

Administració de sistemes GNU/ Linux

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PID_00212803

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Segona edició: setembre 2014
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Av. Tibidabo, 39-43, 08035 Barcelona
Disseny: Manel Andreu
Realització editorial: Oberta UOC Publishing, SL
Dipòsit legal: B-19.883-2014

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Introducció

Els sistemes GNU/Linux han aconseguit un grau de maduresa significativa, que els fan perfectament vàlids per a integrar-los en qualsevol ambient de treball, tant a l'escriptori del PC personal, en un element de mobilitat (com tauletes o mòbils), com al servidor d'una gran organització.

L'objectiu principal que ens proposem en aquest curs és la introducció al món de l'administració dels sistemes GNU/Linux.

Aprendrem com podem proporcionar des de GNU/Linux els serveis necessaris a diferents ambients d'usuaris i màquines. El camp d'estudi de l'administració de sistemes és de dimensions molt àmplies i variat pel que fa als coneixements que són necessaris. Hi ha moltes tasques diferents per fer, amplis problemes per tractar, i hem de disposar de grans coneixements de maquinari i programari; així mateix, tampoc hi sobra una mica de psicologia per a tractar amb els usuaris finals dels sistemes.

No es pretén abordar, en aquest material, una distribució GNU/Linux particular, però se n'han escollit un parell de particularment significatives, pel seu ampli ús i la seva història, per a tractar els exemples de tasques: Debian i Fedora.

Pel que fa al camp de l'administració, s'intentarà gestionar des del nivell més baix possible, normalment des de la línia d'ordres i els fitxers de configuració dels serveis involucrats. Es comentaran, si escau, algunes eines de més alt nivell, però cal anar amb compte amb aquestes últimes, ja que solen ser fortament dependents de la distribució utilitzada i fins i tot de la versió; a més, aquestes eines solen variar funcionalitats entre versions. L'administració de baix nivell sol ser molt més dura, però coneixem amb què estem operant i on podem obtenir els resultats; a més, ens aporta molts més coneixements extra, i un control precís sobre les diferents tecnologies utilitzades.

Les distribucions escollides han estat les últimes disponibles de Debian (o compatibles, com les variants d'Ubuntu) i Fedora (o compatibles, com diferents versions comercials de Red Hat, o de comunitat com CentOS); aquestes (Debian i Fedora) són les més utilitzades en el moment de confeccionar aquests materials. La distribució Debian és un paradigma dins del moviment *open source*, perquè no pertany a cap empresa i està confeccionada bàsicament per les aportacions dels voluntaris distribuïts per tot el món. Debian, a més, integra gairebé exclusivament programari lliure (se'n poden afegir d'altres a part). A

més, un gran nombre de distribucions amb èxit important (com les variants d'Ubuntu, que de fet han superat Debian com a ús en escriptori) tenen Debian com a distribució base.

Nota

Principals distribucions i empreses comentades en el text:

<http://www.debian.org/>

<http://www.ubuntu.com/>

<http://www.canonical.com/>

<http://fedoraproject.org/>

<http://www.redhat.com/>

<http://www.centos.org/>

<http://www.novell.com/linux/>

<http://www.opensuse.org/>

Red Hat és una de les empreses més solvents en el panorama comercial GNU/Linux, i per això és potser la que atorga més suport a escala empresarial (mitjançant serveis de suport de pagament), mitjançant les seves distribucions comercials de Red Hat Enterprise Linux (també hi ha variants lliures alternatives com CentOS). D'altra banda, la seva entrada com a patrocinador ha permès ampliar els resultats del projecte Fedora (i la consegüent distribució GNU/Linux), com a conjunt de tests per a les seves distribucions posteriors, i un desenvolupament d'una àmplia comunitat que ha crescut al voltant seu. Aquest cas forma una interessant experiència combinada de comunitat i empresa en el desenvolupament de la distribució (com després van adoptar altres distribuïdors com és el cas de la versió comercial SUSE Linux i el seu projecte de comunitat OpenSUSE). Per contra, en Debian el suport depèn dels voluntaris i del coneixement compartit dels usuaris, i se centra en la seva comunitat, encara que en els últims temps també ha rebut el suport (no sense certs problemes en el procés) de Canonical, desenvolupador d'Ubuntu.

Com que l'administració de sistemes és un camp tan ampli, aquest manual només ens pretén introduir en aquest apassionant (i com no, també de vegades frustrant) món. Veurem algunes de les tasques típiques, i com podem tractar les problemàtiques que ens apareixen. Però l'administració és un camp que s'aprèn dia a dia, amb el treball diari. I des d'aquí advertim que aquest manual és un treball obert, que amb els seus encerts i els errors més que probables es pot veure complementat amb els comentaris dels seus (sofridors) usuaris. De manera que són benvinguts, per part dels autors, qualsevol tipus de comentaris i suggeriments de millora d'aquests materials.

Comentem, finalment, que el contingut reflecteix l'estat de les distribucions i de les eines d'administració respecte del moment de la realització de la seva edició, o de les corresponents revisions o reedicions.

Continguts

Mòdul didàctic 1

Introducció al sistema operatiu GNU/Linux

Josep Jorba Esteve

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2. UNIX. Una mica d'història
3. Sistemes GNU/Linux
4. El perfil de l'administrador de sistemes
5. Tasques de l'administrador
6. Distribucions de GNU/Linux
7. Què veurem...

Mòdul didàctic 2

Nivell d'usuari

Remo Suppi Boldrito

1. Introducció al sistema GNU/Linux
2. Conceptes i ordres bàsiques
3. Instal·lació i arrencada de GNU/Linux (conceptes bàsics)
4. Configuracions bàsiques
5. L'entorn gràfic

Mòdul didàctic 3

Programació d'ordres combinades (*shell scripts*)

Remo Suppi Boldrito

1. Introducció: l'interpret d'ordres
2. Elements bàsics d'un *shell script*

Mòdul didàctic 4

Migració i coexistència amb sistemes no Linux

Josep Jorba Esteve

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2. Serveis en GNU/Linux
3. Tipologies d'ús
4. Migrar o coexistir
5. Taller de migració: anàlisi de casos d'estudi

Mòdul didàctic 5

Administració local

Josep Jorba Esteve

1. Eines bàsiques per a l'administrador
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3. Nivells d'arrencada i serveis
4. Observar l'estat del sistema
5. Sistema de fitxers

6. Usuaris i grups
7. Servidors d'impressió
8. Discos i gestió de *filesystems*
9. Programari: actualització
10. Feines no interactives
11. Taller: pràctiques combinades dels apartats

Mòdul didàctic 6

Administració de xarxa

Remo Suppi Boldrito

1. Introducció a TCP/IP (paquet TCP/IP)
2. Conceptes en TCP/IP
3. Com s'assigna una adreça d'Internet?
4. Com s'ha de configurar la xarxa?
5. Configuració del DHCP
6. Múltiples IP sobre una interfície
7. IP Network Address Translation (NAT)
8. Udev - *Linux dynamic device management*
9. *Bridging*
10. Xarxa privada virtual (VPN)
11. Configuracions avançades i eines

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Bibliografia

[Bai03] Bailey, E. C. (2003). *RedHat Maximum RPM*. Ofereix una àmplia visió dels sistemes de paquets de programari de les distribucions Debian i Fedora/Red Hat.

[Ban] Banerjee, T. "Linux Installation Strategies HOWTO". *The Linux Documentation Project*. The Dot Gnu Project. <http://www.gnu.org/software/dotgnu/>

[Bar] Barrapunto. Notícies *open source*. <<http://barrapunto.com>>.

[Bas] Mike, G. "BASH Programming - Introduction HOWTO". *The Linux Documentation Project*. <http://es.tldp.org/COMO-INSFLUG/COMOs/Bash-Prog-Intro-COMO/>. Ofereix una àmplia introducció (i conceptes avançats) a la programació de *shell scripts* en Bash, i també nombrosos exemples.

Barnett, Bruce. "AWK". @ General Electric Company. <http://www.grymoire.com/Unix/Awk.html>

"Big Admin: Script Examples". <http://www.sun.com/bigadmin/scripts/filter.jsp>

[Bro01] Scott Bronson. "VPN PPP-SSH". *The Linux Documentation Project*, 2001.

[Bul] Bulma Linux User Group. Documentació general i comunitats d'usuaris. <http://bulmalug.net>

[Cen] The Comunity ENTERprise Operatyng System. <http://www.centos.org>

[Cis00] Cisco. "TCP/IP White Paper", 2000. <http://www.cisco.com>

[Com01] Douglas Comer. *TCP/IP Principios básicos, protocolos y arquitectura*. Prentice Hall, 2001.

[Coo] Cooper, M. (2006). "Advanced bash Scripting Guide". *The Linux Documentation Project* (guies). <http://tldp.org/LDP/abs/html/index.html>. Ofereix una àmplia introducció (i conceptes avançats) a la programació de *shell scripts* en Bash, i també nombrosos exemples.

[Debb] Comunitat Debian. "Distribució Debian". <http://www.debian.org>

[Deb] Debian. "Lloc de Seguretat de Debian". <http://www.debian.org/security/>

[Debba] Debian. "Software Libre vs Software Abierto". <http://www.debian.org/intro/free.es.html>

[Dis] Distrowatch. Distribucions Linux disponibles. Seguiment de les distribucions GNU/Linux i novetats dels paquets de programari. I enllaços als llocs de descàrrega de les imatges ISO dels CD/DVD de les distribucions GNU/Linux. <http://www.distrowatch.com>

[Dra99] Joshua Drake. "Linux Networking". *The Linux Documentation Project*, 1999.

[Fed] The Fedora Project. <http://fedoraproject.org>

[FHS] *FHS Standard*, 2003. <http://www.pathname.com/fhs>

[Fre] Freshmeat. Llista de projectes *open source*. <http://freshmeat.org>

[Fri02] Frisch, A. (2002). *Essential System Administration*. O'Reilly. Administració de GNU/Linux i UNIX. Comenta de manera àmplia aspectes d'administració local i gestió de sistemes d'impressió.

[FSF] FSF. Free Software Foundation i Projecte GNU. <http://www.gnu.org>

[Gar98] Bdale Garbee. *TCP/IP Tutorial*. N3EUA Inc., 1998.

Garrels, Machtelt. "Bash Guide for Beginners". <http://tldp.org/LDP/Bash-Beginners-Guide/html/index.html>

"Man bash". <http://www.gnu.org/software/bash/manual/bashref.html>

[Gnu] Gnupg.org. *GnuPG Web Site*. <http://www.gnupg.org/>

[Gon] Gonzato, G. "From DOS/Windows to Linux HOWTO". *The Linux Documentation Project*.

[Gt] Taylor, G.; Allaert, D. "The Linux Printing HOWTO". *The Linux Documentation Project*. Ofereix informació actualitzada dels sistemes d'impressió i la seva configuració, i també detalls d'algunes impressores. Per a detalls concrets de models d'impressora i controladors, us podeu dirigir a: <http://www.linuxprinting.org/>

[Hin00] Hinner, M. "Filesystems HOWTO". *The Linux Documentation Project*. Informació sobre els diferents sistemes de fitxers disponibles i els esquemes de creació de particions per a la instal·lació del sistema.

[His] HispaLinux. "Comunidad Hispana de Linux". Documentación general y comunidades de usuarios. <http://www.hispalinux.es>

[IET] IETF. "Repositori de *Request For Comment* desenvolupats per la Internet Engineering Task Force (IETF) en el Network Information Center (NIC)".

[Joh08] Johnson, Michael K. (1998). "Linux Information Sheet". *The Linux Documentation Project*.

[KD00] Olaf Kirch; Terry Dawson. *Linux Network Administrator's Guide*.

[Knp] Distribución Knoppix. <http://knoppix.org>

[Koe] Koehntopp, K. "Linux Partition HOWTO". *The Linux Documentation Project*. Informació sobre els diferents sistemes de fitxers disponibles i els esquemes de creació de particions per a la instal·lació del sistema.

[Law07] David Lawyer (2007). "Linux Módem". *The Linux Documentation Project*.

[Lev] Levenez, Eric. "UNIX History". <http://www.levenez.com/unix>

Linux Journal. <http://www.linuxjournal.com>

Linux Magazine. <http://www.linux-mag.com/>

[lin03b] FHS Standard, 2003. <http://www.pathname.com/fhs>

[Linc] *Linux Standards Base project*. <http://www.linux-foundation.org/en/LSB>

[Log] LogCheck. <http://logcheck.org/>

[LPD] The Linux Documentation Project (LDP). Col·lecció de guies i manuals que cobreixen qualsevol dels aspectes de GNU/Linux. Documentació general i comunitats d'usuaris. <http://www.tldp.org>

[Mal96] Fred Mallett (1996). *TCP/IP Tutorial*. FAME Computer Education.

Mike G. "Programación en BASH - COMO de introducción". <http://es.tldp.org/COMO-INSFLUG/COMOs/Bash-Prog-Intro-COMO/>

[Mon] Monit. <http://www.tildeslash.com/monit/>

[Mor 03] Morill, D. (2003). *Configuración de sistemas Linux*. Anaya Multimedia. Bona referència de configuració de sistemes Linux, amb alguns casos d'estudi en diferents entorns; comenta diferents distribucions Debian i Red Hat.

[Mou01] Gerhard Mourani (2001). *Securing and Optimizing Linux: The Ultimate Solution*. Open Network Architecture, Inc.

[Mor03] Morill, D. (2003). *Configuración de sistemas Linux*. Anaya Multimedia.

[Nem06] Nemeth, E.; Snyder, G.; Hein, T. R. (2006). *Linux Administration Handbook* (2a. ed.). Prentice Hall. Tracta de manera àmplia la majoria d'aspectes d'administració i és una bona guia genèrica per a qualsevol distribució.

[New] Newsforge. Notícies *open source*. <http://newsforge.org>

[Nt3] NTFS-3g Project: NTFS-3G Read/Write Driver. <http://www.ntfs-3g.org/>

O'Reilly Associates (2000). Y como *e-book* (free) en Free Software Foundation, Inc. <http://www.tldp.org/guides.html>

[OSDb] OSDN. Open Source Development Network. Comunitat de llocs web, notícies, desenvolupaments, projectes, etc. <http://osdn.com>

[OSIa] OSI. Llista de llicències *open source*. <http://www.opensource.org/licenses/index.html>

[OSIb] OSI (2003). "Open Source Definition". <http://www.opensource.org/docs/definition.php>

[OSIc] OSI (2003). "Open Source Initiative". <http://www.opensource.org>

[PPP00] Linux PPP. "Corwin Williams, Joshua Drake and Robert Hart". *The Linux Documentation Project*, 2000.

[Pri] **Pritchard, S.** "Linux Hardware HOWTO". *The Linux Documentation Project*.

[PS02] **Enríquez, Ricardo; Sierra, Pío** (2002). *Open Source*. Anaya Multimedia.

[Qui01] **Quigley, E.** (2001). *Linux shells by Example*. Prentice Hall. Comenta els diferents intèrprets de programació en GNU/Linux, i també les seves semblances i diferències.

[Ran05] **David Ranch.** "Linux IP Masquerade" i **John Tapsell.** Masquerading Made Simple. *The Linux Documentation Project*, 2005.

[Ray98] **Raymond, Eric** (1998). *La catedral y el bazar*. <http://es.tldp.org/Otros/catedral-bazar/cathedral-es-paper-00.html>

[Ray02a] **Raymond, Eric** (2002). "UNIX and Internet Fundamentals". *The Linux Documentation Project*.

[Rayb] **Raymond, E. S.** "The Linux Installation HOWTO". *The Linux Documentation Project*.

Red Hat Inc. "Distribución Red Hat". <http://www.redhat.com>

[Rid00] **Daniel López Ridruejo.** "The Linux Networking Overview". *The Linux Documentation Project*, 2000.

Robbins, Arnold. "UNIX in a Nutshell" (3a. ed.). <http://oreilly.com/catalog/unixnut3/chapter/ch11.html>

"The GNU awk programming language". http://tldp.org/LDP/Bash-Beginners-Guide/html/chap_06.html

[Sal94] **Salus, Peter H.** (1994, novembre). "25 aniversario de UNIX". *Byte España* (núm. 1).

Scientific Linux. <http://www.scientificlinux.org>

[Sam] Samba Project. <http://samba.org>

[Sama] Samba HOWTO and Reference Guide (Chapter Domain Control). <http://samba.org/samba/docs/man/Samba-HOWTO-Collection/samba-pdc.html>

[Samb] Samba Guide (Chapter Adding Domain member Servers and Clients). <http://samba.org/samba/docs/man/Samba-Guide/unixclients.html>

[Sec00] Andrés Seco (2000). "Diald". *The Linux Documentation Project*.

[Skob] Skoric, M. "Linux+WindowsNT mini-HOWTO". *The Linux Documentation Project*.

[Sla]Slashdot. Lloc de notícies generals de la comunitat Open Source, informàtica i Internet. <http://slashdot.org>.

[SM02] Schwartz, M. i altes (2002). *Multitool Linux - Practical Uses for Open Source Software*. Addison Wesley.

[Smb] Entrada *Server Message Block* a la Wikipedia. http://en.wikipedia.org/wiki/Server_Message_Block

[Smi02] Smith, R. (2002). *Advanced Linux Networking*.

Addison Wesley. Administració de GNU/Linux i UNIX. Comenta de manera àmplia aspectes d'administració local i gestió de sistemes d'impressió.

[Sob10] Sobell, M. G. (2010). *A Practical Guide to Fedora and Red Hat Enterprise Linux*. Prentice Hall. És una bona guia d'administració local per a distribucions Red Hat i Fedora.

[Sou] Sourceforge. Llista de projectes *open source*. <http://sourceforge.org>

[Sta02] Stallman, Richard (2002). "Discusión por Richard Stallman sobre la relación de GNU y Linux". <http://www.gnu.org/gnu/linux-and-gnu.html>

[Ste07] French, S. "Linux CIFS Client Guide". <http://us1.samba.org/samba/ftp/cifs-cvs/linux-cifs-client-guide.pdf>

[Stu] Stutz, M. "The Linux Cookbook: Tips and Techniques for Everyday Use". *The Linux Documentation Project* (guies). És una àmplia introducció a les eines disponibles en GNU/Linux.

[Sun 02] Sundaram, R. (2002). "The dosemu HOWTO". *The Linux Documentation Project*.

[Tan87] Tanenbaum, Andrew (1987). *Sistemas operativos: diseño e implementación*. Prentice Hall.

[Tan06] Tanenbaum, Andrew; Woodhull, Albert S. (2006). *The Minix Book: Operating Systems Design and Implementation* (3a. ed.). Prentice Hall.

[Tri] Tripwire.com. *Tripwire Web Site*. <http://www.tripwire.com/>

[Ubn] Distribució Ubuntu. <http://www.ubuntu.com>

[Vas00] Alavoor Vasudevan (2000). "Modem-Dialup-NT". *The Linux Documentation Project*.

[War] Ward, I. "Debian and Windows Shared Printing mini-HOWTO". *The Linux Documentation Project*. Wine Project. <http://www.winehq.com/>

[Wil02] Matthew D. Wilson (2002). "VPN". *The Linux Documentation Project*.

[Wm02] Welsh, M. i altres (2002). *Running Linux 4th edition*. O'Reilly. Administració de GNU/Linux i UNIX. Comenta de manera àmplia aspectes d'administració local i gestió de sistemes d'impressió.

[Woo] Wood, D. "SMB HOWTO". *The Linux Documentation Project*.

[Xin] Xinetd Web Site. <http://www.xinetd.org/>