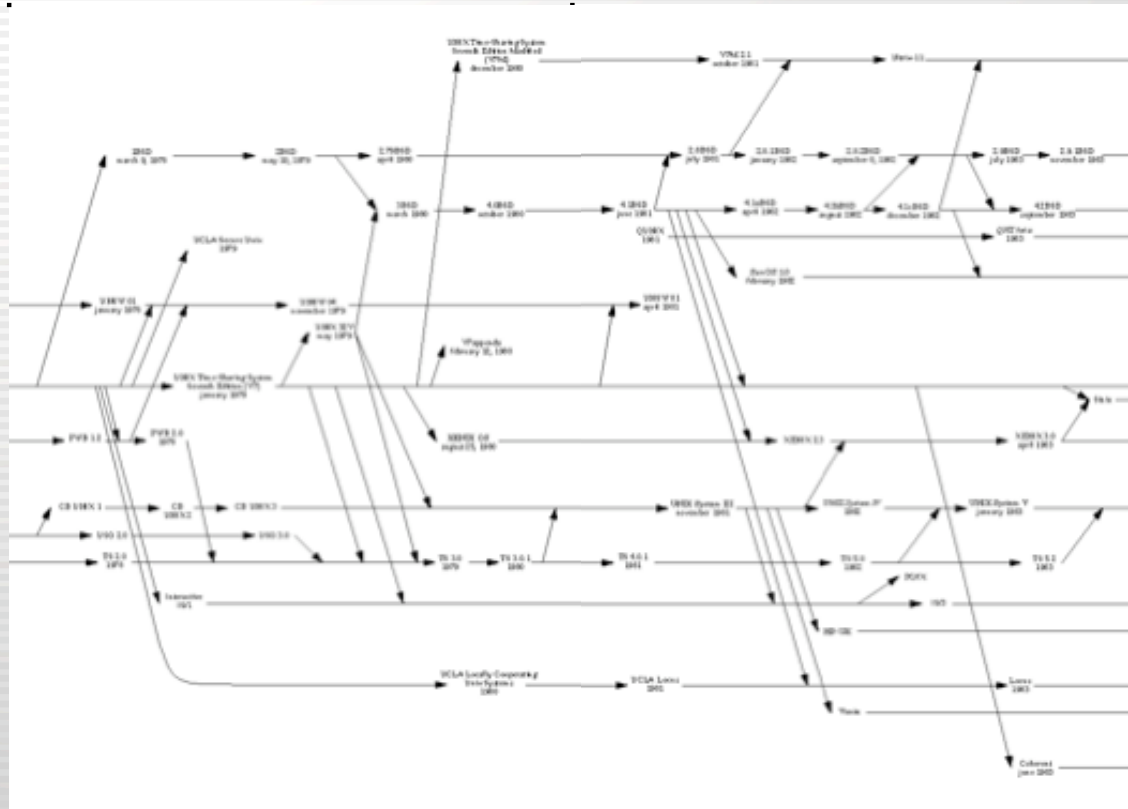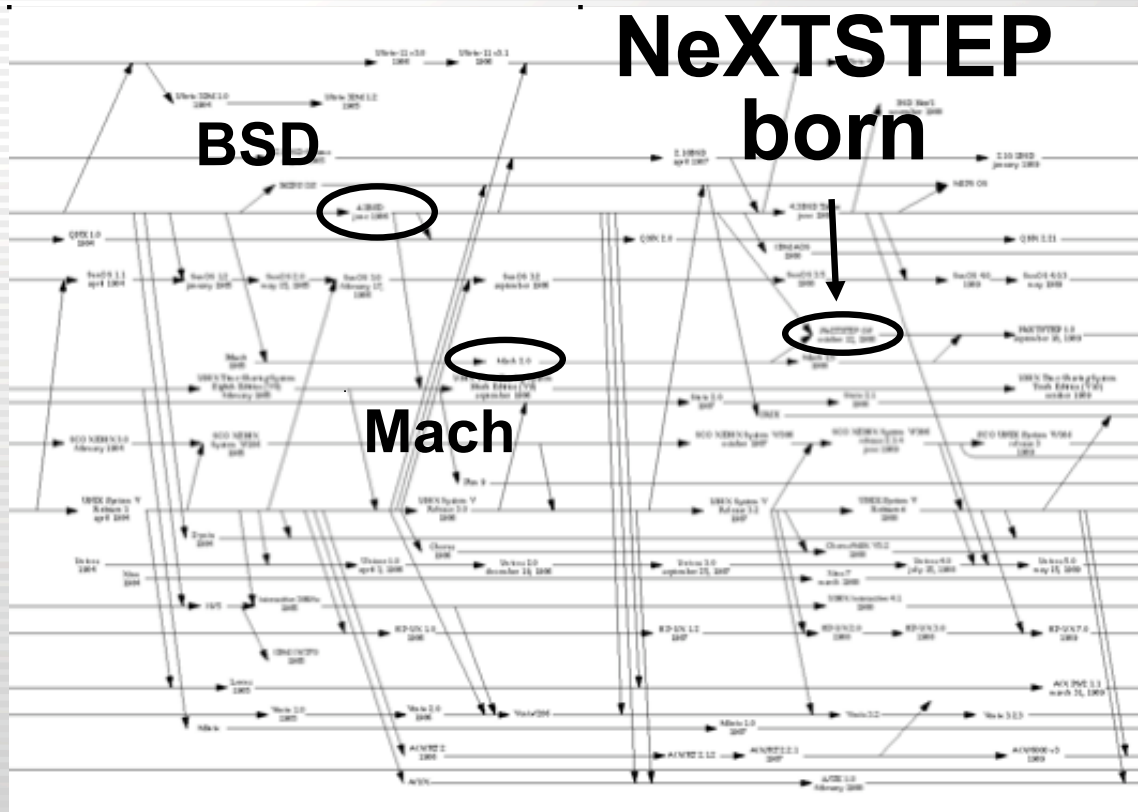
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History of Unix 1990–1994

History of Unix 1995–1998

Rhapsody born

History of Unix 1999–2000

Darwin born

Mac OS X born

Mac OS X Server born

History of Unix 2001–2002

Darwin 1.4.1

Mac OS X 10.2.1
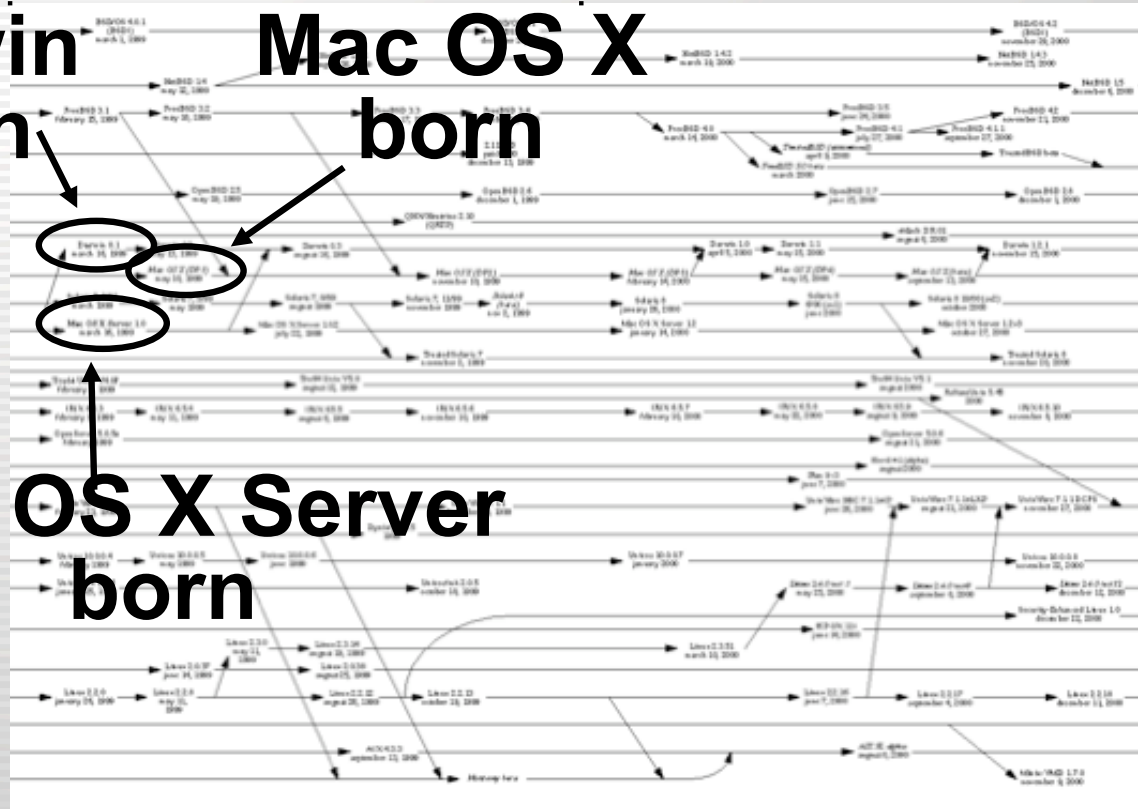
Mac OS X
Server 10.2.1

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What is Mac OS X?

* **Complete overhaul of Mac OS**
* **Some things Mac OS 9 didn't have**
  * **Preemptive Multitasking**
  * **Protected Memory**
  * **Advanced Memory Management**
  * **Symmetrical Multiprocessing (OS–wide)**
  * **Built in advanced graphics**
  * **Easy to program**
  * **Command line**

System Architecture

- **The Mac OS X layers**

AQUA
APPLICATION SUPPORT
GRAPHICS & IMAGING
DARWIN
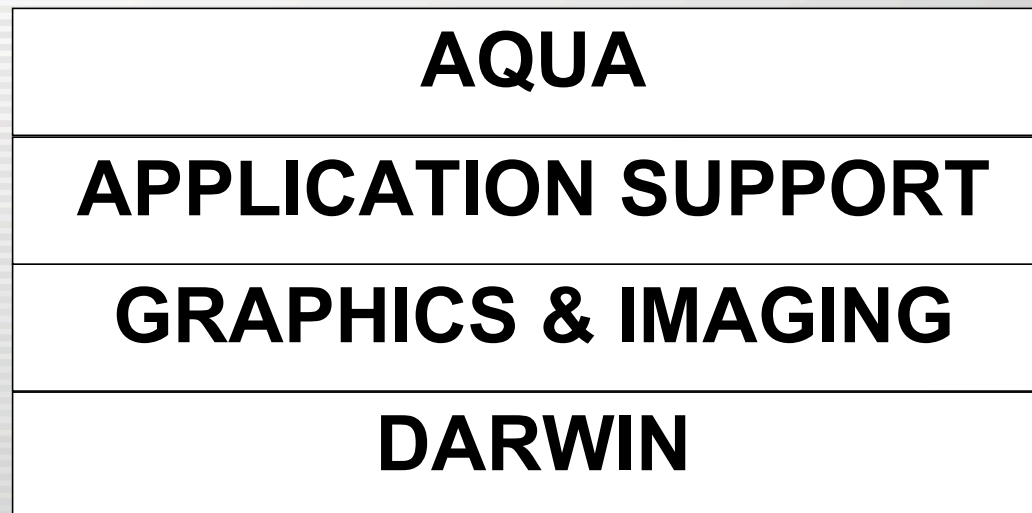
Darwin

- **OS Core Foundation**
  - Industrial–strength
  - UNIX–based
- **Open Source**
  - Allows developers to create & customize
  - Collaborate with Apple Engineers
  - Faster and more reliable OS
- **Notable components**
  - Mach 3.0
  - BSD 4.4

UNIX BASED

Come in IT'S OPEN

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```
Last login: Thu Sep 26 17:00:38 on ttyp1
Welcome to Darwin!
[msmac-9:~] james%
```

Darwin – Mach

- **Mach 3.0**
  - UNIX technology
  - Developed at Carnegie–Mellon University
  - Robust "Open Source" OS
  - Provides most critical functions of OS
    - Memory Management
    - Protected Memory
    - Preemptive Multitasking
    - Advanced Virtual Memory
    - Real–Time Support

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Memory Management

- **Mac OS X handles program memory**
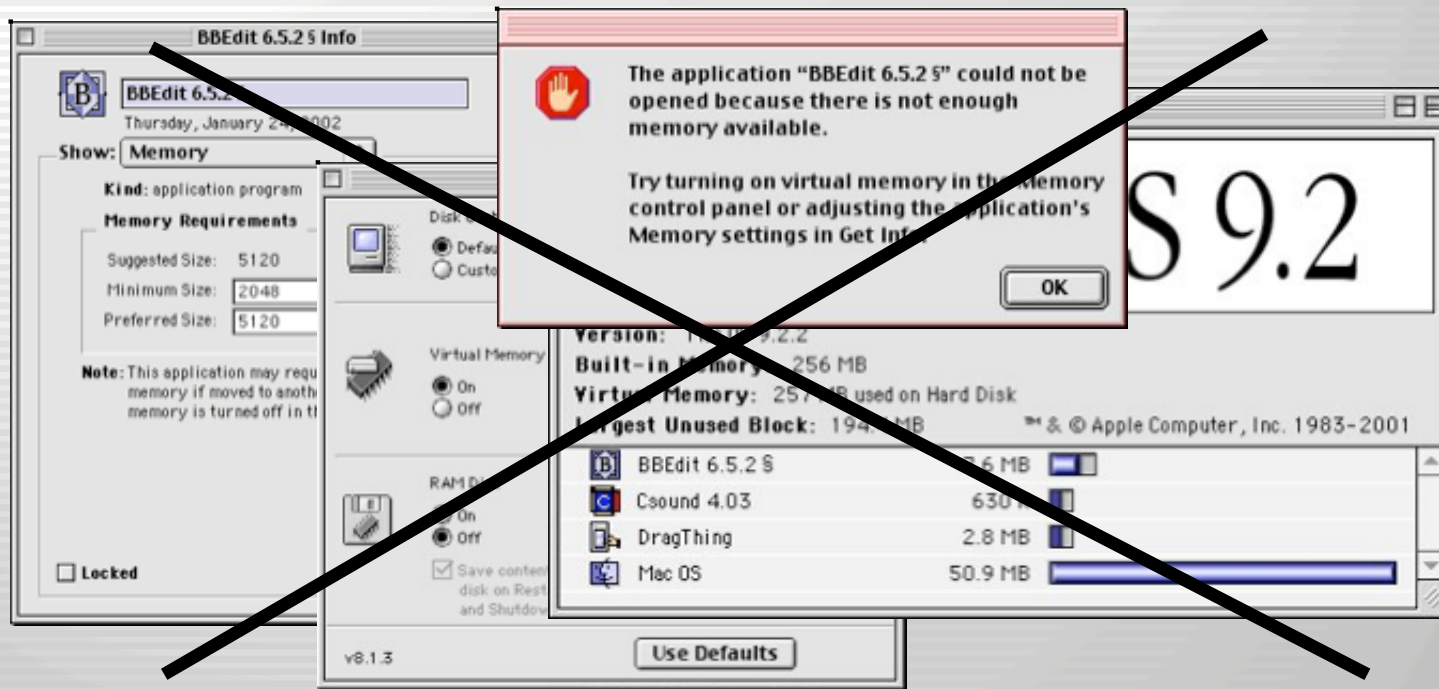
Protected Memory

- **Protects OS and Applications**
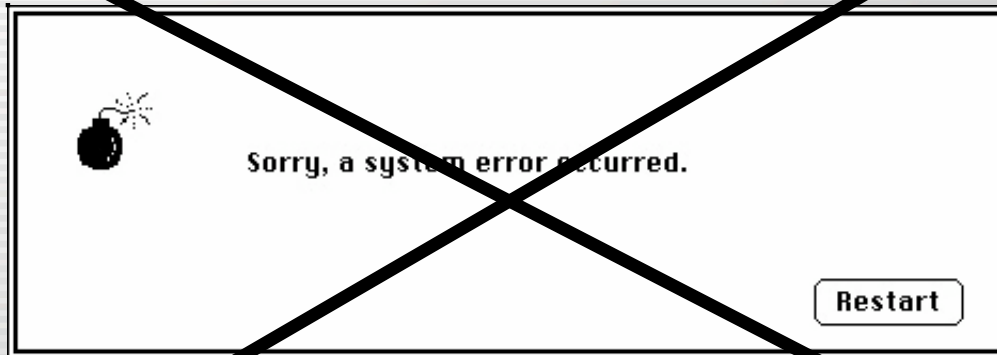
Demonstration – Mach

- **Protected Memory**
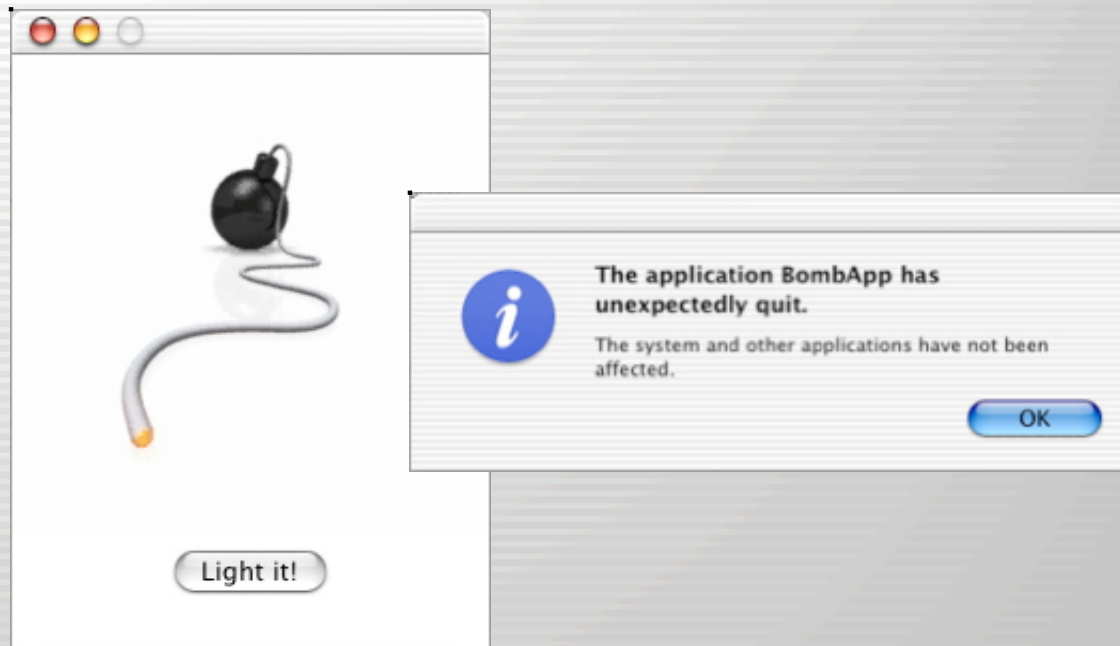
Preemptive Multitasking

- **No more application freezing the system**

-

-

-
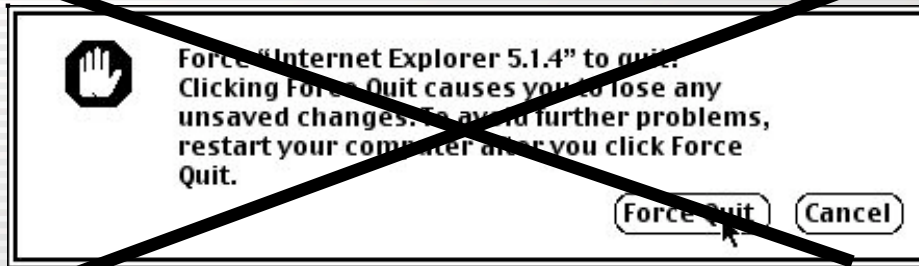
- **No more mouse clicks freezing the system**

- **Use multiple applications at the same time**

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Demonstration – Mach

- **Preemptive Multitasking**
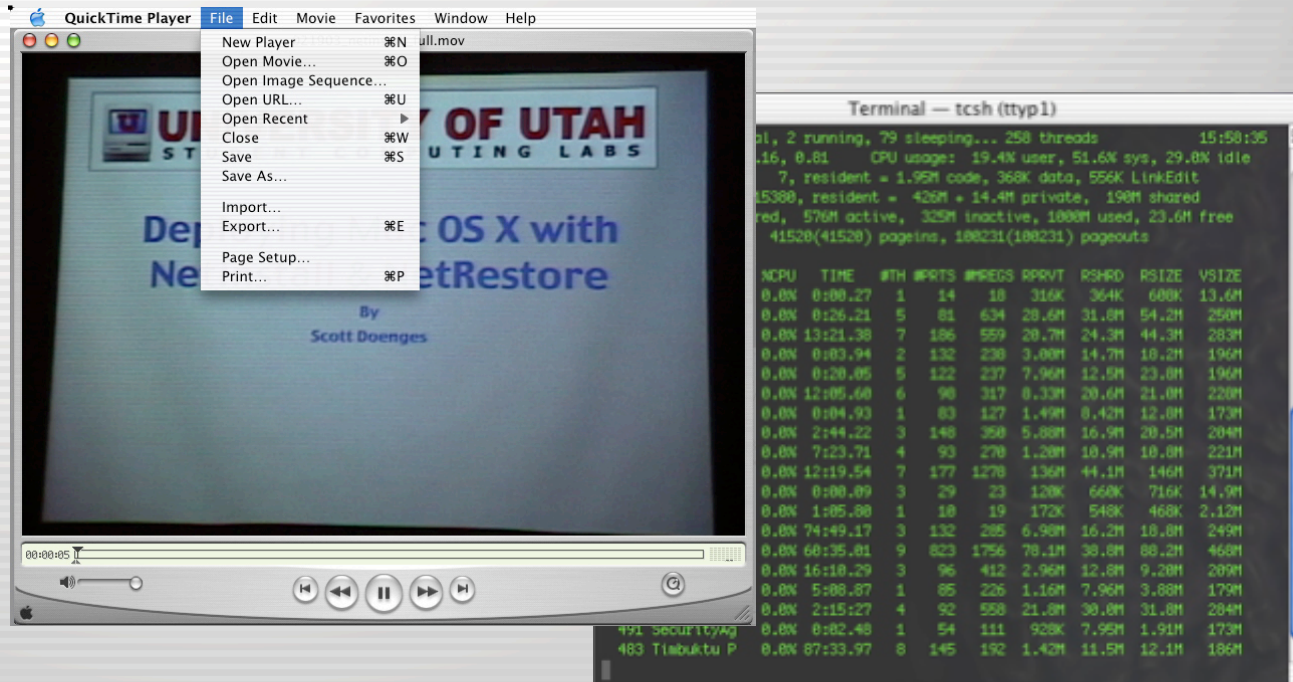
Real–Time Support

- ## Audio or video improved

  - Guarantees low latency access to processor for time–sensitive application

    - iMovie
    - iTunes
    - Quicktime Player
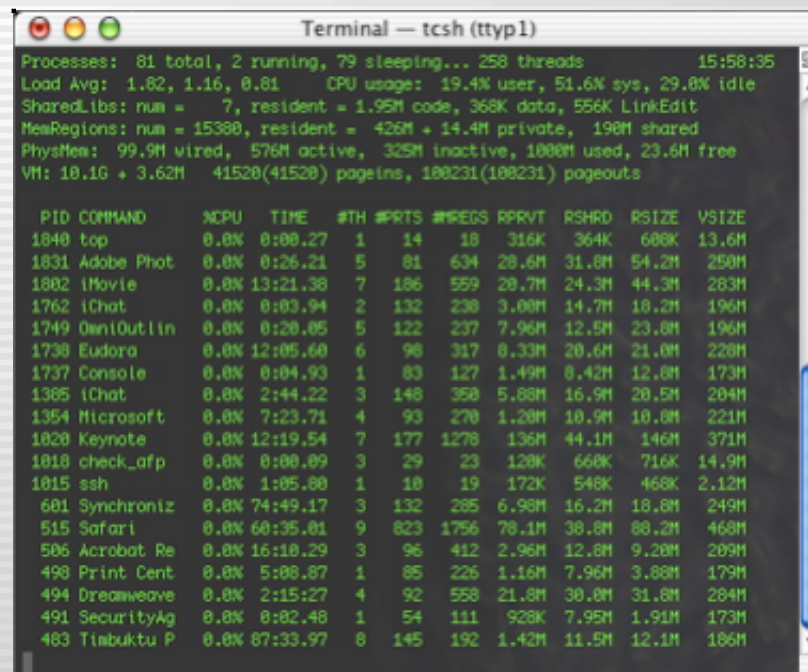
- **BSD 4.4**
  - **Berkeley Software Distribution**
  - **Developed at University of California at Berkeley**
  - **Darwin incorporates elements of BSD**
  - **Support for "shell"environment**
  - **Also provides...**
    - **File systems**
    - **Networking**
    - **Miscellaneous Programming Interfaces**

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Demonstration – BSD

- **Terminal**

Graphics & Imaging

- **The second layer we will discuss is...**

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DARWIN

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Graphics & Imaging

- **Combination of three graphics technologies**
  - Quartz
  - OpenGL
  - QuickTime

- **Gives you support for things like...**
  - Full screen movies
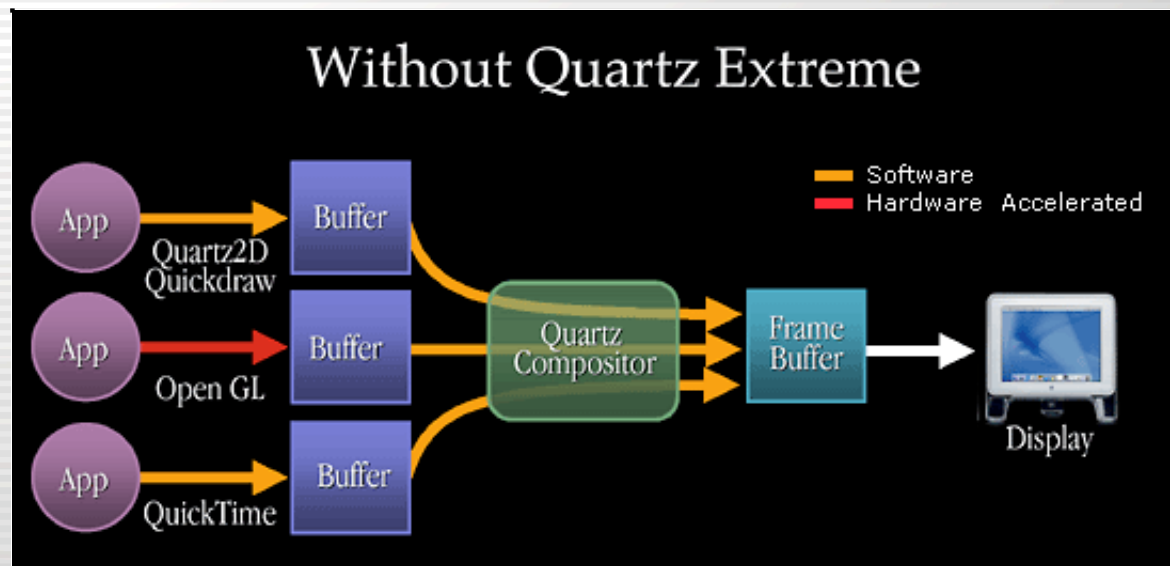 - Monitors with huge & millions of colors
  - 3D Games
  - Elements of User Interface

Graphics & Imaging – Quartz

- **Quartz**
  - **Two–Dimensional graphics/images**
  - **Portable Document Format (PDF) Support**
    - **On–the–fly rendering**
    - **Anti–aliasing**
  - **Windowing System**
    - **Aqua uses the Quartz Engine**
      - **Translucent controls & Menus**
      - **Drop Shadows**
    - Quartz Extreme
      - **16MB of VRAM and AGP2x bus**
      - **Can process massive amounts of graphic data real time**

Quartz Extreme

Quartz Extreme

Graphics & Imaging – OpenGL

- **OpenGL**
  - **Delivers high-end 2D & 3D graphics**
  - **Open Source Industry Standard**
  - **Replaces QuickDraw 3D (from older Mac OS)**
  - **Specifically designed for...**
    - **Games, Animation, CAD/CAM, Medial Imaging, etc.**
  - **Set of imaging functions**
    - **Texture Mapping,**
    - **Alpha Blending**
    - **Anti-aliasing**

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Demonstration – OpenGL

- **Quake III – Team Arena**

Demonstration – OpenGL

- **Maya from Alias | Wavefront**

Maya on Mac OS X
Macworld 2001
San Francisco

Copyright Alias|Wavefront

Graphics & Imaging – QuickTime

- **QuickTime**
  - **Comes with QuickTime 6.1**
  - **Multimedia Technology**
    - Video
    - Sound
    - Animation
    - Graphics & Text
    - 360-Degree Virtual Reality
    - Support most major file formats
      - PICT, BMP, GIF, JPEF, TIFF, and PNG
    - Support most major video formats
      - AVI, AVR, DV, M-JPEG, MPEG-1
    - For web it supports..
      - HTTP and RTP and RTSP (Live Broadcasts)

Demonstration – QuickTime

- **Finder Inline Previews**
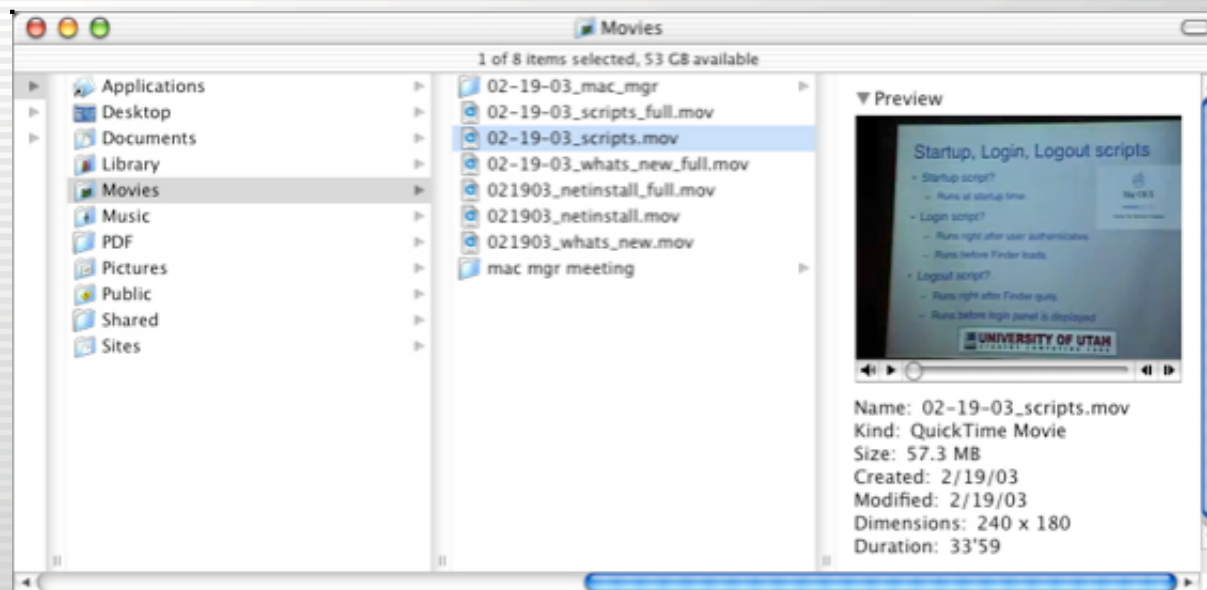
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Application Support

- **The third layer we will discuss is...**

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APPLICATION SUPPORT
GRAPHICS & IMAGING
DARWIN

Application Support

- **Mac OS X multiple application environments**
  - **6 environments**
    - **Classic**
    - **Carbon**
    - **Cocoa**
    - **Java**
    - **BSD**
    - **X11**
    - **Support for older Mac OS apps (i.e. Classic)**
    - **Support/ease porting older apps (i.e.Carbon)**
    - **Provide modern environment for new apps (i.e. Cocoa)**
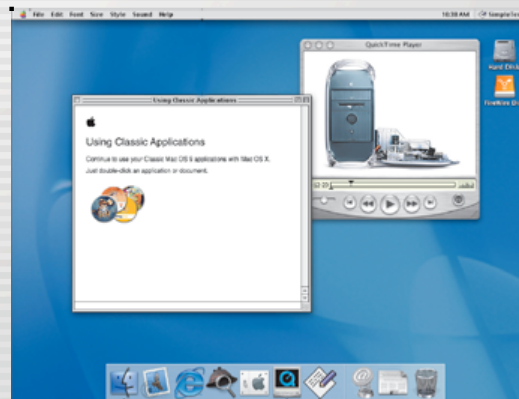
Application Support – Classic

- **Full version of Mac OS 9.2**
  - Runs in a protected memory space
- **Supports Mac OS 9.2 Compatible Applications**
  - PowerPC–native applications
  - Older 68K applications
- **Supports launching Mac OS 9.2 as process**
  - If "Classic" application crashes or hangs, it will only effect "Classic" environment.

Classic Environment starting from "Classic Disk"

Stop
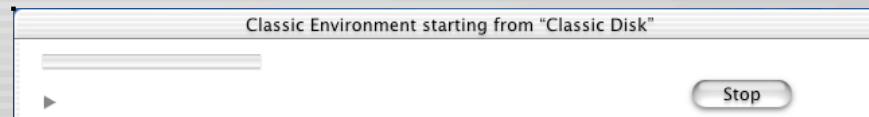
Demonstration – Classic

- **MacDraw 1.9.5 (16 years old)**

MacDraw – Version 1.9.5

by Mark Cutter, Ben Halpern and
Joel Spiegel

[OK]

© Apple Computer, Inc. 1985, 1987

All rights reserved.

Active Docume...

Number of objects: 3

Percent of Memory Used: 0

Untitled
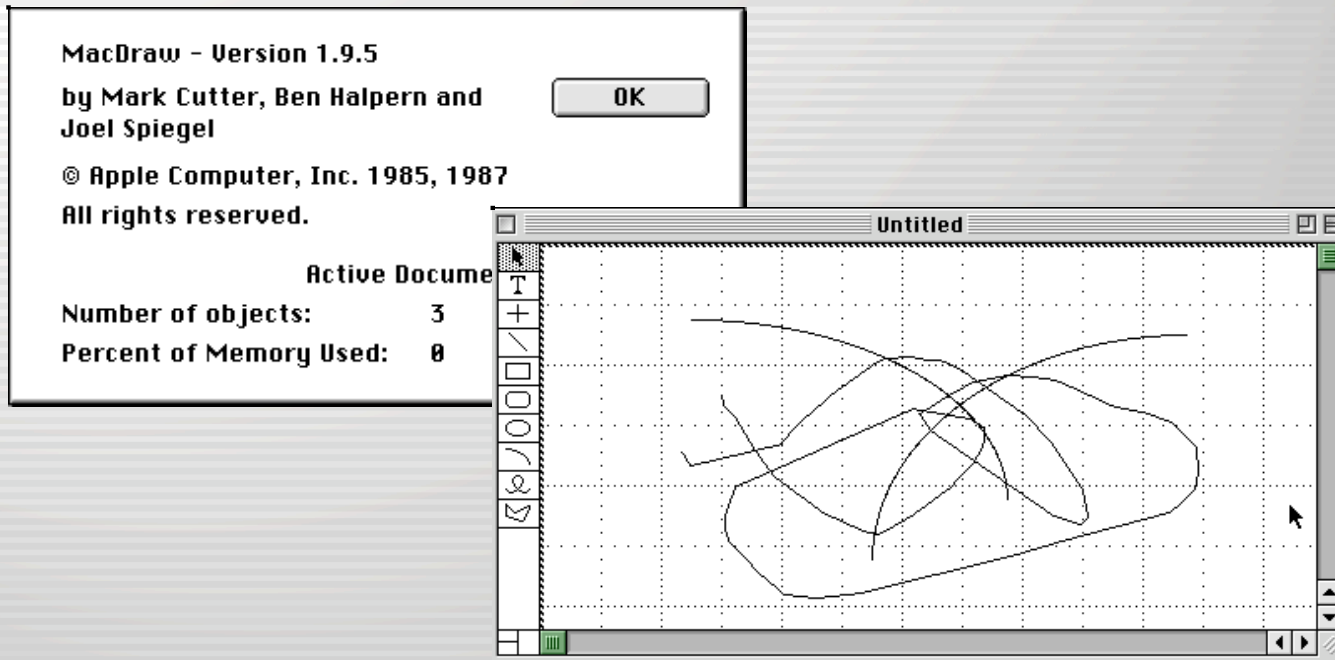
Application Support – Carbon

- **Backwards compatible programming**
  - **API's from Mac OS 9 "ported" to Mac OS X**
    - **Programmer just has to recompile the program using Carbon**
  - **Native Mac OS 8.6 – 9.2 with CarbonLib system extension**
  - **Native Mac OS X**
    - **Support modern features of Mac OS X**
      - **Protected Memory**
      - **Preemptive Multitasking**
      - **Interface features of Aqua**
  - **Helps developers port older "classic" application with relatively small modification in code**

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Application Support – Carbon

- **A pragmatic approach...**

Minimal programming effort

Current application

Carbon application

Mac OS 8

Mac OS X
- Preemptive multitasking
- Memory protection
- Dynamic resource allocation
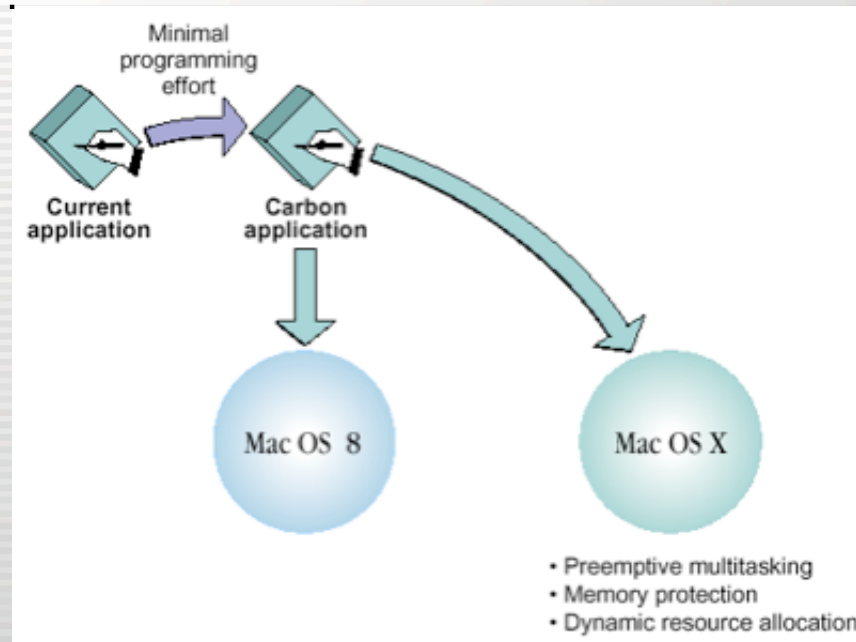
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Carbon Examples – Office X

Carbon Examples – Photoshop
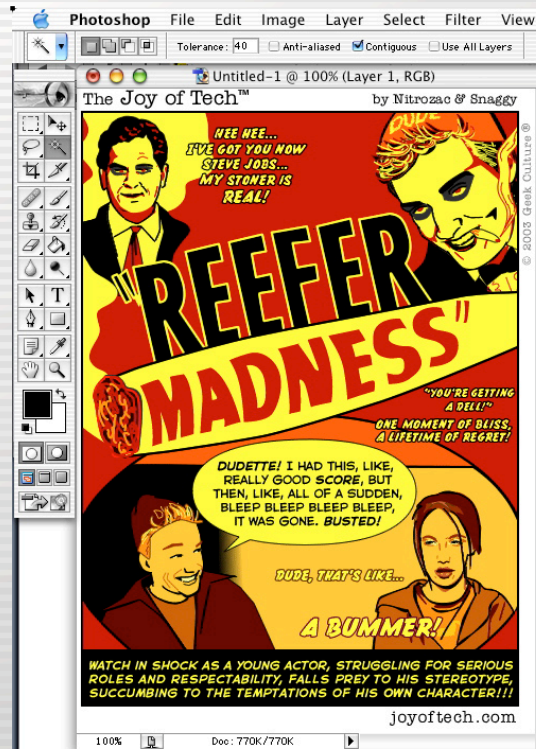
Application Support – Cocoa

- **Object–oriented framework**
- **Provides development tools and services that allow applications to interact with each other to take advantage of variety of advanced libraries.**
- **Cocoa applications look the same as Carbon applications to the end users.**
- **Basically, Cocoa is an environment that allows developers easily build applications that are fast, efficient and advanced.**

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Cocoa Examples – Terminal

Cocoa Examples – Watson
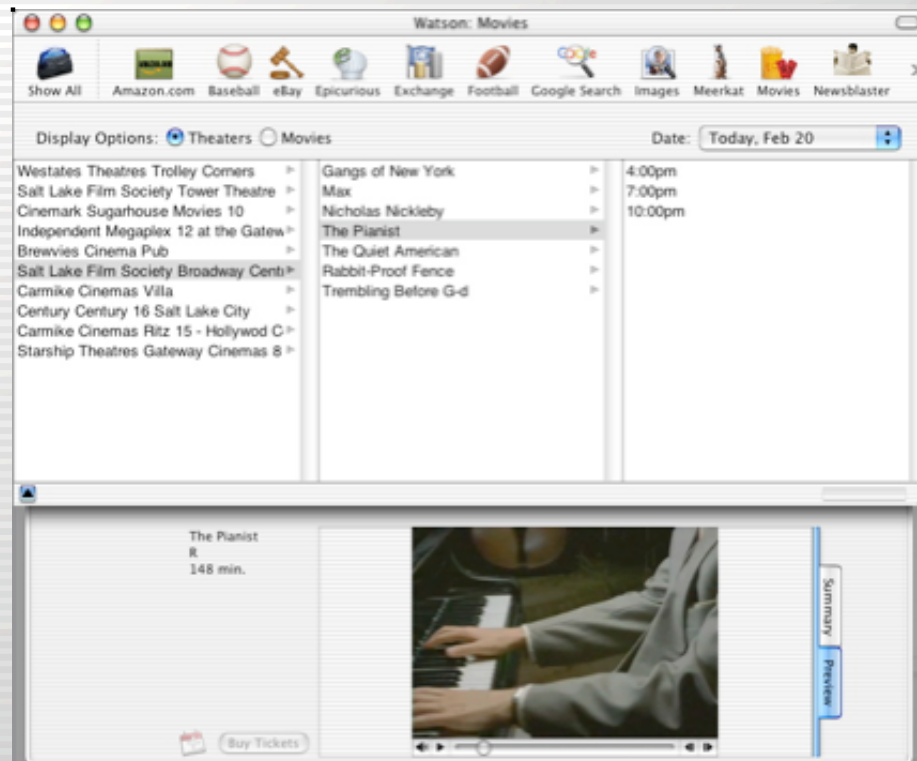
Application Support – Java

- **A highly–optimized, tightly integrated implementation of Java**

- **Java environment supports 100%**

- **Java 2 applications and applets.**

- **All Java applications use Aqua (new user interface)**

- **Native preemptive multitasking threads Includes Applet Launcher to let you run**

  - **Java Applets**

  - **Local or on internet**

  - **Do not need a browser**

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Java Examples – Moneydance

Application Support – X11

- **X11 is an implementation of X Window System**
  - **Makes it possible to run X11–based applications in Mac OS X**
  - **Based on open source XFree86**
  - **Currently available as beta preview**
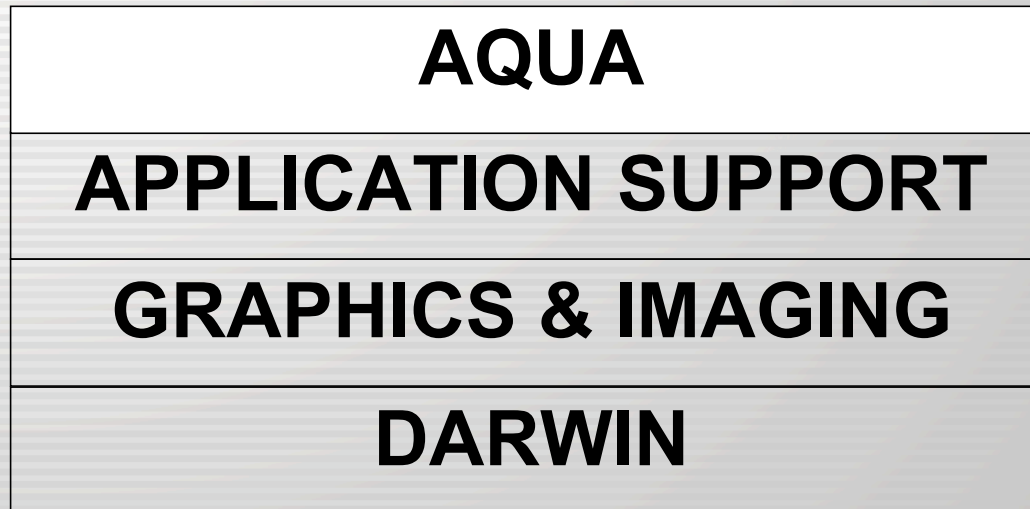 - **Rumored to be fully released with Mac OS X 10.3**

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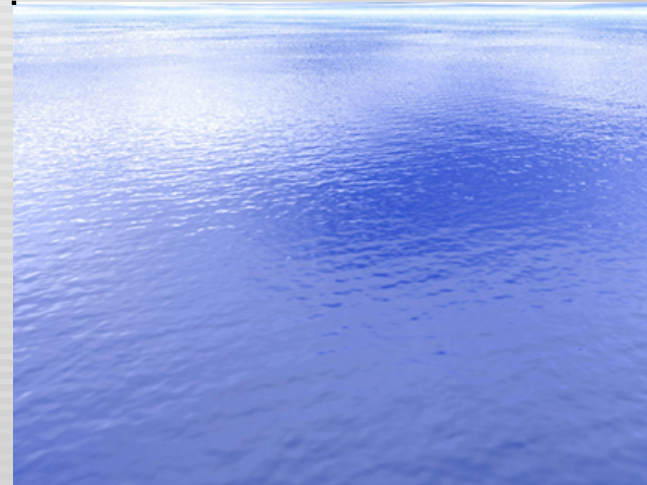**STUDENT COMPUTING LABS**

Application Support – X11

Aqua

- **The last layer is...**

| |
|---|
| **AQUA** |
| **APPLICATION SUPPORT** |
| **GRAPHICS & IMAGING** |
| **DARWIN** |

Aqua – User Interface

* **Apple's goal was to create a User Interface**
  * **Easier to use**
  * **More appealing to users**
  *

* **Aqua**
  * **Properties of water**
    * **Translucence**
    * **Drop shadows**
    * **Animations**
    * **Etc.**

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Aqua

- **The Mac OS X new look and feel**
  - Makes extensive use of animation and rendering.
  - Semi-transparent elements
  - Drop shadows 128 by 128 pixel icons (Photographic)
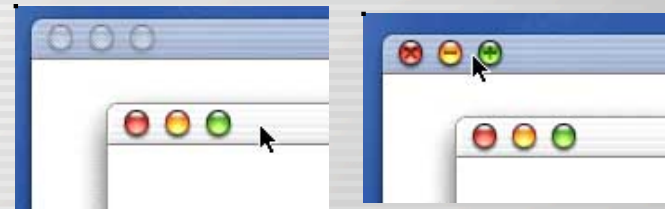 - And much more...
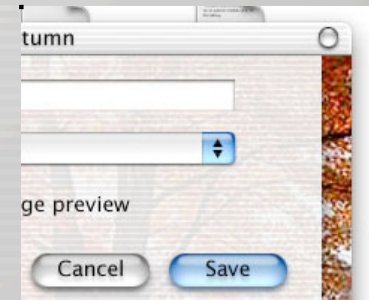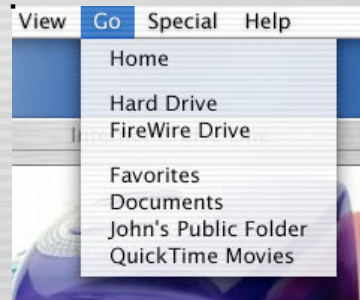
Aqua – Windows

- **Windows**
  - **Controls**
    - **Close (X)**
      Click to close window
    - **Minimize(–)**
      Which put it in the Dock
    - **Zoom (+)**
      Click to enlarge or reduce
    - **Resemble traffic lights**
      - **Red to close the window (stop),**
      - **Yellow to minimize the window (slow)**
      - **Green to zoom the window (go)**

Dialogs

* **Dialogs**

  * **Sheets**
    A new type of dialog that is "attached" to a particular window.

  *

  *

  *

  *

  *

Demonstration – Aqua

- **Transperency, effects, etc.**

Mac OS X Short Courses

- **Mac OS X Basics**
  Friday, March 7th at 10:45 AM
  Marriott Library Multimedia Center – Room 1745

- **Mac OS X Intermediate**
  Monday, March 24th at 10:45 AM
  Marriott Library Multimedia Center – Room 1745

-

- **Mac OS X Advanced**
  Thursday – April 3rd at 10:45 AM
  Marriott Library Multimedia Center – Room 1745

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Questions & Answers

?

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Contact Information

- **Web Site**
  - www.macos.utah.edu

- **Email**
  - mac@scl.utah.edu

- **Address**
  - Marriott Library Multimedia Center
  - Room 1705