

1.111.2 Tune the user environment and system environment variables Weight 3

Linux Professional Institute Certification — 102

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Outline

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1 Context

Topic 111 Administrative Tasks [21]

- 1.111.1 Manage users and group accounts and related system files [4]
- 1.111.2 **Tune the user environment and system environment variables [3]**
- 1.111.3 Configure and use system log files to meet administrative and security needs [3]
- 1.111.4 Automate system administration tasks by scheduling jobs to run in the future [4]
- 1.111.5 Maintain an effective data backup strategy [3]
- 1.111.6 Maintain system time [4]

2 Objectives

Description of Objective

Candidate should be able to modify global and user profiles. This includes setting environment variables, maintaining `skel` directories for new user accounts and setting command search path with the proper directory.

Key files, terms, and utilities include:

- `/etc/profile` — To export environment variables for all users when they log in using a `bash`, `sh`, or `ksh` (and other) shell
- `/etc/skel` — directory from which new home directories get a copy of files
- `env` — display environment variables, or run a command with a modified environment
- `export` — make environment variables available to commands
- `set` — display environment, or control operation of the `bash` shell
- `unset` — completely remove variables or functions from environment

3 What things can we set?

What things can we set?

PATH — a colon-separated list of directories that the shell should search to look for a command.

other environment variables — there are many, including the handy `export RSYNC_RSH=ssh`

aliases, functions — discussed in topic 1.109.1 Customize and use the shell environment

shell prompts — customise the shell prompt(s) `PS1,...` in `/etc/bashrc` or `/etc/bash.bashrc`

umask — determines the default permissions when you create a file

ulimit — places limits on resources; in particular: core file sizes

set — we can set various shell options with the built-in command `set`

3.1 Setting the PATH

Setting the PATH

- The PATH will have already been set with initial values:

Debian/Ubuntu in `/etc/login.defs`

Red Hat/Fedora in `/etc/profile`

– though on my system the PATH `/usr/local/bin:/bin:/usr/bin` exists when `/etc/profile` is sourced

- You need to *append* or *prefix* your existing PATH with other directories:

- append: `PATH="$PATH:/new/dir/bin"`

- prefix: `PATH="/new/dir/bin:$PATH"`

3.2 Prompts: PS1

Prompts: PS1

- The prompts you set go into `PS1`
- Set in `/etc/bashrc` or `/etc/bash.bashrc`
- Highly customisable
- At UNSW in mid 80's, I spent too much time making prompts that did somersaults or printed something quickly that immediately disappeared, to give subliminal messages.

– Depended on having a 2400 bps connection to a DEC PDP11 for the delay in animation

- In `$ man bash ↵`, search for `PROMPTING`
- There are also other prompts: `PS2, PS3, PS4`.

3.3 umask

umask

- Determines the default permissions of any file or directory you create
- Example: this in `/etc/bashrc` or `/etc/bash.bashrc`: `umask 022`
- ... ensures that any ordinary file will have permissions `-rw-r--r--`, a directory or compiled executable will have permission `-rwxr-xr-x`

3.4 ulimit

ulimit

- To see the limits you have: `$ ulimit -a ↵`
- Documentation: `$ help ulimit ↵`

4 export

export

- Every *environment variable* must be *exported* if other commands are to inherit its value
- A variable only needs to be exported once
- The default startup scripts will have exported `PATH`, unless something is strangely wrong
- In `bash`, we can export variables when we define them, or separately, so we can put:

```
export RSYNC_RSH=ssh
```

or

```
RSYNC_RSH=ssh
export RSYNC_RSH
```

5 Setting options in bash with set

Setting options in bash with set

- The bash builtin command `shopt` controls some bash options, but the exam doesn't ask about it.

– do `$ help shopt` ↔

- The builtin bash command `set` is also used to set many options in bash

- `$ set -o <option>` ↔

– ... turns *<option>* on

- `$ set +o <option>` ↔

– ... turns *<option>* off

bash options you can set with set

emacs or vi — choose whether you want emacs-like or vi-like editing of the command line.

history — enable/disable command history

- important for junior to use before viewing porn to avoid being sprung my mum or dad

noclobber — If set, disallow existing regular files to be overwritten by redirection of output.

- Override this setting with:

`$ command >| file-to-be-clobbered-regardless.txt` ↔

Quick Quiz

- Okay, junior wants to execute the command `$ xine -f porn-movie.wmv` ↔ without it going into `~/.bash_history`, where mum or dad might find it.
- What command should junior execute first?

6 Startup Scripts

6.1 The order in which bash executes scripts

login hash shell

- A *login shell* has '-' as the first character of the command name,

`$ ps o pid,user,cmd p $$` ↔

```
PID USER      CMD
8892 nickl    -bash
```

or has the option `--login`.

- When a *login shell* starts up, the following files are *sourced*:

- `/etc/profile`, if it exists
- it sources the first of these that it finds, searching for them in this order:
`~/.bash_profile`, `~/.bash_login`, `~/.profile`
- When the login shell exits, it sources `~/.bash_logout`, if it exists.

Interactive bash shell

- An *interactive shell* has standard input and error both connected to terminals
 - it is not being used to run a command such as `$ sh -c command` ↔ or `$ sh script.sh` ↔
- Behaviour is different on Fedora and Ubuntu systems (Why???)

Fedora/Red Hat — If the shell is not a login shell, then it will source `~/.bashrc`, if it exists.

Ubuntu/Debian — If the shell is not a login shell, then it will source both `/etc/bash.bashrc` and `~/.bashrc`, if each of them exists.

Noninteractive shells

- A non-interactive shell (e.g., one that has been started to execute a command) will source the file whos name is in the environment variable `BASH_ENV`

6.2 What Sources What

What sources what

- `~/ .bash_profile` sources `~/ .bashrc`
- `~/ .bashrc` sources `/etc/bashrc`
- `/etc/bashrc` sources `/etc/profile.d/*.sh` if this is not a login shell
- `/etc/profile` sources `/etc/profile.d/*.sh`
- This means:
 - `/etc/profile` and `~/ .bash_profile` are sourced *only* when a user logs in where their shell is `bash`, `sh`, `ksh`, `ash` and a few other shells, by *whatever means*
 - `~/ .bashrc`, `/etc/bashrc` and `/etc/profile.d/*.sh` are sourced for *every* new interactive shell, including login shells.

What sources what

- `/etc/profile` sources `/etc/bash.bashrc`
- `/etc/bash.bashrc` sources `/etc/bashrc.local` ✓
- `~/ .bash_profile` sources `~/ .bashrc`
- This means:
 - `/etc/profile` and `~/ .bash_profile` are sourced *only* when a user logs in where their shell is `bash`, `sh`, `ksh`, `ash` and a few other shells, by *ssh and a text console only*
 - `/etc/bash.bashrc` and `~/ .bashrc` and `/etc/bashrc.local` are sourced for *every* new interactive shell, including login shells.

6.3 Weird stuff

Weird stuff

- The file `/etc/bashrc` is not read directly by `bash`
 - Red Hat, Fedora systems source `/etc/bashrc` from `~/ .bashrc`
- Red Hat, Fedora systems source `~/ .bashrc` from `~/ .bash_profile`
- When you log into an Ubuntu system via `gdm`, it will *not* source `/etc/profile`!

- However, the file `/etc/bash.bashrc` *does* (somehow) get read!
- The file `/etc/profile` *is* sourced when you log in via `ssh` or at a text console!
- You can define environment variables in `/etc/environment`, but do not use `export` there, since it is not parsed by the shell.
- It gets curiously and curiously.

6.4 Executive Summary

Executive Summary for the suit on the go

- Export variables and the `PATH` from `/etc/profile` on a Fedora/Red Hat system for all users, since it is sourced once only, when logging in, via `gdm`, `kdm`, `ssh` or a console;
- define aliases and functions and the prompts `PS1`, `PS2`, ... in `/etc/bashrc` on Red Hat/Fedora systems, since all `~/ .bashrc` scripts will source it by default whenever a new interactive shell is started
- A better place for aliases and function definitions is a file in `/etc/profile.d/` — you might call it `local.sh` — since upgrades will not affect it.

Executive Summary for the suit on the go

- Export variables and the `PATH` from `/etc/bashrc.local`, since `/etc/bash.bashrc` sources `/etc/bashrc.local` and `/etc/profile` sources `/etc/bash.bashrc`, if you want them set the same for all logins, since `/etc/profile` will not be read when you log in via `gdm`. In fact, `/etc/bashrc.local` will be read whenever you start a new interactive `bash` shell, so it is also the place to define aliases and functions and local customisations to prompts `PS1`, `PS2`, ...
- You can add global environment variables to `/etc/environment`, but just assign variables, do not use `export`.
- If someone can explain the rationale for not reading `/etc/profile` from `gdm`, please let me know. There are issues of security, and setting environment variables independently of shell.

7 Other places to put settings

7.1 `/etc/login.defs`

`/etc/login.defs`

- `/etc/login.defs` appears to have different roles on Red Hat/Fedora systems from Debian/Ubuntu systems.
- On Debian systems, `/etc/login.defs` appears to be read when a user logs in or changes settings. The `umask` value is set there, as is the initial value of `PATH`.
- See `$ man login.defs` ↔ on Debian.
- Red Hat/Fedora systems read `/etc/login.defs` when creating user accounts with `shadow-utils` commands including `useradd`, `usermod`, `groupadd`, ...
- There is no man page on Fedora, but it is mentioned in the man pages for the `shadow-utils` commands.

8 The `/etc/skel` directory

The `/etc/skel` directory

- When a user's home directory is created using tools such as `useradd` or `adduser`, the contents of `/etc/skel` are all copied to the new directory
- You can customise the login scripts
- You can create a `/etc/skel/bin` directory, so each new user will have a `~/bin` directory
- See topic 1.111.1 Manage users and group accounts and related system files for how `useradd`, ... use `/etc/skel`

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