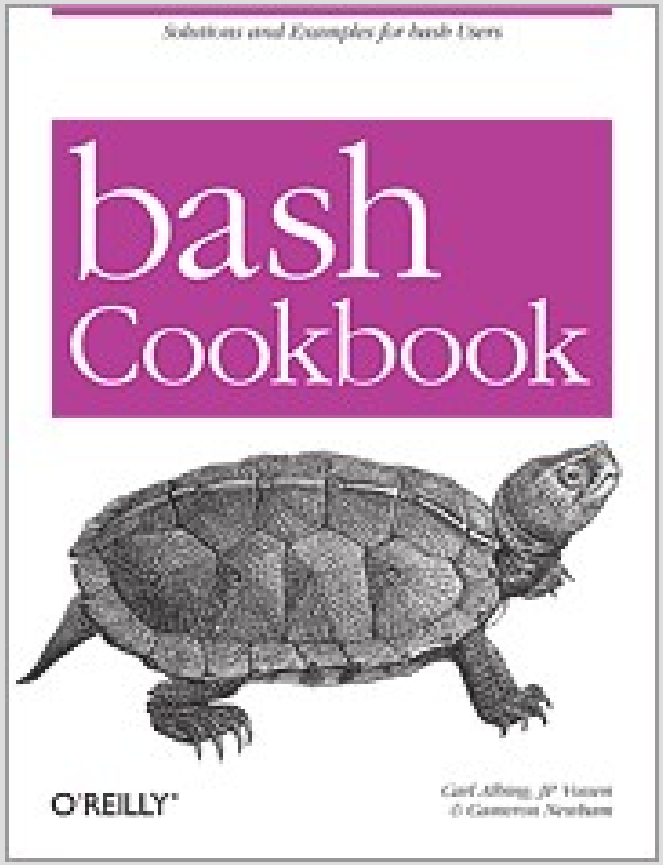
bash: Secure (bash) Shell Scripts

PLUG North
2009-03-09

PLUG West
2009-03-16

JP Vossen
bashcookbook.com



Secure? Really?

- How can shell scripts be secure when you can read the source code?

- Security by obscurity
  - OpenSSH vs. Windows

- Do what they should
- Not what they shouldn't
- Robust and fail gracefully
- Sanitize input
- Documented

Shebang! [14.2]

- If #! Kernel looks for interpreter
- Linux kernel accepts a single argument; BSD & Solaris accept more

- #!/bin/bash -
  - A bit more secure, a bit less portable

- #!/usr/bin/env bash
  - Uses *$PATH*!

- Details: http://www.faqs.org/faqs/unix-faq/faq/part4/section-7.html

$PATH [14.3,10 15.2]

- Hard-code at top of script
  - Helps for cron
- Don't add the current dir '.' to $PATH
  - But why?
  - DOS/Windows
- POSIX $PATH
  - $PATH=$(getconf PATH)
  - $PATH=`getconf PATH`
  - export?

Aliases [14.4]

- \ prefix prohibits alias expansion
  - Why?
- Examples
  - \cd
  - \unalias -a
- 'help unalias'

Limits [14.6]

- ulimit -H -c 0 –
  - -H = hard limit
  - -c 0 = no core dumps
  - – = end of options

- Why?
- 'help ulimit'

Command Hash [14.5]

- hash -r
  - -r = “reset” or clear

- Why?
- 'help hash'

$IFS [14.7]

- $IFS=$' \t\n'
  - Not portable; bash and ksh93 only
  - $*, ${!@}, ${!*}, parameter expansion, and programmable completion all use the **first** character of $IFS.

Breakable:

- IFS='∘→¶
  '

Unexpected:

- IFS='¶
  ∘→'

umask [14.8]

- Sets default file and directory creation permissions
- This is a **mask**!
  - 002 = 0774
  - 077 = 0700
  - etc.
- umask 002

“temp” dirs [14.11]

- Yuck:
  - mktemp
  - /dev/urandom

- $RANDOM is great. But not in dash! :-(
- temp_dir=“prefix$RANDOM$RANDOM”
- Why make a “temp” **directory**?
  - mkdir -m 0700

- Examples tarball: make_temp

Cleaning up [14.11,23 17.7]

- trap
  - trap "rm -rf $temp_dir" ABRT EXIT HUP INT QUIT
- ~/.bash_logout
  - clear
- Disconnecting inactive sessions
  - SSH: “IdleTimeOut”, but not in OpenSSH
  - Bash: $TMOUT <seconds>
  - X screen saver

World-writeable Dirs [14.9]

- Examples tarball: chkpath.2

```
exit_code=0
for dir in ${PATH//:/ }; do
    [ -L "$dir" ] && printf "%b" "symlink, "
    if [ ! -d "$dir" ]; then
        printf "%b" "missing\t\t\t\t"
        (( exit_code++ ))
    else
        stat=$(ls -lHd $dir | awk '{print $1, $3, $4}')
        if [ "$(echo $stat | grep '^d.......w. ')" ]; then
            printf "%b" "world writable\t$stat "
            (( exit_code++ ))
        else
            printf "%b" "ok\t\t$stat "
        fi
    fi
    printf "%b" "$dir\n"
done
exit $exit_code
```

Chkpath.2 Output

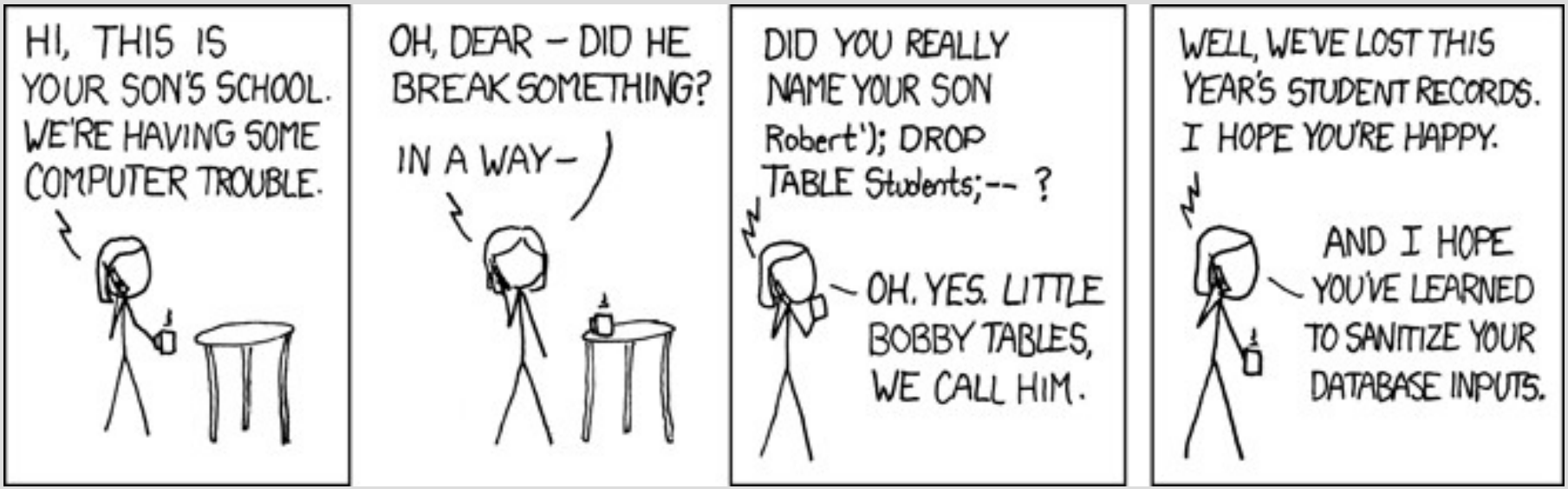
```
# ./chkpath ; echo $?
ok              drwxr-xr-x root root /usr/local/sbin
ok              drwxr-xr-x root root /usr/local/bin
ok              drwxr-xr-x root root /sbin
ok              drwxr-xr-x root root /bin
ok              drwxr-xr-x root root /usr/sbin
ok              drwxr-xr-x root root /usr/bin
ok              drwxr-xr-x root root /usr/X11R6/bin
ok              drwx------ root root /root/bin
missing                              /does_not_exist
world writable  drwxrwxrwt root root /tmp
symlink, ok               drwxr-xr-x root root /root/sbin
2
```

Validating Input [14.12]

- Why?
  - Hint: e.g. SQL injection (http://xkcd.com/327/)

Can be tricky

  - Examples tarball: validate_using_case
  - http://www.bashcookbook.com/bashinfo/
    source/bash-4.0/examples/scripts/shprompt



Setting Permissions [14.13]

- chmod 0755 some_script
- chmod +x some_script

- $ find some_directory -type f -print0 \
  | xargs -0 chmod 0644 # File perms

- $ find some_directory -type d -print0 \
  | xargs -0 chmod 0755 # Dir. perms

Passwords [14.14,20]

- $ ./cheesy_app -u user -p password
  - ps auwx (on Linux, man ps for other OSs)
  - .bash_history
    - Leading space or *$HISTIGNORE*
  - -c <config file>

- Using in scripts
  - sudo with NOPASSWD
  - Maybe SSH
  - ~/.hidden/

setuid and setgid [14.15]

- OK for directories, since it means something different.
- Linux won't even allow setuid on shell scripts (portability problem).
  - You could do a C wrapper. Don't.
- Use sudo instead

Users [14.16,18,19,22]

- Non-root
  - Duh! Ubuntu does this well
- sudo
  - Also duh, but... man sudoers
  - Does **lots** more than you think!
- rbash Restricted shell in */etc/passwd*
  - No: cd, redirection, commands/source with /, exec, functions, set +r
  - Can't: change environment variables or built-ins
- SSH
  - *~/.ssh/authorized_keys* & “forced commands”
  - command="/bin/echo Command was: $SSH_ORIGINAL_COMMAND"

chroot [14.17]

- Mainframe VMs (since late 1960's!)
  - http://en.wikipedia.org/wiki/Virtual_machine_monitor
  - http://en.wikipedia.org/wiki/VM/CMS

Current VMs

  - VMware, VirtualBox, Xen, QEMU, etc.
- BSD jails
  - http://en.wikipedia.org/wiki/FreeBSD_jail
- Solaris 10+ “containers” or “zones”
  - http://en.wikipedia.org/wiki/Solaris_Containers
  - http://www.opensolaris.org/os/community/zones/faq/
- Linux chroot
  - Tricky, lame

Questions?

- http://examples.oreilly.com/bashckbk/
- [N.N] = Recipe numbers
- bashcookbook.com
- PLUG Mailing list
- jp@jpsdomain.org