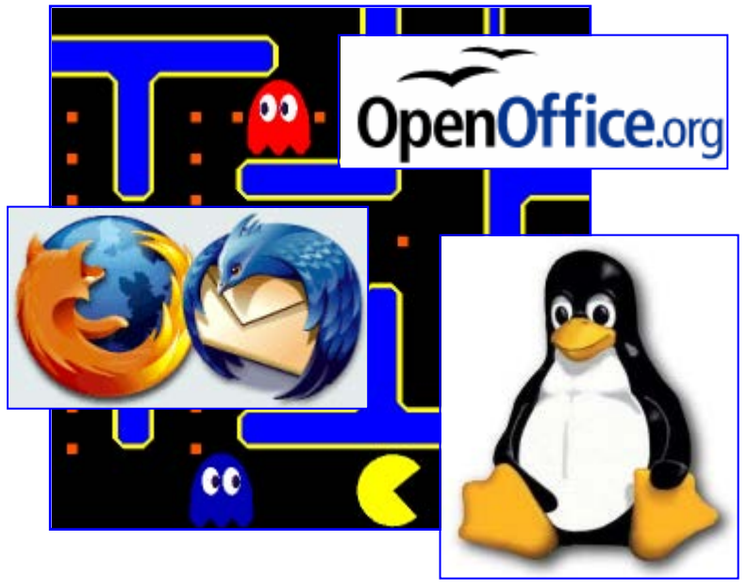
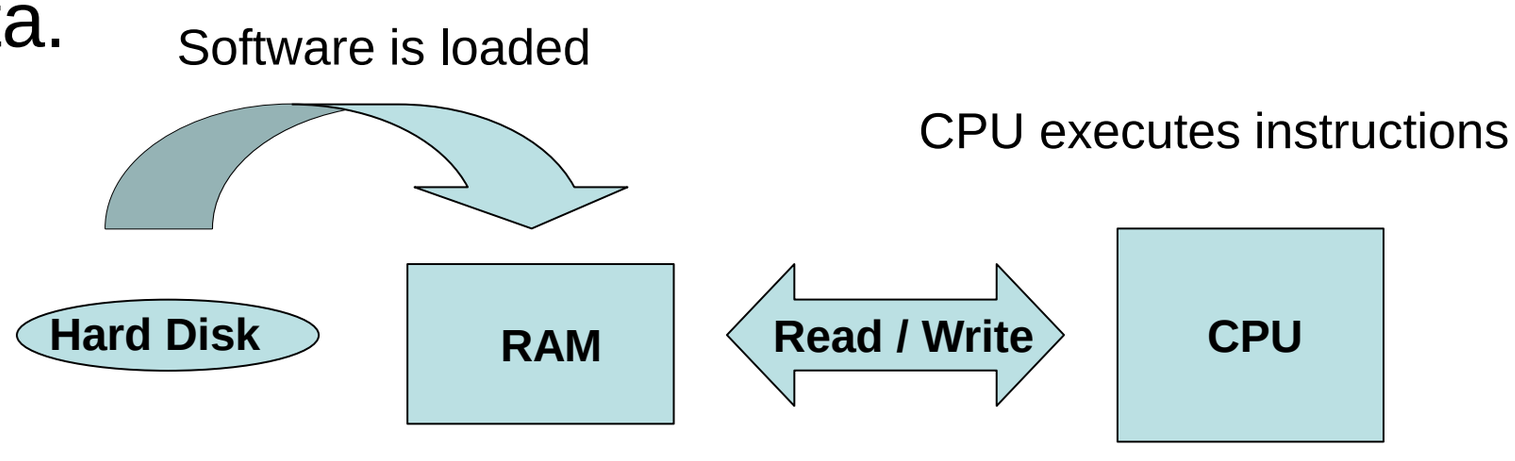


COMPSCI 111 / 111G
Software

What is software?

•Instructions and other data for the computer. Also known as “programs” or “applications”.

- Loaded from Secondary Storage into Primary Memory.
- Runs (executes) from RAM.
- 1936 Turing’s universal machine. Programs are data.



File Formats

- All data is stored as (binary) numbers
- Data is organised in files (named collections of related data)
- Method of encoding depends on the software, called the file format

- File Formats
- Defines the way that the numbers are interpreted
- E.g. for a graphics file:

“first the width, then the height, then all the pixel colour values line by line”

- File Extensions
- A dot followed by letters at the end of a file name
- Most operating systems use the file extension to determine the file format

Graphics	**.jpg , .png , .gif**	**Video**	**.mpg , .avi , .divx**
Sound	**.mp3 , .wma , .ogg**	**Programs**	**.exe , .com , .bat**
Text	**.txt , .doc**	**Program Code**	**.c , .java , .cs , .py**

Standards

- Open Standard
  - Published openly
  - Free to use
  - Maintained by a "non-profit" organisation
  - E.g. HTML, PDF
- Proprietary Standard
  - Intellectual property of an entity (individual / company)
  - Use of the standard is usually through a license
  - E.g. Adobe Flash, RealPlayer,
    some digital rights management (DRM) technologies
  - Risk for users: vendor lock-in

.pdf files

- PDF stands for ``portable document format”. Proprietary standard of Adobe Corp. until 2008. Now open standard.
- Open a .pdf file using a text viewer, it starts like this:

- %PDF-1.4
- %–‘≈ÿ
- 5 0 obj <<
- /Length 1012
- /Filter /FlateDecode
- >>
- stream
- x⁄≠WKo7æÎW÷P—æŸKÅ∫iÍ†nSXAI[âð—jÌ
- é¸}áèU$ÎQ8õÉ¿Á|‰Ã˜Õ,≈»a‰ıËóÈËÍ7·à•L;C¶˜ƒ* ¬*êÈúº/Æˇ∫}{w}3ûpc

Copyright and Patents

- Software subject to normal legal copyright
  - Copyright = “right to copy”
  - Creator retains the rights to their creations (not the ideas behind them)
  - Usually lasts for the life of the author plus 50 or 70 years
  - Best applicable to: music, visual art, literature, programs
- Software Patents
  - Retain control over ideas / inventions
  - Usually enables to exclusively commercialise an idea for 20 years (can be important to amortise research cost)
  - US recognises software patents, Europe does not (arguable)
  - Hotly debated issue

Proprietary Software

- Software that has restrictions on using and copying
  - All rights are retained by the owner.
  - Owner enforces these restrictions
- Can be:
  - Commercial
  - Freeware
  - Shareware
  - Semi-free (for non-profit)

Microsoft Corporation, 1978

Freeware

- Software is distributed free of charge
  - No agreement about distribution, no access to source code
- Types of Freeware
  - Loss Leader (given away with loss as sales promotion)
  - Adware - make money via ads
  - Partially working cut-down versions - see “Crippleware”
- Abandonware
  - Software which is no longer supported, and yet still available
  - Some people believe there is nothing morally wrong with using “abandoned” software
  - Not legally recognised
- E.g. MS Internet Explorer, Apple iTunes, Adobe Reader, Skype

Shareware

- Idea: try before you buy
- Trial period offered
  - Purchase the license and upgrade to commercial version
- **Nagware**
  - Reminder messages to license software
- **Crippleware**
  - Software that lacks important features until licensed
  - E.g. Word processor that cannot save or print , such as WinZip, TextPad

Open Source / Free Software

- Open-Source Software
  - Source code is text that shows how software was programmed
  - open-source: anybody can read the source code, E.g. Linux OS
  - WordPress (used for Blogs) http://wordpress.org/about/

- Free Software (“free speech”, not as in “free beer”)
  - Freedom to use and study the work (it is open-source)
  - Freedom to distribute derivative works

"I would love to change the world, but they won't give me the source code"

- Copyright prevents these acts
  - Explicit permission is required
  - Free software license gives permission

- Richard Stallman
  - Free Software Foundation (FSF)
  - GNU General Public License (GPL)

https://stallman.org/

Kinds of Software

- Application Software
  - Helps the user to complete a task
  - E.g. word processor, spreadsheet, database, web browser, games
- System Software
  - Needed to run the computer system
  - **Operating System** (OS):
    manages all the hardware resources for application programs
    (CPU, RAM, Hard Drive, …)
  - **Device drivers**:
    programs that help an OS to control a piece of hardware
  - **Diagnostic and maintenance tools**:
    analysis, trouble shooting and optimisation
    (e.g. checkdisk, defrag)

Operating System

- Low-level software that allows you to use the system
  - Default interface when no application is running
  - Manages the system: CPU, memory, HD, …
  - Does all the direct interaction with the hardware (using drivers)

- Examples:
  - Microsoft Windows:
    - most used, but many complaints
  - Macintosh OS:
    - more expensive, less software & hardware, more focus on usability
  - Unix, Linux:
    - more technical. Linux runs on many supercomputers
  - iOS and Android:
    - mobile device operating systems

"Windows - so intuitive
you only need a 678-page manual."

"Unix is user-friendly.
It's just very selective about
who its friends are."

http://en.wikipedia.org/wiki/Operating_system

Command Line Interface (CLI)

- Text-based
  - Powerful way to combine different commands
  - Hard to use: textual commands look weird if you don’t know them
  - Good for experts that use it often

http://en.wikipedia.org/wiki/Command_line_interface

Sample of CLI dialog

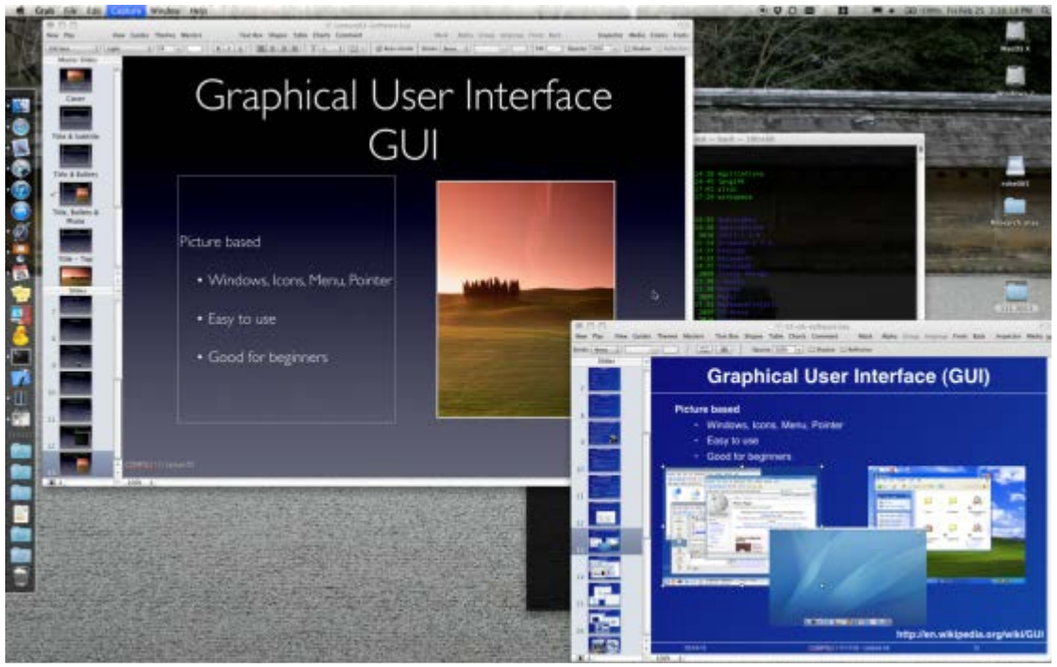
```
Digital UNIX (ruru.cs.auckland.ac.nz) (ttyq8)

login: andrew-l
Password:
Last login: Wed Feb 17 17:16:41 from andrew-l-pc.cs.a

36ruru % ls -l
total 5338
drwx------   6 andrew-l staff        8192 Feb 29  1996 BUPscripts
-rw-r--r--   1 andrew-l staff      120320 Feb 24 16:14 Hardware and Software.doc
drwx------   2 andrew-l staff        8192 Jun  9  1997 bin
-rw-------   1 andrew-l staff          78 Nov 17 14:06 echo
drwx------  13 andrew-l staff        8192 Mar  1 11:38 mac
-rw-------   1 andrew-l staff      183566 Jan 11 16:08 netman.ps
-rw-------   1 andrew-l staff     1820608 Jan 11 16:00 phdthesis.ps
drwx------   2 andrew-l staff        8192 Aug 15  1998 pictures
drwx------   2 andrew-l staff        8192 Aug 15  1998 public.htm
drwxrwx---  17 andrew-l gradG        8192 Mar  4 18:31 public.html
drwx------   2 andrew-l staff        8192 Feb 27  1996 test
-rw-------   1 andrew-l staff     3252419 Jan 11 16:08 trainhw.ps
drwxrwxrwx   2 andrew-l staff        8192 Dec 17  1997 turf
-rw-r--r--   1 andrew-l staff         242 Jun 11  1997 update_char
37ruru %
```

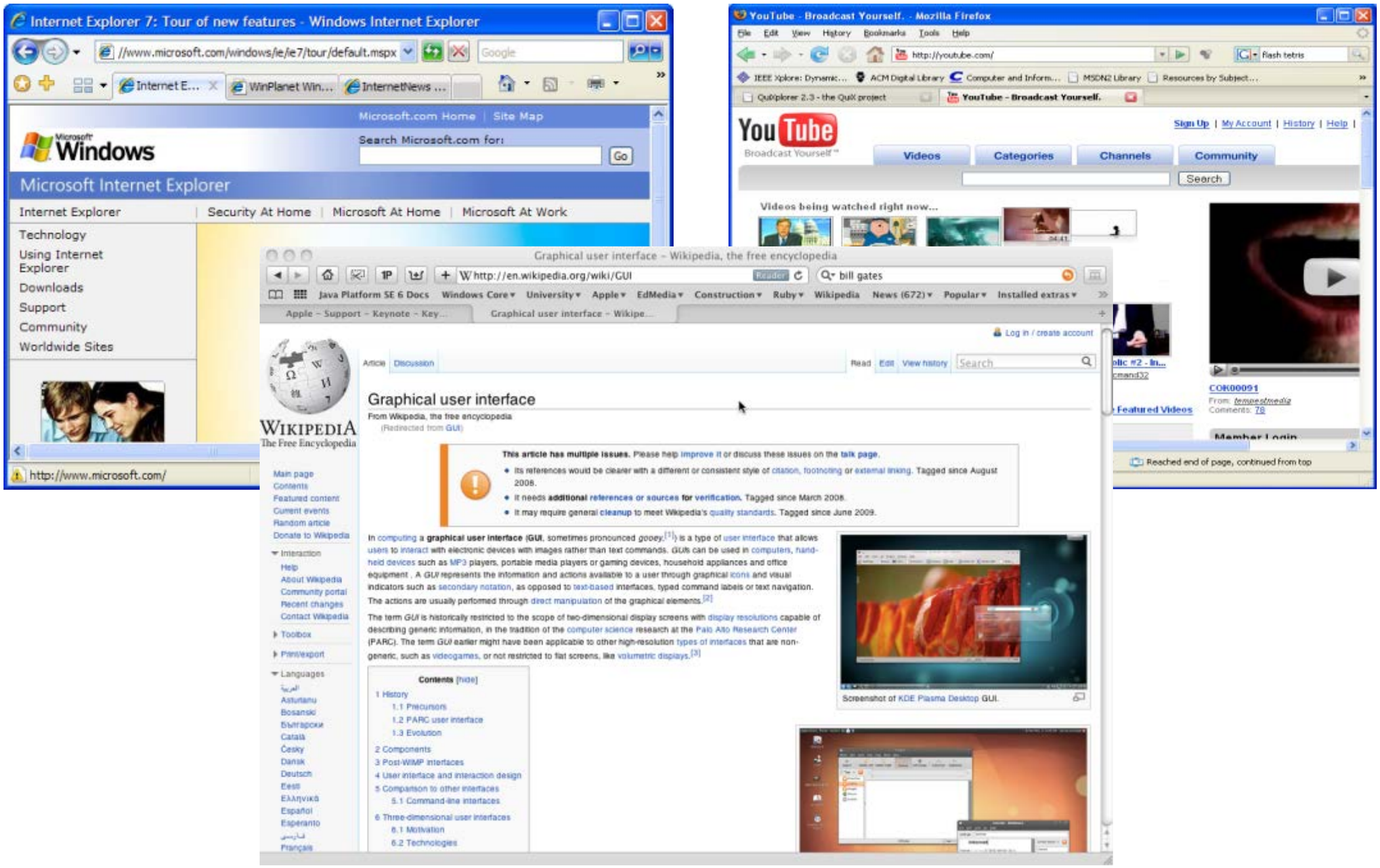
Graphical User Interface (GUI)

- Picture based
  - Windows, Icons, Menu, Pointer
  - Easy to use
  - Good for beginners



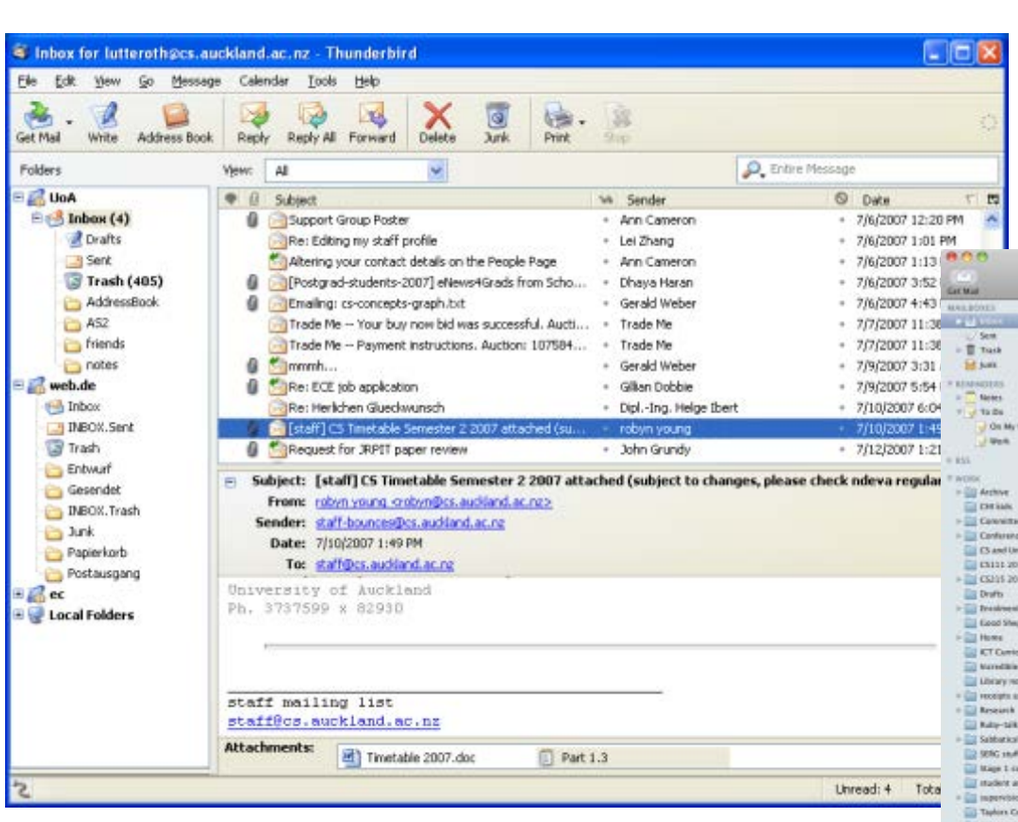
http://en.wikipedia.org/wiki/GUI

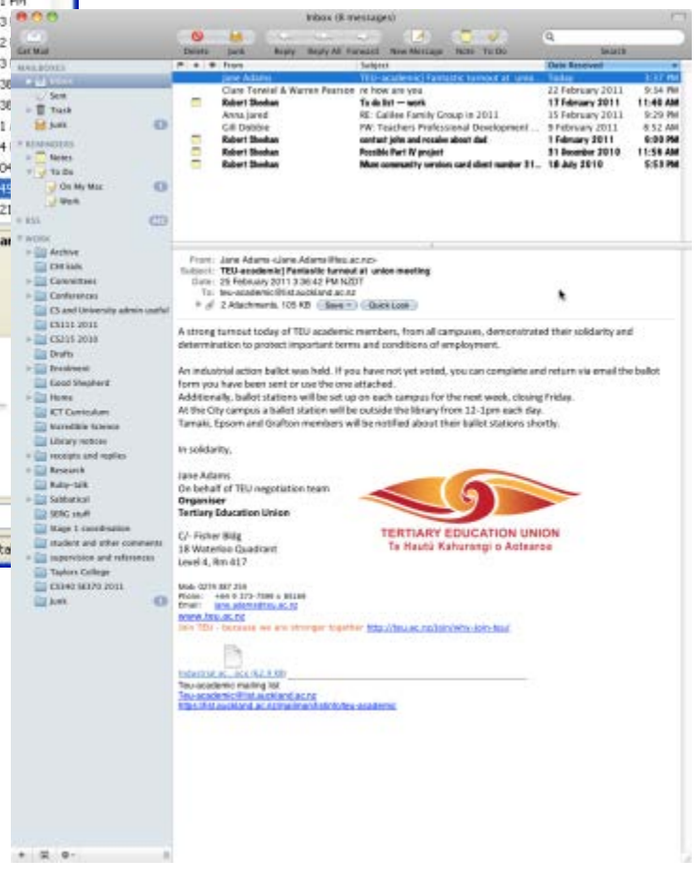
Web Browsers

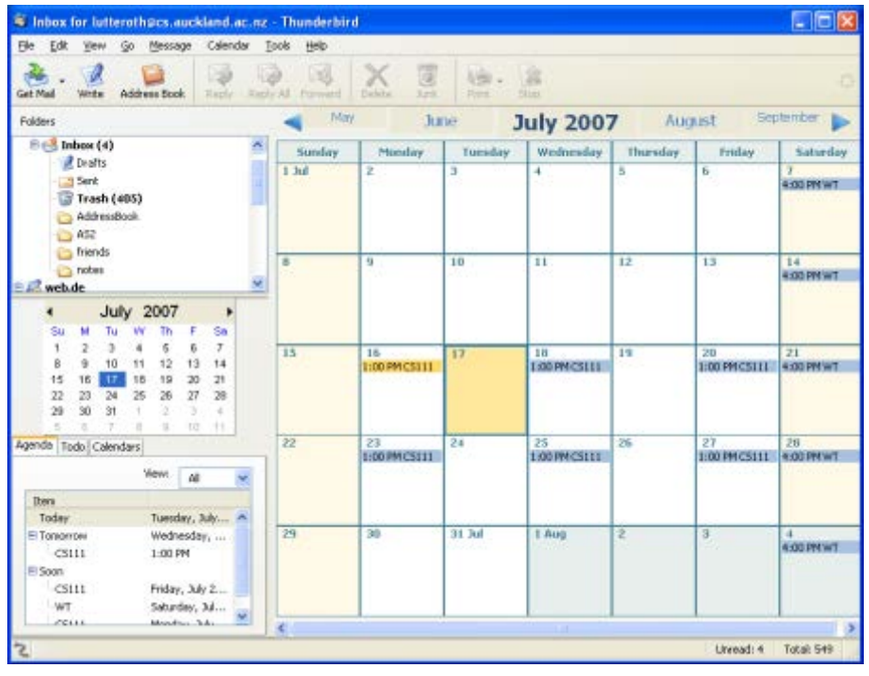


Email Clients

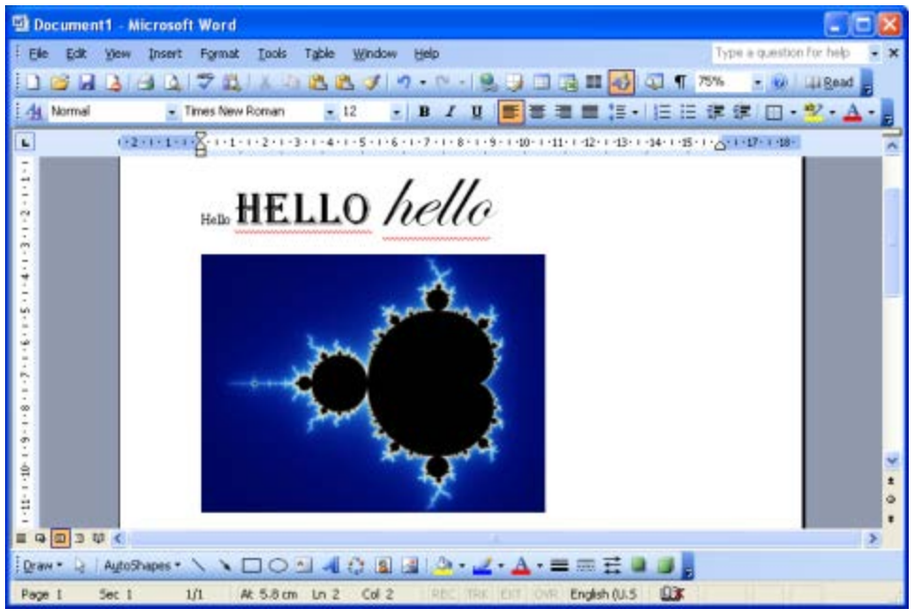
A client is a software that accesses a server.



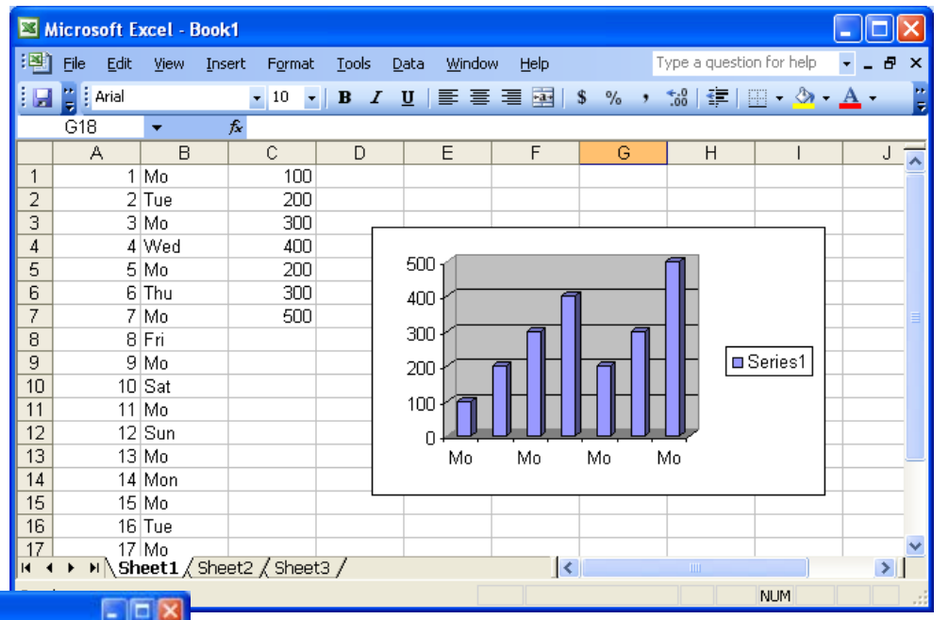




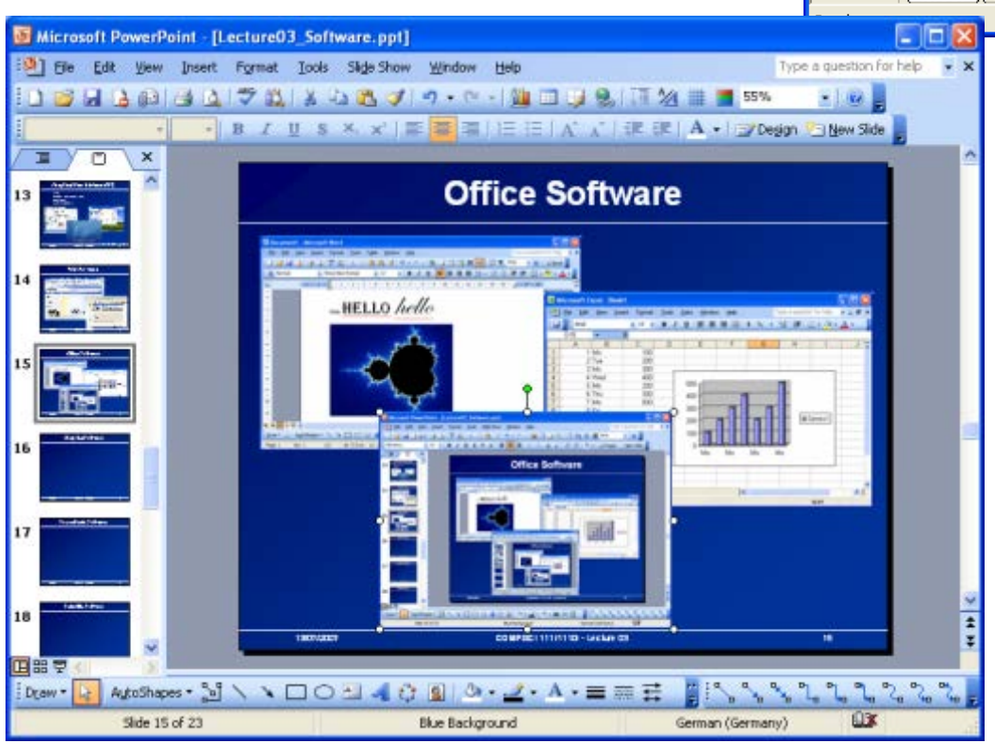
MS Office Suite



Word



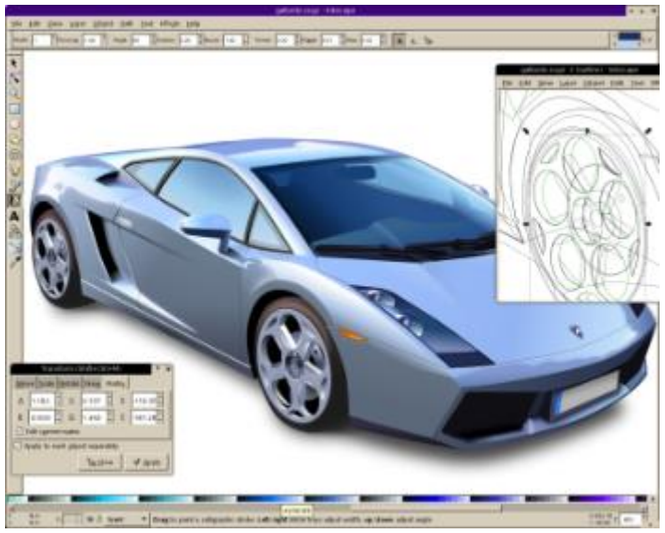
Excel

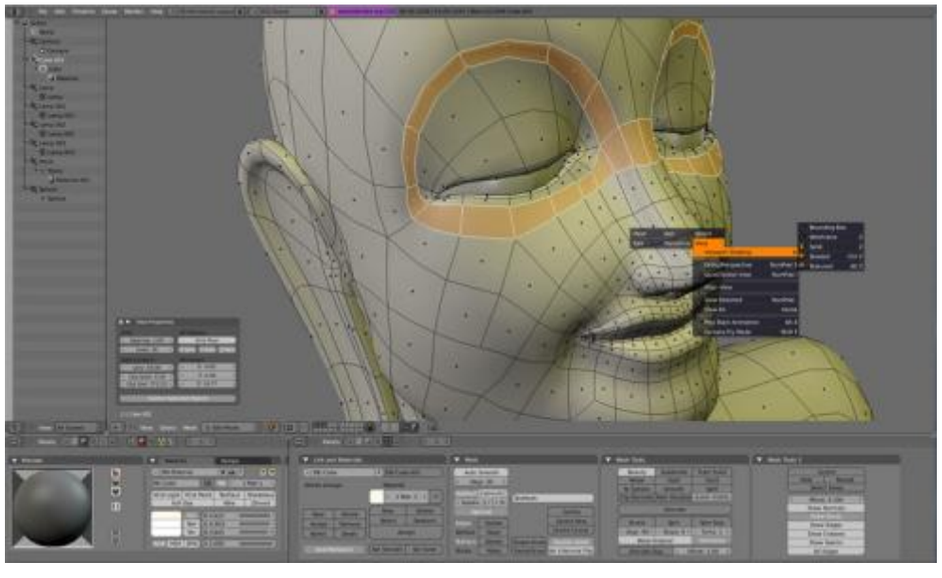


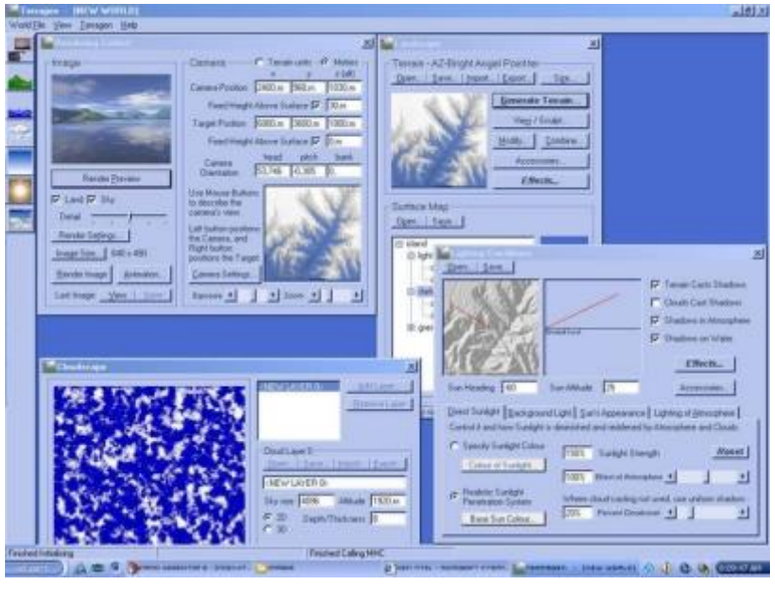
Power Point

http://en.wikipedia.org/wiki/Office_suite

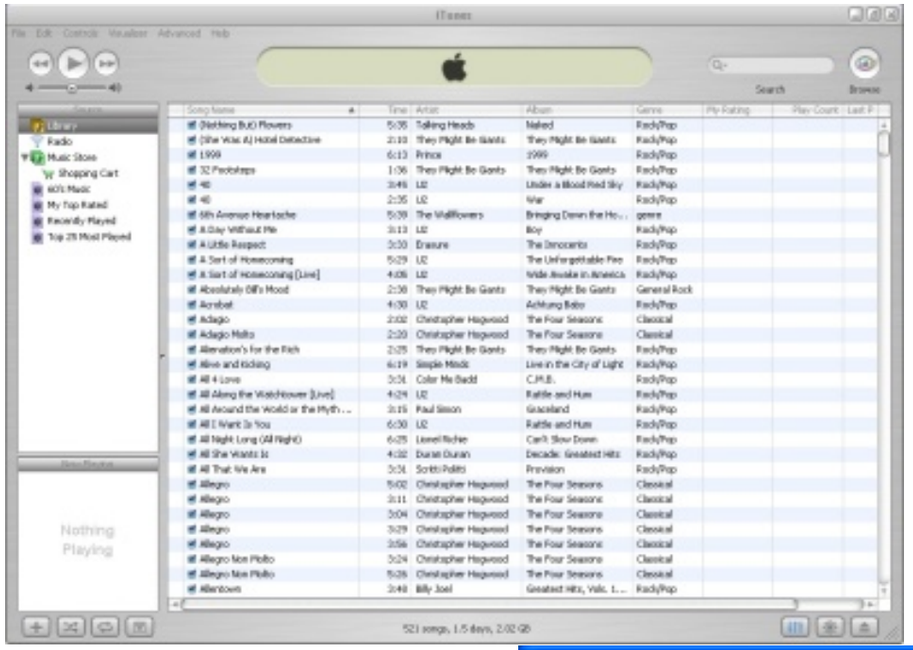
Graphics Software



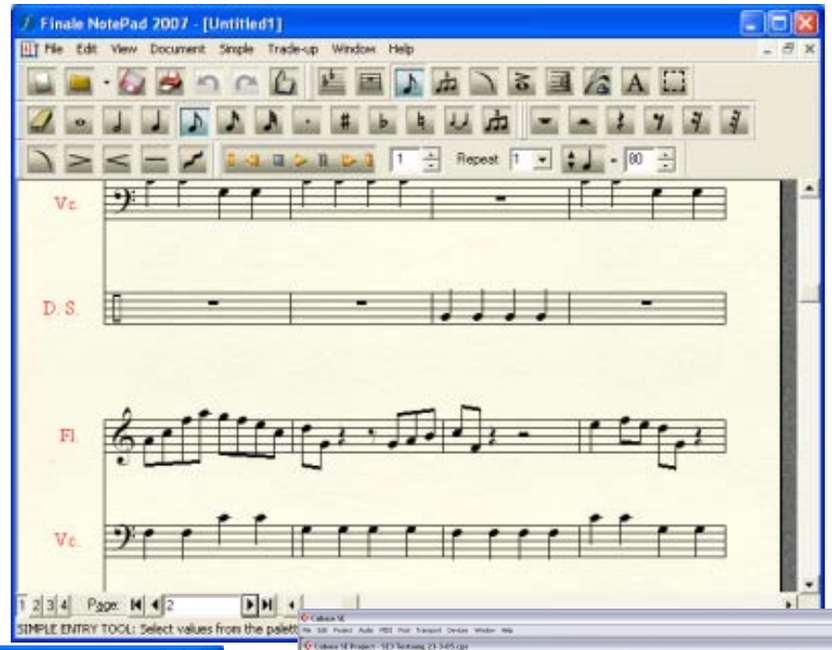




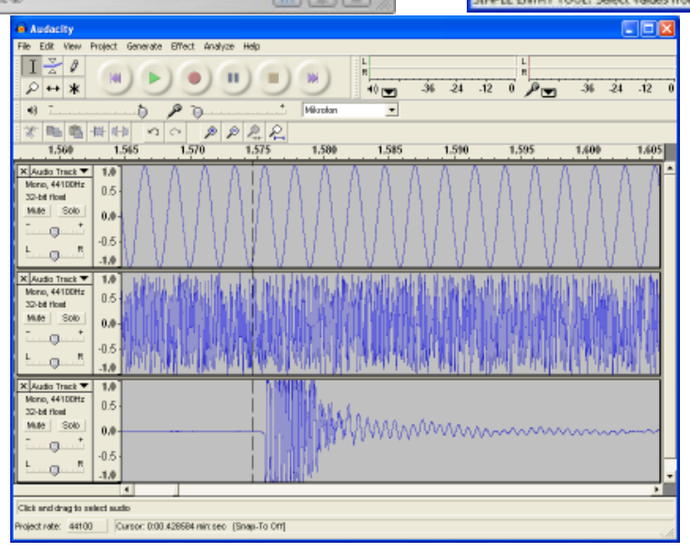
Sound/Music Software



iTunes

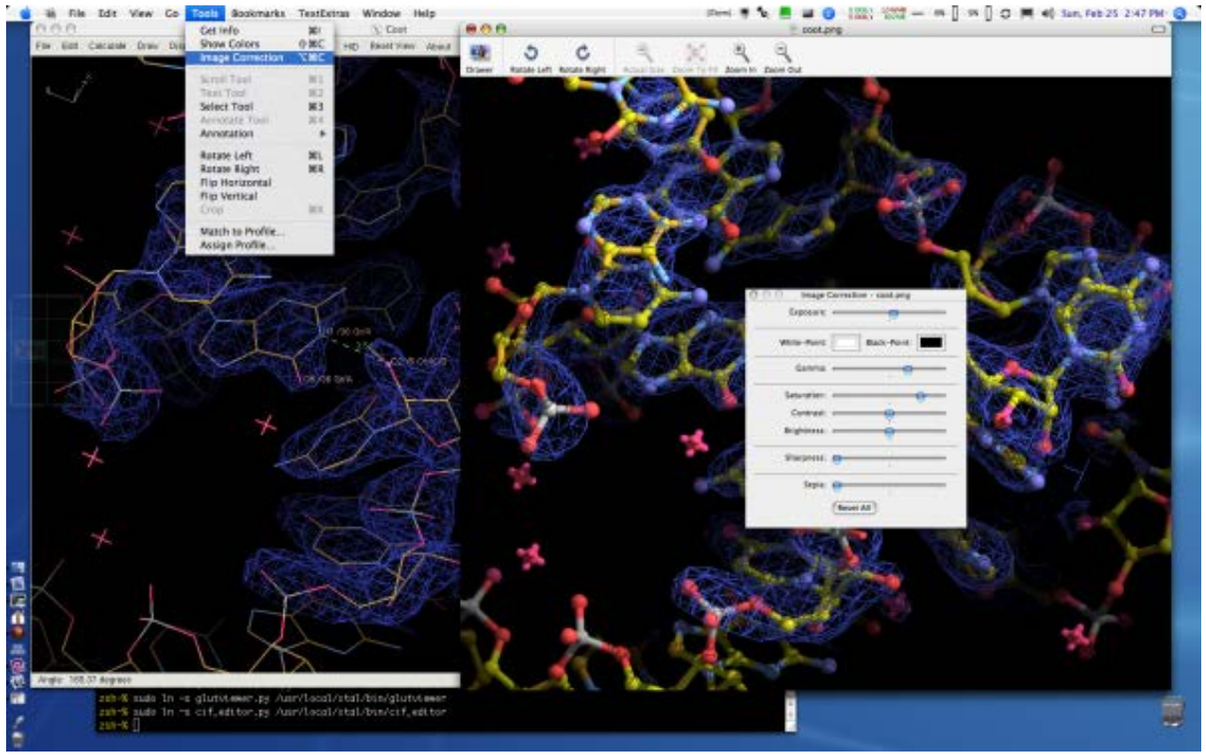


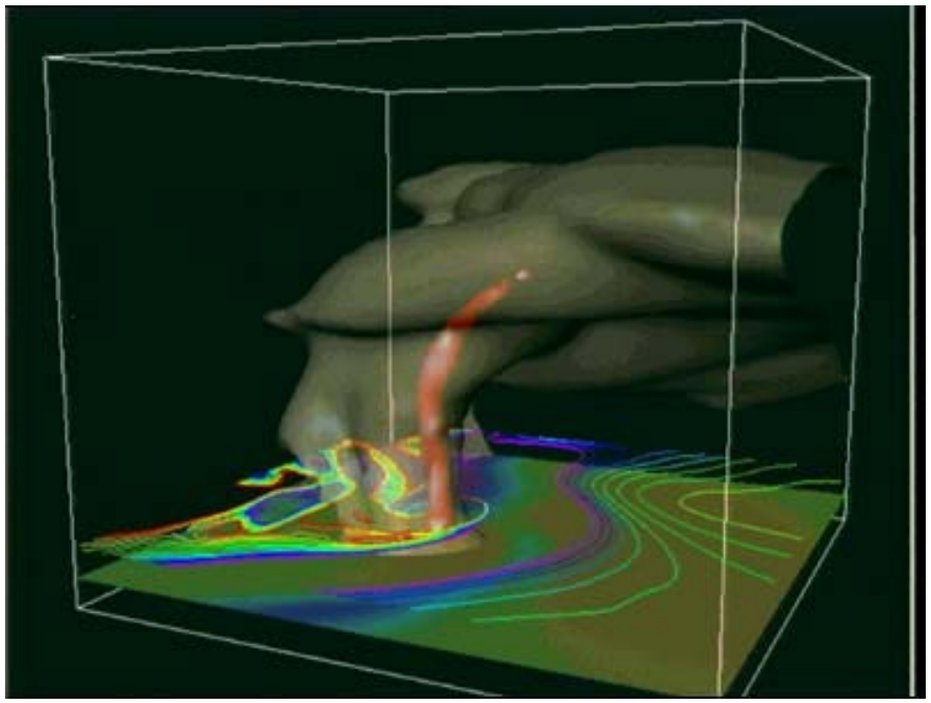
Finale Notepad

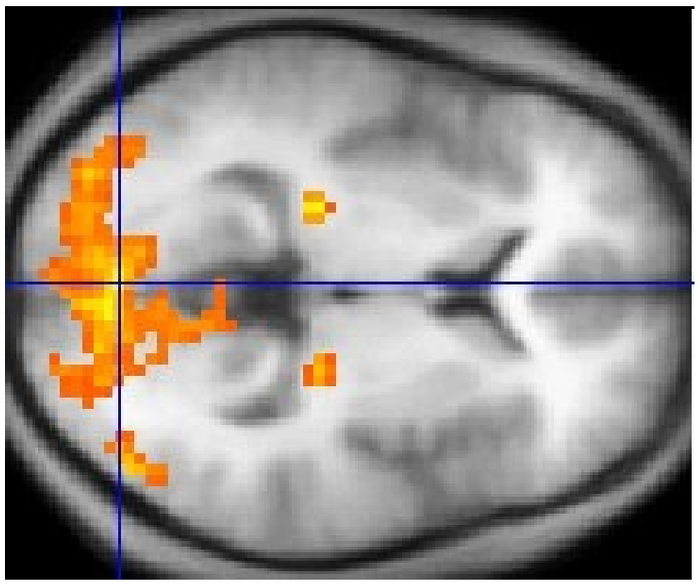


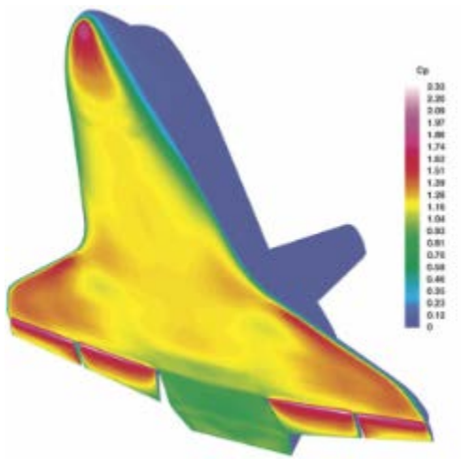
Audacity

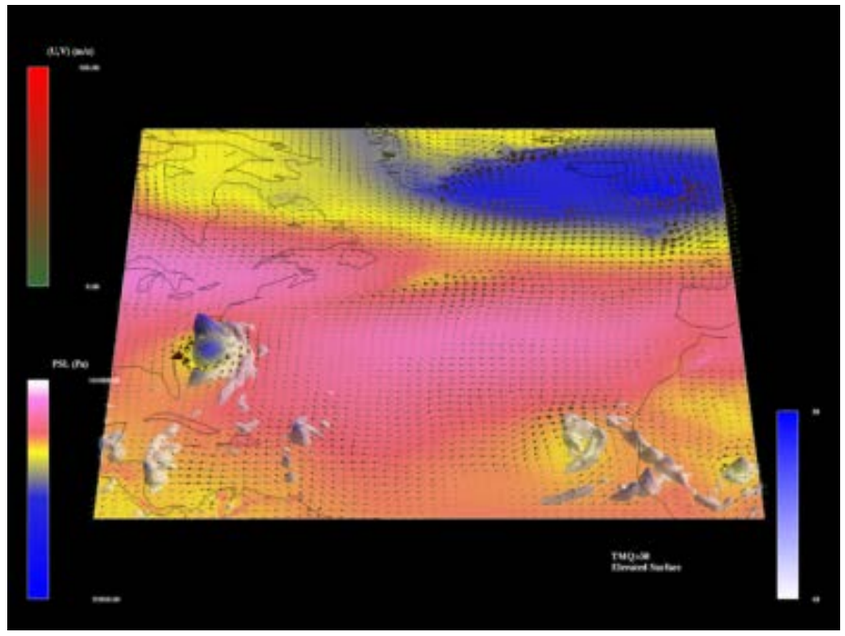
Scientific Software



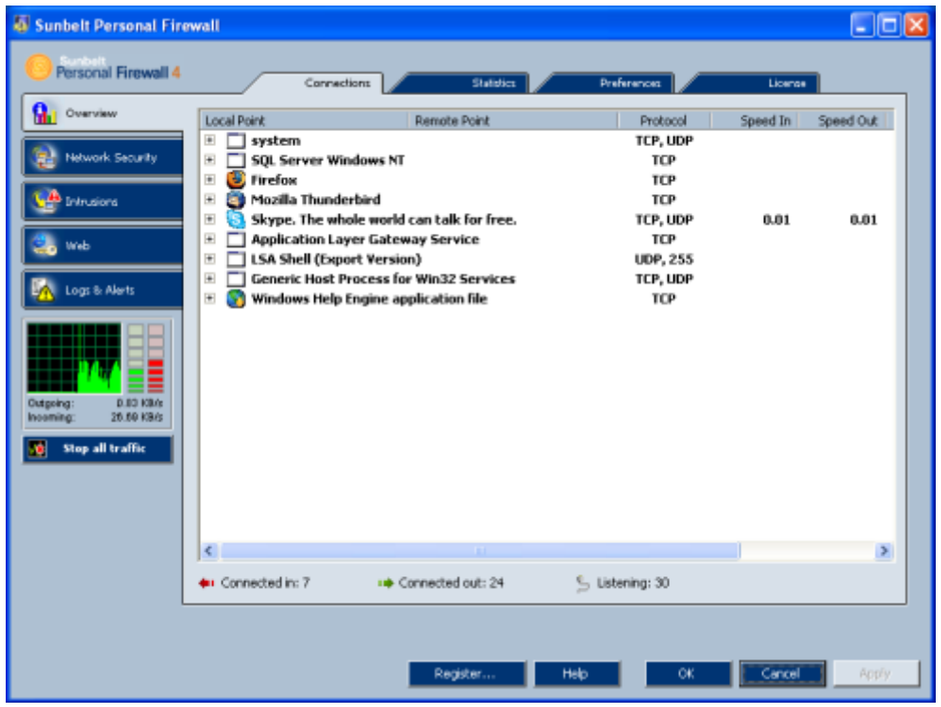


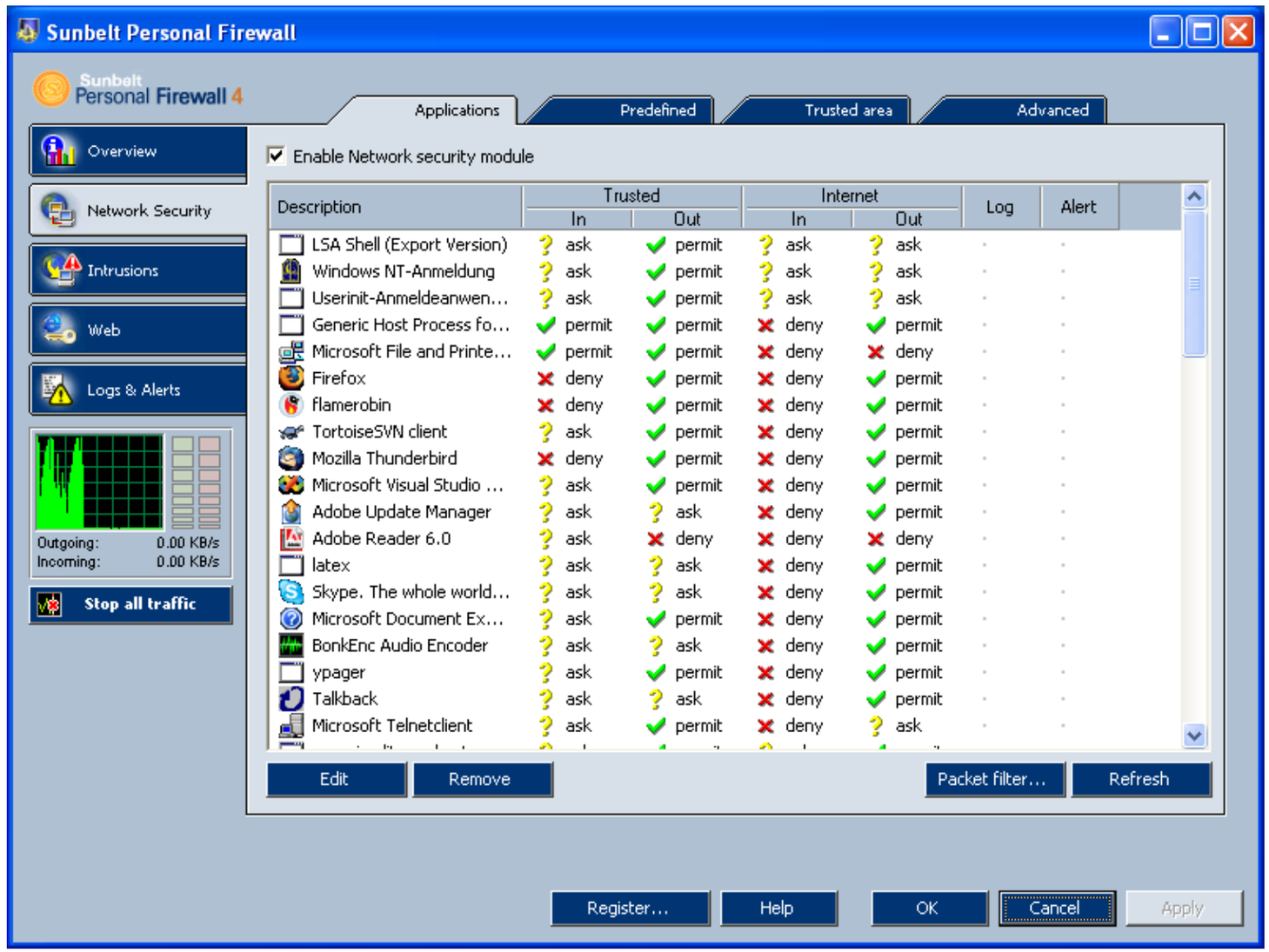


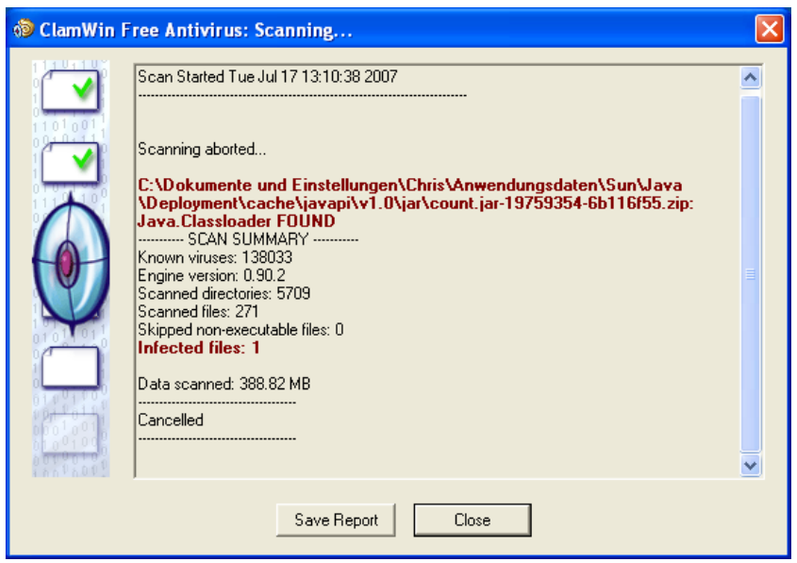




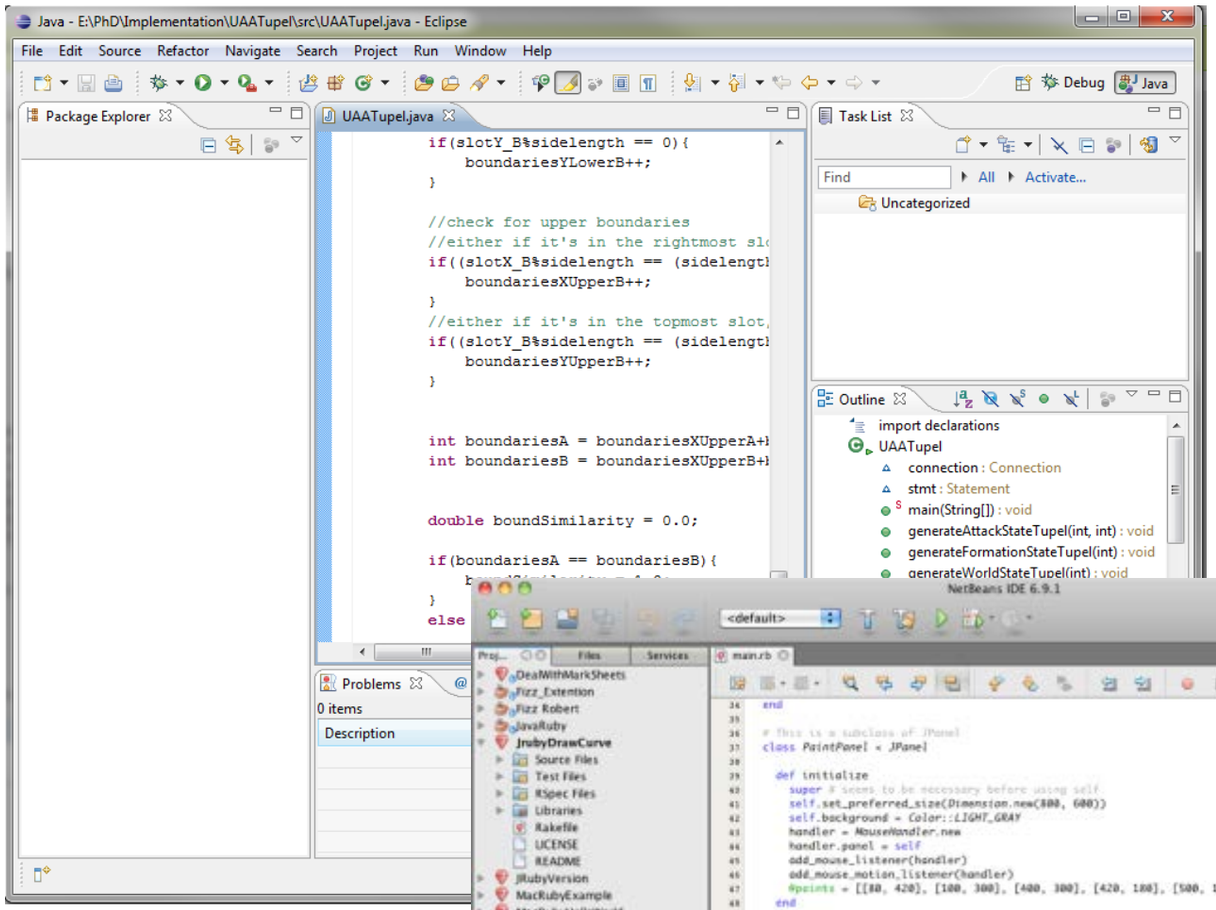
Security Software



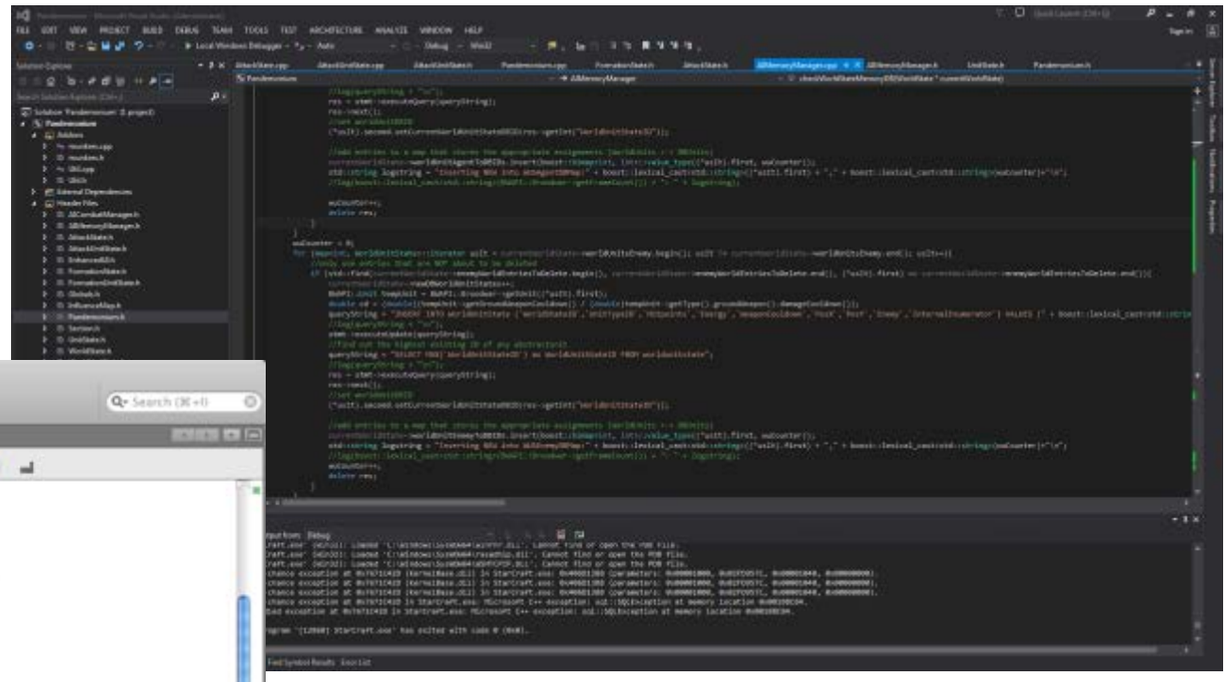




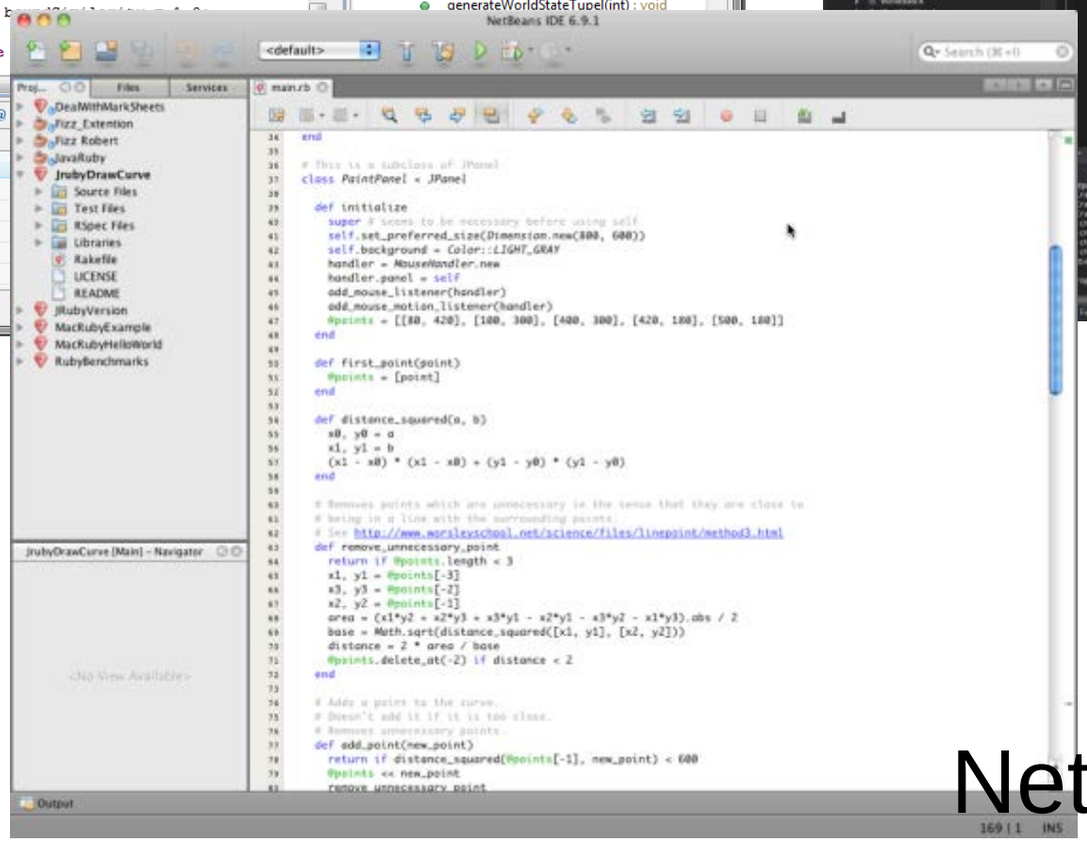
Software Development Tools



Eclipse



Visual Studio



Netbeans IDE

What if software fails?

- Usually software is not perfect.
  - Too complex to be completely free of errors
  - User interfaces are often not logical
    - Many programmers have good technical know-how but lack a sense of usability
- If a problem occurs…
  - It may not be your fault
  - You are most likely not the only one with that problem
  - Ask others for help !!!
  - Google is your friend: search the Internet and you will often find solutions
- Is it easy to fix a defect in a program?
  - Unfortunately, usually not
  - The internals of proprietary software are usually not accessible
  - Open-source programs can be large and hard to understand
  - But often problems can be circumvented by using the program in a different way

Spyware, Malware, Viruses

- Spyware
  - Collects data from your PC and sends it to someone else
  - May otherwise look like (or even be) a useful program
  - The data may be sensitive (e.g. passwords, personal documents) or just statistical
- Malware
  - Generic term for malicious software
  - Usually malicious program is disguised as useful program
  - Causes harm, such as deleting or modifying data
- Viruses
  - Small programs that attach themselves to other programs
  - May cause harm

Summary

- Software (programs) consists of instructions that control the computer and data
- Programs are loaded from secondary storage into primary memory, then executed by the CPU
- Data is organized in files, which have different file formats
- Software (and other data) is protected by copyright laws
- Software can be proprietary or open-source or a mixture of both
- Different kinds of software:
  - System software
  - Applications
  - Spyware, Malware, Viruses