APPLIED COMPUTING 1P01
Fluency with Technology
Software

APCO/IASC 1P01

Brock University
Types of Software

The two fundamental types of software are:

- Application Software
- System Software
Categories of Application Software

Multimedia

- Graphics Editing
  - Illustration
  - Photo editing and Touchup
- Music and Audio
  - Media Players
  - Music management and organization (e.g. iTunes, Rhythmbox)
  - Sound editing (e.g. Audacity)
- Video
  - Media Players (again) (e.g. VLC, MPlayer)
  - Video editing
  - (Note that some media library software can also manage videos)
Categories of Application Software

Office and Productivity

- Typically for producing documents/reports, analysis, projections, or presentations
  - i.e. Often used to package and transform information into a human-digestible format
- Often bundled up into *Office Suites*, but we’ll come back to this
Categories of Application Software

Number Crunching and Analysis

- Accounting and Financial Software
- Statistics, Regression, Modeling, and Analysis
- Bitcoin mining (sigh)
- Task-specific research software (e.g. protein folding)
- Rendering (note that this is also a media-related category)
Categories of Application Software
Internet/Networking/Communication

- Software that includes *protocols* and/or *libraries* for communicating with other remote devices
- (We’ll be revisiting this multiple times, so we’ll leave it for the moment)
Categories of Application Software

Gaming

- Software that is used for the sake of the experience, rather than to produce anything
- I’m assuming you don’t need any examples or explanations for this
  ▶ But what’s a unique, novel, or significant game (or category thereof)?
Categories of Application Software

Anything else?
Later on, we’ll be talking about *System Requirements* — necessary resources for satisfactorily running software. Typical necessary resources often vary depending on the type of program:

- Media editing software typically benefits greatly from great quantities of RAM.
- Games (surprise surprise!) tend to do best when aided by powerful graphics cards.
  - However, depending on the program, number crunching can also often be sped up via powerful graphics cards! Why might that be?
- Can we think of other common requirements for particular categories of software?
Productivity Software
Office Suites and Publishing

- Productivity software lets you “get stuff done”
- Often bundled up into collections or suites
  - Typically some level of interoperability
  - Typically unified interface (e.g. the ‘wart’ in the upper-left corner)
  - e.g. Microsoft Office
- Sometimes there may be more than one tool for the same job
Word Processing

Word Processing software is for the layout/arrangement and editing of primarily text documents

- Typically WYSIWYG
- Used to publish to printed documents, “the web”, or other electronic documents (e.g. PDF)
- Provides numerous tools for document creation/editing
- Will typically allow for different views, to facilitate the current use
- Will allow for formatting/font/etc., and typically streamlines it
Word Processing

What’s Offered

- Word Wrap
- Spelling and Grammer checking
- Autocomplete
- Page breaks
- Margin handling
- Importing graphics/clipart
- Maintains authorship information
- Text editing macros (e.g. cut/copy/paste, search & replace, etc.)
- Usually allows applying styles across the document (or portions thereof)

  ▶ Note: This is slightly (but significantly) different from simply formatting

Can you think of one of these features that tends to be severely underappreciated?

Can you think of other useful features of word processors?
Word Processing

Example Uses

The applications for Word Processing software have grown substantially over the years. Originally, they were simply a replacement for typewriters. Additional features have been added over time, which have created overlap with other classes of software. Because of this, Word Processing software has several legitimate uses:

- Writing documents/articles/letters
- Creating brochures
- Flyers
- Form letters and mailers

We’ll revisit some of these in a little bit.
Word Processing Software
Microsoft Word

- Part of all versions of Microsoft’s office suite, creatively called Microsoft Office
- Uses .doc or .docx extension
- The de facto standard in word processing
- Can import numerous standards of documents and embeddable files
- Can export to different document formats and publish .pdf documents
- Objectively the best general purpose word processing software available

We’ll revisit this topic when we have our word processing/MS Word lecture (and lab)
There are numerous alternatives to MS Word. Some common (or semi-common) free options include:

- OpenOffice/LibreOffice Writer
- AbiWord
- Google Docs
- WordPad (yes, it technically counts!)
- (Corel) WordPerfect
Typesetting

Typesetting Software is similar to — but distinct from — traditional Word Processing software.

- It’s typically “more powerful” for specific tasks
- It gives more direct attention to the specific locations of elements
- It doesn’t always include its own editor
- Typically not WYSIWYG!
- Often requires *compiling* your document
- Usually extensible
  - e.g. The Beamer package allows for bland presentations!
- Usually requires memorizing commands
- Fantastic for mathematical formulae
- Ideal for citations/references, bibliographies, figures, etc.
- Gives absolute control over formatting/style
- Explicit control over fine details
- Incredibly tricky to work with, often requiring kludges
- Especially suited for research articles and textbooks
- For example, *TeX* and \LaTeX\
Desktop Publishing

Desktop Publishing software is typically used for documents where the layout is integral to the function.

- Brochures
- Flyers
- Advertisements/catalogs
- Magazines
- etc.

Documents may be published for electronic (e.g. .pdf) or print media.

WYSIWYG is, of course, required.

Wait… is some of this sounding familiar?

- Over the years, Word Processing software has grown to satisfy many of the needs of typical DTP software
- By now, many amateur/small-scale needs are satisfied by, for example, MS Word
Desktop Publishing

Applications

- Microsoft Publisher
- Adobe FrameMaker
- Scribus
- Troff/Groff/Nroff
- LyX
  - Based on \LaTeX
  - WYSIWYM
Presentation Software

Presentation software allows you to create *slide shows* to present some sort of information

- Based on actual slide-based projection
  - Yes, as in business meetings had to have physical slides made up before presentations/meetings!
- Commonly includes functionality for:
  - Clipart/graphics
  - Font formatting/styling
  - Templates for common slide layouts
  - Transitions between slides
  - Animations
  - Links/buttons to jump to other (non-sequential) positions
  - Video/sound
    - I’d highly advise against this

Usually, the ability to actually show the presentation is included in the software.
Presentation Software

Paid Software

The most widely-used presentation software is Microsoft PowerPoint.

- It’s powerful and flexible
- It provides numerous tools for layout/transitions/formatting, and keeping them constant across slides
- A PowerPoint Viewer can be freely downloaded to view presentations without purchasing the complete software
- Uses .ppt and .pptx file extensions
- We’ll revisit PowerPoint in the Presentation lecture

Corel also includes Corel Presentations as part of the WordPerfect Office suite.
Presentation Software

Free Alternatives

- Google Docs
- OpenOffice/LibreOffice Impress
- SlideShare
- Beamer
  - Based on \LaTeX
  - e.g. uh... this.
- Powerdot
  - Also based on \LaTeX
Spreadsheets

Spreadsheets are tabular data, modeled after paper office *worksheets*. They’re used for:

- Organization and presentation of data
- Calculations
- Cross-referencing data
- Logic decisions and macros
- Regression and projection

It’s also sometimes used as a quick’n’dirty way of simply arranging things in a tabular format

- Employee hour sheets
- Attendance sheets
- Anything where you don’t want to bother with tables in a word processor
Everyone who’s used a computer should have heard of Microsoft Excel:

- The gold standard of spreadsheets
- Uses .xls and .xlsx file extensions
- Uses .csv as well!
- We’ll learn more about this in the MS Excel lecture (next week!) and in labs

Corel includes Quattro Pro in the WordPerfect Office suite.

- A rich and respectable history, but there’s little compelling reason to pay for it
Spreadsheet Software
Free Alternatives

- OpenOffice/LibreOffice Calc
- Gnumeric
- Google Docs
Accounting/Financial

- Task-specific software
- Well-suited for money matters
  - i.e. maybe you should stop using Excel to keep track of your transactions
- Tax software is also available
  - Of questionable value to individuals
Databases

Databases hold information in *tables*:

- Each table holds information for a specific task/theme
- Each table is comprised of multiple *records*
  - Each record represents a single tuple of information that should be considered together
  - Each record is comprised of multiple *fields*
    - Each field represents a single piece of data for the record, of some *type*

E.g.

- A company database has tables for *Employees, Inventory, and Customer Records*
  - Each employee has an *ID number*, a *name*, a *birth date*, etc.
    - A name is *text*
    - A date is of type *date*
    - An ID number could be a number, but is probably also *text*

The database software should manage things like controlling access; connections/communication; adding, removing, and modifying records/tables; and querying data.
Graphics editing typically falls under one of three categories:

- Raster Graphics
- Vector Graphics
- 3D/Rendering and Design (CAD)

The first two tend to be shared (to some extent or another) across applications:

- Raster is used for photo editing/manipulation
- Vector is particularly well-suited for diagrams
- Both are popular for illustration (and are often combined for that purpose)
Internet and Web Software

We’ll be talking about the internet and the web later, but for now you should realize that a large portion of modern software has to remember that “the internet is a thing”.

Web browsers, web apps, FTP, RDP, etc. all rely on the internet.

So does primarily “offline” software that requires a remote server for authentication or ads.
Location and Geopositioning

Locations can be integrated into existing services (e.g. web searches and delivery that customizes based on where you are), or can be the primary use of the software (e.g. navigation software)

There are actually numerous ways to track where you are

- IP addresses
- GPS
- WiFi
  - Not just which ones you’re connected to, but which ones are around you!

Typically, even navigation software requires an internet connection to be fully effective

- It prevents your device from having to pre-cache all possible map images that might be necessary
- It allows for easy updates when roads have been built/closed/changed
- It allows for up-to-date traffic information
Versions and Updates

- If an application is reasonably good, it may continue to be used for some time
- Few programs are sufficiently perfect as to never require modernization, additional features, or other changes
- Relatively few applications are distributed without even a single bug
- The scope of a program might potentially increase over time (e.g. Word Processing software)

All of this means that, from time to time, a new version of an application may need to be released.
Versions and Updates

Minor Updates and Revisions

- *Revisions*, or minor updates reflect small changes to the original software
  - Bugfixes
  - Patches to eliminate security risks
  - Small usability tweaks
  - etc.

- Normally, such updates to software are distributed for free
  - After all, they don’t offer any significant new features, and are often to address mistakes made in the original release

- Often, software may be set to automatically update itself, or prompt the user to approve an update
Versions and Updates
Major Updates and Releases

When small tweaks aren’t enough, the need may eventually arise for a completely new version or release.

- New versions typically offer new features
- They also commonly have updated interfaces
- Some changes may be simply to fit modern designs/paradigms
- Of course, this also gives users incentive to pay for new software to replace their existing applications
- This is also where it’s most common to need a computer upgrade to “continue doing the same thing”

Can we think of some notable new software releases lately?
Versions and Updates

Version Numbering

- Commonly, new major releases simply increment the trailing number
  - Windows 2, Windows 3; Windows 7, Windows 8
  - Firefox 2, Firefox 3
  - etc

- Minor releases often add a decimal
  - Windows 3.0, Windows 3.1; Windows 8, Windows 8.1

- Very minor revisions may add another decimal (e.g. 3.2.1, 5.6.8)
  - The Linux kernel is numbered this way

- For reasons of style and/or simplicity, other schemes may be used
  - Windows 95, Microsoft Office 2010, etc.

- Mac OS is a special case
  - Mac OS used a normal numbering scheme until Mac OS 9, after which was OS X
  - *since* OSX, instead of going to OS XI, OS XII, etc., they’ve added a decimal
    - OS X 10.3, 10.4, 10.9.1, etc.

- Ubuntu is another special case
  - Ubuntu numbering goes by Year.Month
  - The most recent stable release was 14.04 (released April of 2014)
Support Lifecycle

Even when new releases are available, most major software companies still support older versions, providing customer support, patches, minor revisions, etc.

Eventually, they’ll usually stop doing this.

- Windows tends to be supported for almost comical lengths of time, particularly for popular versions
  - e.g. Windows XP, released in 2001, will almost completely cut off support in April 2014!
- Ubuntu has two types of release: normal, and Long-Term Support (LTS)
  - LTS releases are typically maintained for 5 years
  - Other releases are typically maintained approximately until the next LTS release is out

Using unsupported software can lead to several problems, most notably:

- Security patches becomes a lower priority (or cease entirely)
- Third-party software and peripherals may no longer be supported
  - When purchasing new software, make sure to check the system requirements!
Extensions and Plugins

Extensions and plugins (occasionally called “add-ons”) are both special limited forms of software that serve to augment another application.

- They may be offered by the creators of the original software, or by third parties.
- They often add additional features or support:
  - Video codecs
  - Webpage customization
    - Overriding CSS styling
    - Ad-blocking
    - Injecting javascript for common tasks
  - Filters/brushes for photo editing software
- They typically interface with Application Programming Interfaces (APIs)
  - This simply means that they typically interact with the primary software in very clear well-defined ways.
- Arguably a predecessor to DLC.
Most applications don’t simply run directly on the hardware (we’ll talk about this more later)

Instead, applications often:

▶ Run on top of other programs (that may run on top of programs, etc.)
▶ Run, using a common set of related software components

For example:

▶ To run Java programs, you need the Java VM
▶ Games typically use graphics centred around DirectX or OpenGL
▶ Flash games require an Adobe Flash plugin (or comparable equivalent)
▶ Steam/Source Engine/Steamworks

Among other things, this is a big reason why a piece of software might only run on Windows, or OS X, or some variant of Linux, even if all three are running on essentially the same hardware
Cloud Computing and Web Apps

Most software you run executes on your own device
  - Does that necessarily have to be the case?
Also, you traditionally store files on some local form of storage
  - Again, does that need to be the case?
Strictly speaking, it doesn’t
  - Remote computers are capable of driving many common computing tasks
  - Remote storage is no less store-y than local storage
Several larger software companies provide services that run on their own hardware, and provide a web-based interface.
  - Google Drive, Google Docs, Google etc...
  - Amazon Cloud Drive, Amazon Elastic Compute Cloud, Amazon etc...
  - Ultraviolet
Cloud Computing and Web Apps
Ups and Downs

Is good!
- Wherever you are, if you have an internet connection, you have access to your files/programs
  - beyond the basic convenience of this, it also means your files are automatically accessible on multiple devices
- Cloud storage is typically stored in redundant configurations and backed up regularly
  - How often do you back everything up?
- Some cloud/web services are free!
- You typically don’t need to worry about updates
Cloud Computing and Web Apps

Ups and Downs

Is bad!

- Web services may be more restrictive (e.g. Google Docs are decent, but not fantastic)
- When your internet goes down, you lose access to *everything*
  - For file storage, this can be mitigated when an offline storage mode is available
  - You no longer have physical custody of your data
    - Beware the gubbermint!
    - More practically, it lowers the threshold of “reasonable expectation of privacy”
    - Some may not like the principle of having their data inspected/exploited
    - There’s always the potential for a security exploit

Perhaps we should revisit this topic for the Internet/Web lecture?
Portable Apps

*Portable Software* is an alternative to web computing.

- You put several applications you expect to need, as well as files you might need “on the go” onto a flash drive (or CD, I guess)
- Pop the drive into whatever computer you happen to be using, and run everything from the drive
- Profile information, settings, etc, are all stored on that drive
  - Nothing is stored on the host computer’s registry!
- Handy for numerous uses:
  - Security and diagnostic software
  - Your favourite text/code/document editor
  - Free games
  - Image and sound editing
  - Chat programs
    - This is something you really shouldn’t use on someone else’s computer
  - Web browser
    - Helps to protect privacy
    - Lets you keep bookmarks with you
    - Lets you install extensions when not possible on the host computer

Take a look at portableapps.com/apps for more examples
Acquiring New Software

Distribution and Payment Models

Unlike ye olden times, much software can be (legally) acquired and used for free

- Some developers simply believe in free/open software
- Some companies realize that they want to become essential to your daily life

Common Models:

- Proprietary/Paid
  - The classic “you pay us; we give you software” scheme
- Open Source/Free
  - If open source, you can create derivative works and compile it for yourself
  - Otherwise, hey, it’s still free!*
    - Oftentimes, free software is distributed with the hope that you'll pay them for consulting/support

*Oftentimes, free software is distributed with the hope that you'll pay them for consulting/support
Acquiring New Software
Distribution and Payment Models (cont)

- Free-to-play, “Freemium”, etc.
  - Basic functionality is free
  - Microtransactions can make it worth using
  - Typically for games
  - Often, if the game is played long enough, can often cost more than traditional software
  - “Pay to win”

- Ad-supported
  - Usually free, though not always
  - May drain the batteries of mobile devices much faster
  - May incur additional fees from data usage

- Subscription-based
  - Microsoft Office 365
  - PlayStation Plus
  - Adobe offers several tools this way

There are others (e.g. Shareware, Trialware), but these aren’t a common concern
Licensing
EULAs

*End User License Agreements* are licensing agreements that define how the developer/publisher gives you permission to use the software you’ve already paid for.

- Potentially, EULAs can have several consequences, including cessation of service or revocation of license (without refund)
- EULA violation could even theoretically lead to lawsuits

In practice?

- There’s little to be done about them for the moment. It’s really not worth the effort to worry about too much
- More often than not, EULAs are really designed to protect the company from other companies and potentially exploitative use
  - i.e. They aren’t written with *you* in mind
Software Distribution

Software itself may be distributed (whether sold or not) through numerous mechanisms.

- Shrinkwrapped software is still an option
- “Digital distribution” refers to services that offer software for download, typically through some client
- Mobile devices typically come with their own app stores for purchasing new apps (or downloading them for free)

Some platforms (particularly mobile platforms) are more “locked-down”, in that they try to discourage you from purchasing/installing software from third party sources.
Software Distribution

Sidelading

Even if a device initially offers only applications from a single source, that doesn’t necessarily mean it must stay that way.

- Some platforms may easily allow for the addition of another app store
- Most platforms, either automatically or through some finagling, allow for sideloading
  - For Android, this can be toggled on and off within the device’s settings
  - This can also allow amateurs/enthusiasts to create their own programs for distribution on their websites

On that note, do we know the difference between rooting, unlocking, and jailbreaking a phone?
Digital Rights Management is any mechanism designed to inhibit the copying of copyrighted material

- Copy protection in some form or another goes back decades
- Many companies are now offering “DRM-free” products, and reversing policies on existing works
- In other words, DRM typically only helps when it doesn’t irritate the crap out of paying customers
  - Steam was once widely loathed as a platform, because of its apparently punitive DRM
We’ll revisit this topic during the Hardware/Maintenance lecture, but for now:

- Computers often require protection
- Oftentimes, the computer is really being protected from incautious users
- e.g. Antivirus, Antimalware, Antispyware, Registry Cleaning, etc.

Similarly, there are other forms of software that can protect you and your data, including encryption, backup, etc.
Operating Systems

Operating Systems:
- Manage resources (e.g. RAM)
- Handle scheduling of tasks/processes
  - Should I explain what processes/threads and multitasking/multithreading are?
- Provide virtual memory
- Provide frameworks upon which other software can be developed/executed
- Typically are bundled with commonly-used simple applications (e.g. Calculator)
- Provide an interface between the hardware and application software
- Lots of other things
Operating Systems

Parts of an OS

- The kernel
- Drivers
- Services and Daemons
- Libraries
Operating Systems
Common Operating Systems

- **Microsoft Windows**

- **Mac OS X**
  - Designed specifically to run on Apple hardware, so compatibility is less of an issue

- **Linux** is not an operating system; rather, Linux is the kernel at the core of Linux distributions
  - Ubuntu/Xubuntu/Kubuntu/Lubuntu
  - Gentoo
  - Debian
  - Arch
  - Fedora/Red Hat/CentOS
  - Linux distributions are largely distinguished by their default packages, package managers, and desktop environment
Operating Systems
Common Operating Systems (cont)

- **Android**
  - Based on Linux
  - Good support for multitasking, and a wide variety of devices
  - Fractured install base, numerous options available (including unofficial ones)

- **iOS**
  - For Apple mobile devices

Most computers can have their operating system changed, and allow for the option of a *multiboot*

- Whether to try out a new OS before installing, or for diagnostic/recovery purposes, a *Live CD* lets a computer boot into an alternate Operating System without requiring changes to the existing installation

- See also: Boot Camp
Operating Systems

Additional Topics

- As implied earlier, check system requirements for compatibility
- *Virtual Machines/Virtualization* let you run an alternate Operating System as a process within an existing OS
- Operating Systems tend to be designed with specific needs in mind, which may make them unsuitable for other uses
  - Limited multitasking in iOS improves battery life
  - The wide range of devices running Android requires more flexible support
  - Task-specific computers may require special Operating Systems (e.g. for realtime execution)
- Some Operating Systems might be targeted to a specific *architecture*