Professional Skills

https://warwick.ac.uk/fac/sci/dcs/teaching/modules/cs133/

Computers and Operating systems – utilisation and application (term 1)
Wider Social Context – legal, ethical ad professional issues (terms 1 and 2)
Communication Skills – presentations and technical writing (term 2)

Term 1 Lectures
- Intro to UNIX
- Files and Navigation
- Processes
- The Shell and Scripting
- LaTeX and BibTeX
- Regular Expressions
- Linux Commands

Contracts, HR, Health and Safety

12 November 2019   10:08

Contracts
Legal agreement between two or more parties who must be competent, intend to make the contract, and receive, provide a consideration

Software Contracts
- What is to be supplied
- Price, deadlines
- Legal rights
- Confidentiality
- Obligations
- Warranty and maintenance
- Indemnity
- Arbitration
- Applicable Law

Licenses
- 1 machine or many
- Copies / copy protection

Human Resources
Recruitment and selection
Redundancies, dismissal, grievances
Staff support and development
Appraisals
Remuneration

- Human Rights Act 1998
- Equality Acts 2006 and 2010

Discrimination
Illegal Discrimination
- Protected characteristics like gender race religion
- Age
- Disability

Overcoming discrimination
- Recruitment is fair
- Equal opportunity policy
- Training to not discriminate
- Enforcement / fast complaints procedure
- Policy review

Employers Duties
- Provision and maintenance of safe working environment
- Safe systems of work
- Safe use of substances
- Safe conditions
- Provision of information, instruction, training and supervision

UNIX and Linux

01 October 2019   10:18

UNIX and Linux are operating systems
Embedded systems to high performance systems

Three components:
- Kernel
- Shell: interface to the kernel
- Utilities: editors, compiles etc

History
1969 – UNIX developed at Bell LAbs
1983 – Origins of commercial UNIX and GNU project
1991 – Linux begins work on Linux
1997 – Apple deploy Darwin in MAC OS X

UNIX Flavours:
SysV
BSD
Linux
SolarisAIX

Linux Distributions
- Redhat
- CentOS
- Debian
- Ubuntu

Top Level of Unix
Kernel – contains the drivers, code which enables the machine to understand where files are, what they contain etc
Shell – interaction of the user with the shell

Computer Programs
Sequence of instructions the computer follows

1. High Level: java, Pascal, C++, C
2. Low level: assembler, microcode, bytecode
3. Binary: machine dependent

UNIX Philosophy
Each program or command should be a tool that does only one thing very well
When you need a new tool, it is better to combine the existing tools that to write new ones
Small is beautiful
Everything is a file and can be manipulated as a file

The Shell
Can be thought of as a command interpreter
Friendly hooks to kernel
Programming language

<u>Files</u>
Store data
Contain sequences of byte (chars)
Can be classified as regular (text, binary, html), directory (folder), device (screen, keyboard, mouse)

<u>Benefits of the Shell</u>
Specify whole sets of filenames through patterns
Input-output re-direction
Define shorthand and commands

Files and Directories

Octal permissions
4 read
2 write
1 execute

Access Control Lists can provide access for individual users.
Setfacl and getfacl

Directories can be considered special files that contai a list of b
File names and the corresponding inode numbers

Each file in a linux system has a unique inode number, and the name of the file is therefore
irrelevant – the file can have multiple names all corresponding to the same inode number

Hard Link
For a given inode, you have two names – two directory entries that reach the same file

Soft Link
A file that contains information about the name of another file, and the system silently locates and
opens that file. The files have different inodes, but one points to the other

/etc
Contains system wide config files.
Hosts – machines on campus
Printers – known printers
Groups – known groups
Motd – logon message
Shell – shells known to chsh

There are multiple versions of commands that can be called. The system looks through the
directories in PATH one by one searching for the commands until it is found. This can cause issues if
the wrong version is called

Processes

08 October 2019   10:12

Applications are referred to as processes

Running applications are managed by the kernel

When you login, you interact with a continuously running login process. When you enter your details, a new processes is created which exists for the duration of the session. From here, applications are opened which begin more processes. This creates a tree like structure of processes

Every process has standard attributes
- A process ID number (PID)
- Input and output streams, where each one is numbered

Streams are:
- Standard input stream (stin no.0)
- Standard output stream (stdout no.1)
- Standard error stream (stderr no.2)

Input
Use a < symbol to redirect data
e.g. MyScript < f takes data from f
You can redirect input to a script using a 'here' document
e.g.
MyScript << end
<lines of input go here>
end

Output
MyScript 1> OUTPUT 2>ERR will redirect the output stream of the script to file OUTPUT and the error stream will be redirected to ERR

Ps will show processes
Top will show activity associated with each currently running process
Kill <id> (-9 or –KILL flag) will kill processors

A job is a process directly under the control of the shell
A job can run in the foreground or background
Every job is a process but not every process is a job

PIpes
A pipe connects the output of process A to the input of process B

& is used to run a command in the background e.g. date & creates a new job and runs it in the background

Shell Scripting

15 October 2019   10:09

PATH
Indicates the directory location used by the shell to locate executable files

Export (Variable Scope)
If a process generates a subprocess, the variables known to the parent process may not be known to the child process. The EXPORT command will make them known

Exit Status
Every process returns an exit status when it terminates
The exit command is an int
0 = success
1-255 = failure
Variable ? Stores the exit status, use echo $? To print

Scripts
Sequence of statements which can take arguments

Sh myscript
Sh myscript arg1 arg2

Override command interpreter with #! New line e.g. to use z-shell #!/bin/zsh

IF
e.g.
If ls;
Then x;
Else y;
Fi

More Syntax
ListA && ListA
If listA successful, execute listB

The or symbol (||) is used to execute B if A is unsuccessful

If [[true]]

While [["$ANSWER" = "Hello"]]
Do
Done

$# - num args
$1 – 1st arg
$2 – 2nd arg
~$* - all args one string
~$@ - all args many strings

Profession

BCS Code Of Conduct duties:
- Public Interest – regard for health, privacy, security, environment
- Professional Competence and Integrity – only perform services within competence, develop knowledge continually
- Duty to Relevant Authority – Avoid conflict of interest, carry out responsibilities with due care and diligence
- Duty to the Profession – Uphold the reputation of the profession, seek to improve professional standards

Professional Bodies e.g. the BCS, General Medical Council, reserve titles, and reserve functions e.g. surgery.
Only accessible via qualifications, license, or membership of a professional body

CPD
- A documented process
- Self-driven and directed
- Learning through experience, reflective learning and review
- Guides development goals and objectives
- Formal and informal learning

Legal Entities
An individual, company or organisation that has legal rights and obligations
Individuals, government, companies, schools, charities, partnerships

Corporation
- Separate from owners
- Royal Charter (e.g. UoW)
- Act of parliament
- Companies act (limited company)
- Owners (stockholders have limited liability)

Limited Companies

PLC
Can sell shares to general public – shares and bonds
Stocks traded on stock exchange
 Must adhere to regulations and reporting standards
Can be vulnerable to takeover

LTD
Can sell shares to private investors or venture capitalists
Stocks traded between investors
Less regulations - <$10million < 500 shareholders

Two documents are created when a company is created

Memorandum of Associations

- Name, office, country
- Company activities specified
- Liability clause
- Share capital
- Declaration of association
- The Companies Regulation 2008

Articles of Association
- Rules for how business is constructed
- Sale of shares
- Memberships of board of directors
- Board meetings
- Directors terms of office
- Directors powers
- Dividends

Structuring Principles
Structured by:
- Function
- Location
- Product
- Service Products
- Technology

Copyright

28 October 2019   09:15

Copying Is defined as any form of replication including reproduction, downloadin
Names and titles excluded
Berne convention – 50 (now 70) years after death of last author
Database rights – 15 years

Copyright is transitive – secondary infringements are when someone copies a copy – they are still liable
Companies would include deliberate errors to catch copies
Copying software does not mean 'line by line' but business logic is not protected

Open Source
Software is still copyright but it is licensed by the author under certain circumstances
Software backup is allowed
De-compilation to correct errors is allowed
De-compilation to discover how to interoperate with a program is allowed
You can sell your license
International body WIPO trying to regulate open source copyright
There are issues in the USA – Digital Millennium Copyright Act DMCA
- Trying to circumvent copyright is now a criminal offence

2014 Changes
Extends exceptions to include
- Archiving and preserving all media types
- Data analysis
- Research and education
- Quoting for parody
- Private use
- Accessible copies for disables

EU Copyright Directive
15th April 2019
- Requires websites to obtain a license from publishes to link to news stories on their site
- Requires platforms obtain licenses for content e.g. music and video

Trade Marks and Design
Trade Mark is a distinctive name (sign, image, logo, icon). Design refers to visual appearance

Issues are dealt with by the Intellectual Property Office

Trade Marks Act came into effect in 1994

There is automatic protection ™ but registration ® is advisable

Patents
Temporary right to exploit an invention usually for 20 years
Stronger than copyright
In Europe, a patented invention must be
- New

- Involving a non-obvious inventive step
- Capable of industrial application
- Not in an excluded area

Disclosure before applying for a patent invalidates a patent
A patent must be registered at the IPO

Case Study: Apple vs Samsung
Long running dispute over whether Samsung copied the iphone
Started in 2011 with Samsung ordered to pay $1bn

Digital Rights management
Technology to prevent copying and sharing of software e.g. music
Technology for protecting digital rights includes
- Product keys
- Limited number of active installations
- Persistent online authentication to check still authorised

Case Study: XBox One
Microsoft initially planned to restrict the sharing of games and require daily online authentication

Reveal of the console in 2013 prompted huge backlack and damaged reputation
Microsoft reversed its plans

Confidential Information
Difficult to enforce
Contractual terms and conditions can enhance protection – e.g. NDA's

Privacy

1. Case Study – TalkTalk October 2015
2. Case Study – Facebook 2015
   50 million accounts compromised by attackers who stole access tokens which allowed them to sign in to accounts without needing passwords

The Solution

EU Data Protection Directive
EU General Data Protection Regulation

Personal Data

Data stored and processed about a data subject
Not just computerised records – any information
Processing includes collection, recording, organisation and storage

Technical Terms

Information Commissioner – the company or person given the charge of data handling
Processing

Jurisdiction and Enforcement

Applies to any organisation anywhere in the world if data are collected relating to any EU resident
Any company that handles large amounts of data must have a Data protection Officer. This is required for all public authorities, all entities involved with regular and systematic monitoring of data subjects on a large scale, and al entities conducting large scale processing of special categories of personal data e.g. race/origin/age/name/address

Risk Based Approach

Privacy impact assessments must be made if appropriate focussing on protecting data subjects rights.
Application of practical techniques e.g. pseudonymisation

Penalties

A) data breaches up to 10m or 2% of global gross revenue
B) Violations of obligations and legal justification up to 20m or 4% of global gross revenue

GDPR Principles
- Processing personal data must be lawful fair and transparent
  ○ Necessary for performance of a contract
  ○ Legal obligation
  ○ Vital interests of a data subject
  ○ Public interest of official authority
  ○ Consent of data subject
  ○ Legitimate interests

- Purpose must be legitimate
- Personal data must be adequate, relevant and not excessive

- Personal data must be accurate and kept up to data
- Personal data must be kept for no longer than is necessary
- Personal data must be processed in a secure manner
- The controller is accountable

Consent must be:
- Freely given
- Specific
- Informed
- Unambiguous
- Demonstrable
- Legitimate interests

Exemptions
- Taxations
- Self-incrimination
- Immigration
- Journalism
- Research
- Parliamentary privilege
- Social work data
- Health data
- Exam scripts and marks

Rights
- Access within 1 month
- Right to rectification
- Right to erasure
- Right to restriction of processing
- Right to data portability
- Right to object and automated decision-making

Profiling
- Automated processing to determine personal criteria e.g. health economic reliability
- Right not to be a subject of profiling if it has legal effect
- Not yet 100% clear in legal terms e.g. personalised advertising

Freedom Of Information

19 November 2019   10:43

Freedom of information act 2000
covers all public bodies in the UK
Extends definition of data in Data Protection act 1998 to include unstructured records

Changes need to know to right to know

Refers to non-personal data

Requests

By email
Response must say if the information exists and if it does, must give it
Fee may be charged
Time limit of 20 working days

Exemptions

Absolute
- Security services
- Trade secrets
- Court records
- Vexatious requests

Qualified
- Subject to prejudice test
- Crime detection
- Public interest

Data Protection overrides Freedom of Information Access Rights

Issues with Freedom of Information
Data matching – when two organisations both protect data but should share them eg. Social security and HMRC records
Government Overrule
Credit Agencies
DNA databases
Cross-border data – different countries sharing data

Computer Misuse

CMA is not a regulation relating to data protection

1) Unauthorised access
Any unauthorised access – switching on, using any data / programs
Such that access is knowingly unauthorised
No damage necessary £5,000 / 2 year imprisonment

2) Unauthorised access with intent
To commit or facilitate commission of further offences
Intent to commit a crime
Not necessary to prove any offence

3) Unauthorised Modification
Acts with intent to impair the operation of the computer
Acts which impair access to a program
Designed to target worms and viruses

Section 3ZA covers serious offences and holds a 14 year maximum sentence

Police and Justice Act 2006
Amends the misuse act
- Fixes DOS attacks with 'intent to impair operation'
- Increases penalties for hacking
- Makes unauthorised access extraditable
- Criminalises the use of tools which are used for offences

Regulation of Investigatory Powers 2000

Specifies what can be done by authorities

Monitoring
- Systems can be monitored under certain circumstances
- Ensure standards are met
- Ensure criminal activity is not being carried out
- Effective system use
- Detect unauthorizes use
- Monitor phone lines (but not record)

Interception
- Illegal by a 3rd party (excluding government security agencies)
- Requires a warant
- Reasons include national security and crime

Scrutiny
Report written each year to document misuse
Tribunal exists to hear complaints
Commissioners check the powers under the act

2016 RIPA Act