

Lights, camera, action!

- Today
- More scripting
- Social impacts

"scripts" in computing come from scripts in the theater

David Notkin • Autumn 2009 • CSE303 Lecture 5

Scripts

- A script is program whose purpose is to run other programs
 - a series of commands combined into one file
 - bash (like most shells) has syntax for writing script programs
 - if your script becomes big, consider a "real" language
- To write a bash script (in brief):
 - type one or more commands into a file; save it
 - type a special header in the file to identify it as a script
 - enable execute permission on the file
 - run it!
- There are other scripting languages ... many others
 - JavaScript, Python, awk, sed, PHP, perl, ...

(Boring) Examples

```
echo "This is my amazing script!"
echo "Your home dir is: `pwd`"

clear
echo "Today's date is `date`, this is week `date +%V`."
# this is a comment - next line adds a blank line
echo

echo "These users are currently connected:"
w | grep -v USER | sort
echo

echo "This is `uname -s` on a `uname -m` processor."

echo "This is the uptime information:"
uptime
echo
echo "That's all folks!"
```

Shell variables

- **name=value** [declaration and assignment]
\$name [usage]
 - Must be written **EXACTLY** as shown; no spaces allowed
 - Convention is to use all-uppercase names
 - Variables have global scope by default
- **bash\$ BEARDAGE=34**
bash\$ NAME="David"
bash\$ echo \$NAME"'s beard is " \$BEARDAGE
 David's beard is 34

Common errors

- Misspelling a variable name creates a new variable
 - **NAME=David**
 - ...
 - **Name=Daniel # doesn't change NAME**
- Previously unnamed variables have an empty value
 - **bash\$ echo "Welcome, \$name"**
 - **Welcome,**
- Assigning a multi-word string requires quotes
 - **NAME="David Notkin"**
 - **NAME=David Notkin # what happens?**

Capture command output

- **variable=`command`**
 - assigns the output of command into the variable

```
bash$ FILE=`ls -l *.txt | sort | tail -n 1`
bash$ echo "Your last text file is: $FILE"
```

Special variables

variable	description
\$DISPLAY	where to display graphical X-windows output
\$HOSTNAME	name of computer you are using
\$HOME	your home directory
\$PATH	list of directories holding commands to execute
\$PS1	the shell's command prompt string
\$PWD	your current directory
\$SHELL	full path to your shell program
\$USER	your user name

– Automatically defined for you in every bash session

if/else

```
if [ test ]; then # basic if
    commands
fi

if [ test ]; then # if / else if / else
    commands1
elif [ test ]; then
    commands2
else
    commands3
fi
```

There **MUST** be a space between `if` and `[` and between `[` and `test` since `[` is actually a shell command, not just a character

Testing commands

shell command	description
=, !=, <, >	compares two string variables
-n, -z	tests whether a string is or is not empty (null)
-lt, -le, -eq, -gt, -ge, -ne	compares numbers: <, <=, ==, >, >=, !=
-e, -d	tests whether a given file or directory exists
-f, -w	tests whether a file exists and is read/writable

```
if [ $USER = "notkin" ]; then
    echo "Nice beard!"
fi

LOGINS=`w | wc -l`
if [ $LOGINS -gt 10 ]; then
    echo "attu is very busy right now!"
fi
```

Command-line arguments

variable	description
\$0	name of this script
\$1, \$2, \$3, ...	command-line arguments
\$#	number of arguments
@	array of all arguments

```
if [ "$1" = "-r" ]; then
    echo "Running in special reverse format."
fi

if [ $# -lt 2 ]; then
    echo "Usage: $0 source destination"
    exit 1 # exit the script, error code 1
fi
```

Whence?

- To promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries

US Constitution: Article I, Section 8

USPTO on patents (variations worldwide)

- "A patent for an invention is the grant of a property right to the inventor, issued by the United States Patent and Trademark Office. ... The right conferred by the patent grant is ... 'the right to exclude others from making, using, offering for sale, or selling' the invention in the United States or 'importing' the invention into the United States."
- "Utility patents may be granted to anyone who invents or discovers any new and useful process, machine, article of manufacture, or composition of matter, or any new and useful improvement thereof."

USPTO on servicemarks

- “A trademark is a word, name, symbol, or device that is used in trade with goods to indicate the source of the goods and to distinguish them from the goods of others. A servicemark is the same as a trademark except that it identifies and distinguishes the source of a service rather than a product.”
- “Trademark rights may be used to prevent others from using a confusingly similar mark, but not to prevent others from making the same goods or from selling the same goods or services under a clearly different mark.”

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USPTO on copyright

- “Copyright is a form of protection provided to the authors of ‘original works of authorship’ including literary, dramatic, musical, artistic, and certain other intellectual works, both published and unpublished. The 1976 Copyright Act generally gives the owner of copyright the exclusive right to reproduce the copyrighted work, to prepare derivative works, to distribute copies ...
- “The copyright protects the form of expression rather than the subject matter of the writing. For example, a description of a machine could be copyrighted, but this would only prevent others from copying the description; it would not prevent others from writing a description of their own or from making and using the machine. Copyrights are registered by the Copyright Office of the Library of Congress.”

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Intellectual property

- Overall, the intent is to encourage ingenuity and protect those in creative ventures, with the goal of promoting innovation for society
- The intent is to encourage creativity – not to create monopolies
- And remember, I'm not an attorney, nor do I play one in the classroom

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Focusing on copyright: software

- Roughly, the owner of a copyright controls the “right to copy” whatever is copyrighted
 - Copying to a hard drive
 - Copying into memory
 - Sending a copy over a network
 - ...
- This wasn't always true, which in part led to the development of EULAs – in most cases one licenses the right to use software rather than actually buying the software
 - There are legal disputes over the differences

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Fair use: Copyright Law (1976)

- “[T]he fair use of a copyrighted work ... is not an infringement of copyright. In determining whether the use made of a work in any particular case is a fair use the factors to be considered shall include:
 - the purpose and character of the use, including whether such use is of a commercial nature or is for nonprofit educational purposes;
 - the nature of the copyrighted work;
 - the amount and substantiality of the portion used in relation to the copyrighted work as a whole; and
 - the effect of the use upon the potential market for or value of the copyrighted work.”

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Reverse engineering (software)

- Taking apart something to see how it works
- In software, this usually means converting from object code to source code
- As reverse engineering is based on a copy of a piece of software, it is almost always in violation of copyright unless the right to do so is explicitly granted
- However, if decompilation is needed to attain interoperability, US and European copyright laws permit it in some cases
 - One US example allowed a company to decompile to get around a software locking mechanism for a Sega game console

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Europe: 1991 Software Directive

- Explicit right to decompile for interoperability only if:
 - The program must be properly licensed
 - Decompilation must be necessary and the burden is on the decompiler to show that manuals, API documents, etc. are insufficient
 - The process must be as confined as much as possible to the parts relevant to interoperability.
 - Decompiled information may only be used for the specific interoperability purpose and may not be shared

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Proprietary licenses

- For proprietary software licenses is the software publisher grants a license to use copies of software
- Ownership of those copies stays with the software publisher, thus reserving for the owner almost all rights and granting only a limited set of rights to the end-user.
- Without accepting the license, the end-user may generally not use the software at all

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Free Software Foundation

- "Free software is software that gives you the user the freedom to share, study and modify it. We call this free software because the user is free. ...
- "Currently, many people use proprietary software that denies users these freedoms and benefits. If we make a copy and give it to a friend, if we try to figure out how the program works, if we put a copy on more than one of our own computers in our own home, we could be caught and fined or put in jail. That's what's in the fine print of the license agreement you accept when using proprietary software.
- "The corporations behind proprietary software will often spy on your activities and restrict you from sharing with others. And because our computers control much of our personal information and daily activities, proprietary software represents an unacceptable danger to a free society."

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Free software licenses

- These are licenses that are substantially consistent with the GNU GPL and other similar licenses
- The owner retains ownership
- The license grants all rights except the right to sell or license it on different terms (roughly, this is copyleft)
 - The intent is the perpetuation of free use of software.
 - Commercial licensing for a profit is also prohibited
- The end-user may use the software without accepting the license – only when additional rights are desired must the end-user accept and be bound to the license terms

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Licenses approved by the OSI

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| 3. Adaptive Public License | 23. GNU General Public License version 3.0 (GPLv3) |
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| 5. Apple Public Source License | 25. GNU Library or "Lesser" General Public License version 3.0 (LGPLv3) |
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| 43. Open Group Test Suite License | 62. zlib/libpng license |
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| 55. Sybase Open Watcom Public License 1.0 | |
| 56. University of Illinois/NCSA Open Source License | |
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| 58. W3C License | |

OSI's criteria for an open source license

1. Free Redistribution
2. Source Code
3. Derived Works
4. Integrity of The Author's Source Code
5. No Discrimination Against Persons or Groups
6. No Discrimination Against Fields of Endeavor
7. Distribution of License
8. License Must Not Be Specific to a Product
9. License Must Not Restrict Other Software
10. License Must Be Technology-Neutral

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Differences: many and subtle

- Two key distinctions among licenses characterize whether they can
 - link from code with a different license
 - release changes under a different license
- FSF, Fedora, DFSG also have approval processes for identifying free and/or open licenses – and there are significant differences in which licenses have been approved by each organization

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Patent retaliation

- Most free licenses now include patent retaliation clauses
- These clauses are intended to ensure that rights granted under the license may be terminated if a user attempts to enforce specific patent monopolies
- Free software cannot license patents that have non-zero per-copy fees
 - There is no way to know how many copies are made
 - Additional requirements to pay/notify someone each time a copy is made would take it out of the free software realm

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DRM and Tivoization

- The Digital Millennium Copyright Act (1998) makes it illegal to produce and disseminate technology with the primary intention of violating the rights of copyright holders by circumventing technical copy-restriction mechanisms
- TiVo's software uses the Linux kernel and GNU software, both licensed under GPLv2, which requires distributors to make the corresponding source available to each person who receives the software
- Also, TiVo's products only run programs if the program's digital signatures authorized by TiVo.

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Did TiVo comply with the license?

- Stallman believes TiVo violate the license because it is not the case that any modified software will run on TiVo's hardware
- Torvalds believes it is appropriate for TiVo to use digital signatures to limit what software may run on their systems that they sell as a security tool.
 - He believes that software licenses should control only software, not the hardware on which it runs – as long as one has access to the software and can modify it to run on some other hardware,
- FSF's GPLv3 is intended to allow private digital signatures for security, but to still prevent Tivoization.

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License compatibility (wikipedia)

- One license says "*modified versions must mention the developers in any advertising materials*"
- Another says "*modified versions cannot contain additional attribution requirements*"
- These two packages would be license-incompatible

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License proliferation (wikipedia)

- License proliferation compounds the problems of license incompatibility.
- It likewise burdens software developers and distributors by increasing the amount of legal documents they must read.
- License proliferation gained momentum during the late 1990s and increased into the early 2000s.
- There is now some discouragement to producing new licenses

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Documentation licensed?

- FSF: no
- Debian: yes

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General comments

- The devil is in the details of the licenses
- Even more, the devil is
 - in the management of the licenses and
 - in the processes that are needed to protect individuals, companies, etc. in the face of software from diverse sources
- Understanding ones' long-term goals and intentions with respect to software is crucial as part of making good decisions

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Questions?

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