

Introduction to the Use of Computers

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Autumn 2012, Fridays: 10:00–12:00: WTA & 15:00–17:00: WHB 300

Course Information

Administrative matters

- ▶ Course website:
<http://doc.gold.ac.uk/~mas01cr/teaching/is50004a/>
- ▶ My e-mail address: c.rhodes@gold.ac.uk
- ▶ Feedback and Consultation hours:
 - ▶ Mondays, 10:00-11:00 and Wednesdays, 09:00-10:00
 - ▶ Use phone for entry to BPB 2nd floor (x7851)
- ▶ Lectures: Friday, WTA, 10:00–12:00
- ▶ Lab sessions: Friday, WB300, 15:00–17:00

Course Information

Course Materials

- ▶ Lecture materials
 - ▶ slides: on course website *after* the lecture;
 - ▶ lab sheets: on course website; annotated version one week later;
 - ▶ your own notes.
- ▶ Past examination papers
 - ▶ (soon) available at course website;
 - ▶ please save last year's paper for revision lectures.

Course Outline

Syllabus

- ▶ Department and College Computing Facilities
- ▶ **Data storage:** files, folders and directories, drives; storage media, units; text encodings
- ▶ **Binary representations:** integers, arithmetic, Boolean logic; logic gates, implementation of arithmetic circuits; floating point representation
- ▶ **Computer components:** CPU and program execution; RAM and the memory hierarchy
- ▶ **Operating systems:** kernels and shells
- ▶ **Networking:** layered descriptions; network topologies; Ethernet and IP addressing; example Internet protocols; HTML and Web servers
- ▶ **Computers and the law:** use and misuse; data protection; encryption; online communications

Course Outline

Assessment

Two assignments (10% each of the total course mark):

- ▶ one given out in early November (deadline: late November);
- ▶ one given out at the end of term (deadline: mid January);

One three-hour written exam (30%):

- ▶ sample and past papers (soon) on the course website.

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Study skills half-module (50%)

Course Outline

Reading List

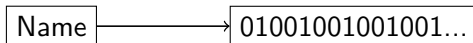
- ▶ * J. Glenn Brookshear, *Computer Science: An Overview* (Addison Wesley)
- ▶ William Gibson, *Neuromancer*
- ▶ David Goldberg, *What Every Computer Scientist Should Know About Floating Point Arithmetic*
- ▶ Laurence Lessig, *Code v2.0* (Basic Books)
- ▶ Laurence Lessig, *Free Culture* (Penguin)
- ▶ Peter Seibel, *Coders at Work* (Apress)
- ▶ * William Stallings, *Computer Organization and Architecture* (Pearson)
- ▶ Neal Stephenson, *Cryptonomicon*
- ▶ Neal Stephenson, *Snow Crash*
- ▶ * Ron White and Tim Downs, *How Computers Work* (QUE)

Filesystem concepts

Files

Files...

- ▶ are an abstraction for persistent storage of data;
- ▶ contain information represented by a sequence of binary integers;
- ▶ have names, which can be used to retrieve the contents of the files;

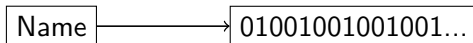


Filesystem concepts

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Some systems have restrictions on file **names**:

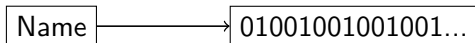
- ▶ DOS, early Windows: 8 characters in name (+ 3 'extension')
- ▶ Mac OS 9 (and earlier): no ':' in names

Filesystem concepts

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Typical current restrictions:

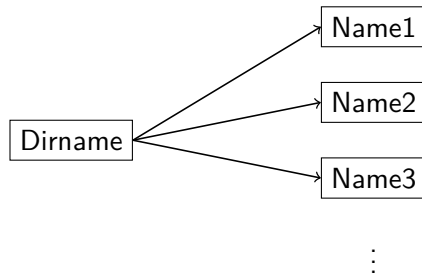
- ▶ names no longer than 255 characters;
- ▶ names may not contain '/' character.

Filesystem concepts

Folders

Folders...

- ▶ are an abstraction representing collections of files;
- ▶ contain a set of files and folders;

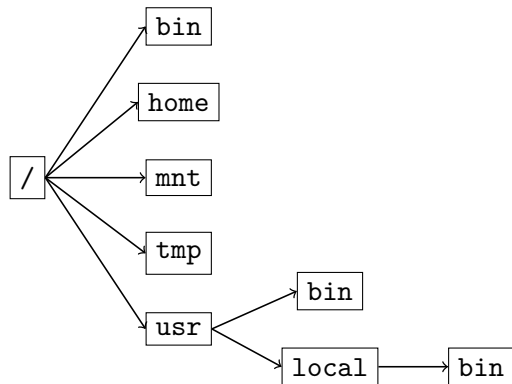


A file on a filesystem is uniquely identified by its file name **and** its directory.

Filesystem concepts

Directories: Unix layout

Unix directory layout:

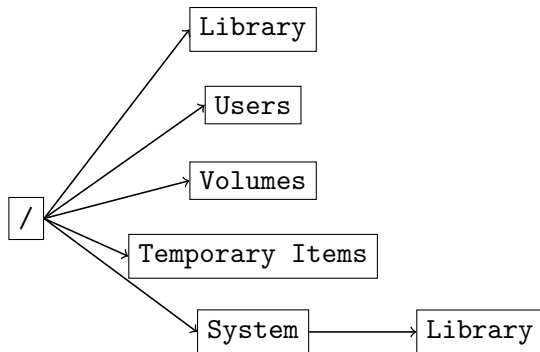


A file named `firefox` in the directory `bin` inside the directory `usr` just below the root directory is identified by `/usr/bin/firefox`.

Filesystem concepts

Directories: Mac OS X layout

Mac OS X directory layout:



Filesystem concepts

Drives

Drives...

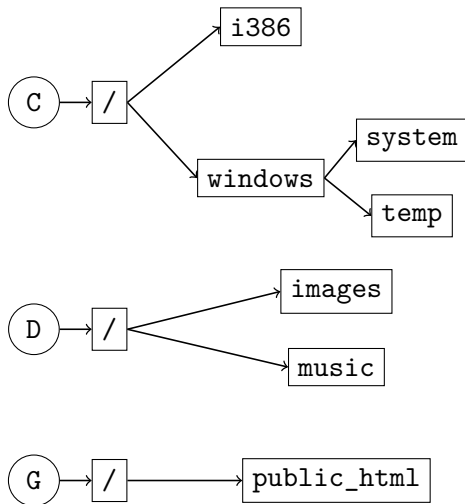
- ▶ are an abstraction representing storage devices attached to the computer;
- ▶ have a label corresponds to one device;
- ▶ can represent physical devices (e.g. Hard disk, optical disk, USB key) and virtual devices (e.g. file server accessed over the network);
- ▶ are only used on Windows operating systems.

Each drive has a distinct root directory.

Filesystem concepts

Drives and Directories: Windows layout

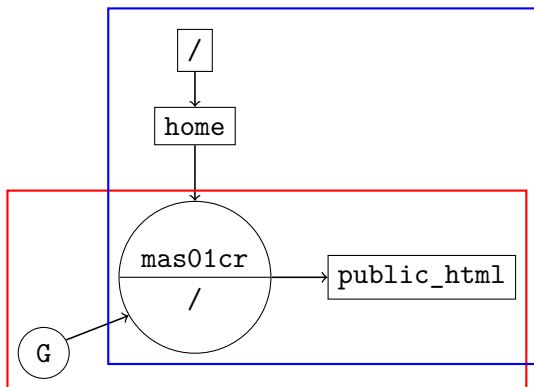
Windows directory layout:



Filesystem concepts

Network Filesystems

Filesystems can be shared across networks. For example, files can be stored on a Unix fileserver and shared to a Windows desktop:



Filesystem concepts

Organizing files and folders

Essential question:

- ▶ how to find data you care about?

Filesystem concepts

Organizing files and folders

Essential question:

- ▶ how to find data you care about?
- ▶ how to make it *easy* to find data you care about?

Filesystem concepts

Organizing files and folders

Essential question:

- ▶ how to find data you care about?
- ▶ how to make it *easy* to find data you care about?
- ▶ how to make sure you can always find data you care about?

Filesystem concepts

Organizing files and folders

Essential question:

- ▶ how to find data you care about?
- ▶ how to make it *easy* to find data you care about?
- ▶ how to make sure you can always find data you care about?
- ▶ how to make sure that you don't get distracted when you're looking for data?

Filesystem concepts

Organizing files and folders

How to find data you care about?

- ▶ a file is uniquely identified by its name and its folder...
- ▶ ...so, if you know these, you can ask the computer to open the file.

Filesystem concepts

Organizing files and folders

How to make it easy to find data you care about?

- ▶ remembering arbitrary file names and folders names is hard;
- ▶ choose sensible ones!
 - ▶ keep related files in the same folder;
 - ▶ organize folder hierarchy in some way; for example:
 - ▶ root level: separate out work, study, personal
 - ▶ collect files by task, or course, or time period

Filesystem concepts

Organizing files and folders

How to make sure you can always find data you care about?

- ▶ sometimes, computer systems fail;
- ▶ failure can be temporary (e.g. network outage) or permanent (disk drive loss or destruction)
- ▶ back up important data:
 - ▶ have copies of data on different physical disks;
 - ▶ make copies of data on different disks in multiple locations;
 - ▶ make backing up data a part of your routine.

Filesystem concepts

Organizing files and folders

How to make sure you don't get distracted when you're looking for data?

- ▶ start looking in a sensible place;
- ▶ as files age, look to *archive* them
 - ▶ collections of files stop being accessed after a while;
 - ▶ if left, they continue taking up space (physical and cognitive);
 - ▶ collections can be compressed and placed in a separate file storage location (archived);
 - ▶ can be found if necessary, but don't get in the way.

Filesystem concepts

Operations on files and folders

- ▶ Create;
- ▶ Rename;
- ▶ Move;
- ▶ Copy, (Link);
- ▶ Delete.

Filesystem concepts

Operations on files and folders

Create:

- ▶ in file managers, right-click (or ⌘-click)→New
- ▶ in applications, File→Save
- ▶ conventionally:
 - ▶ file names have 'extensions' after a dot to indicate the kind of file;
 - ▶ directory names do not have extensions.

Filesystem concepts

Operations on files and folders

Rename:

- ▶ in file managers, right-click (or ⌘-click)→Rename
- ▶ in the DOS shell, use the 'move' command
- ▶ in the OS X or Unix shells, use the 'mv' command
- ▶ useful because
 - ▶ don't need to choose the perfect name to start off;
 - ▶ as file contents change, so can the name.

Move:

- ▶ move file or folder to a new location;
- ▶ in file managers right-click (or ⌘-click)→Move To
- ▶ no distinction between rename and move in the shells;
- ▶ for when sensible organization of files changes.

Filesystem concepts

Operations on files and folders

Copy:

- ▶ copies file contents to a new name and folder location;
- ▶ can be applied recursively to copy folder hierarchy contents;
- ▶ after copy operation, the original and new copies are independent.

Link:

- ▶ not (normally) possible on Windows filesystem ;
- ▶ in file managers, C-S-<drag> or Alt-⌘-<drag>;
- ▶ in the OS X or Unix shells, use the 'ln' command;
- ▶ effectively allows one file in two locations.

Filesystem concepts

Operations on files and folders

Delete:

- ▶ for when files or folders are no longer useful;
- ▶ from a file manager, use the <Delete> or <Backspace> keys;
- ▶ often a Rubbish Bin / Recycle Bin / Trash stage before full deletion;
- ▶ from the shells, use the 'del' or 'rm' commands (NB: usually no safety net at the shell).

Character Sets and Encodings

ASCII

ASCII: American Standard Code for Information Interchange

```
!"#$%&'()*+,-./0123456789:;<=>?  
@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^_  
`abcdefghijklmnopqrstuvwxyz{|}~
```

+ 33 non-printing characters

Character Sets and Encodings

ASCII

ASCII: American Standard Code for Information Interchange

- ▶ 0–9: 0x30–0x39
- ▶ A–Z: 0x41–0x5A
- ▶ a–z: 0x61–0x7A
- ▶ + punctuation and ‘control characters’:
 - ▶ CR: 0x0D
 - ▶ LF: 0x0A
 - ▶ SPC: 0x20

Character Sets and Encodings

ASCII



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Character Sets and Encodings

ASCII

ASCII printing characters:

20	21	22	23	24	25	26	27	28	29	2a	2b	2c	2d	2e	2f
	!	"	#	\$	%	&	'	()	*	+	,	-	.	/
30	31	32	33	34	35	36	37	38	39	3a	3b	3c	3d	3e	3f
0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
40	41	42	43	44	45	46	47	48	49	4a	4b	4c	4d	4e	4f
@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
50	51	52	53	54	55	56	57	58	59	5a	5b	5c	5d	5e	5f
P	Q	R	S	T	U	V	W	X	Y	Z	[\]	^	_
60	61	62	63	64	65	66	67	68	69	6a	6b	6c	6d	6e	6f
`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
70	71	72	73	74	75	76	77	78	79	7a	7b	7c	7d	7e	
p	q	r	s	t	u	v	w	x	y	z	{		}	~	

Single-byte encoding

Character Sets and Encodings

ASCII: Hello, World!

48 65 6c 6c 6f 2c 20 57 6f 72 6c 64 21

Character Sets and Encodings

ASCII: Hello, World!

```
48 65 6c 6c 6f 2c 20 57 6f 72 6c 64 21  
H e l l o ,   W o r l d !
```

Character Sets and Encodings

ASCII: Hello, World! (HTML version)

3c 68 74 6d 6c 3e 3c 68 65 61 64 2f 3e 3c 62 6f

64 79 3e 3c 70 3e 48 65 6c 6c 6f 2c 20 57 6f 72

6c 64 21 3c 2f 70 3e 3c 2f 62 6f 64 79 3e 3c 2f

68 74 6d 6c 3e

Character Sets and Encodings

ASCII: Hello, World! (HTML version)

```
3c 68 74 6d 6c 3e 3c 68 65 61 64 2f 3e 3c 62 6f
< h t m l > < h e a d / > < b o
64 79 3e 3c 70 3e 48 65 6c 6c 6f 2c 20 57 6f 72
d y > < p > H e l l o , W o r
6c 64 21 3c 2f 70 3e 3c 2f 62 6f 64 79 3e 3c 2f
l d ! < / p > < / b o d y > < /
68 74 6d 6c 3e
h t m l >
```

Character Sets and Encodings

ASCII: Hello, World! (Postscript version)

2f 54 69 6d 65 73 20 32 30 20 73 65 6c 65 63 74

66 6f 6e 74 20 37 32 20 35 30 30 20 6d 6f 76 65

74 6f 20 28 48 65 6c 6c 6f 2c 20 57 6f 72 6c 64

21 29 20 73 68 6f 77 20 73 68 6f 77 70 61 67 65

Character Sets and Encodings

ASCII: Hello, World! (Postscript version)

```
2f 54 69 6d 65 73 20 32 30 20 73 65 6c 65 63 74  
/ T i m e s      2 0      s e l e c t  
66 6f 6e 74 20 37 32 20 35 30 30 20 6d 6f 76 65  
f o n t      7 2      5 0 0      m o v e  
74 6f 20 28 48 65 6c 6c 6f 2c 20 57 6f 72 6c 64  
t o      ( H e l l o ,      W o r l d  
21 29 20 73 68 6f 77 20 73 68 6f 77 70 61 67 65  
! )      s h o w      s h o w p a g e
```